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E-Learning in the Republic of Korea

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Foreword

When, today, one wishes to capture the essence of the planet's socio-economic state of play, the expression "Global Knowledge Society" seems to find universal favour. It best renders, even cross-culturally, the sense of a phenomenon that has permeated the language and culture of everyone from the Hong Kong trans-national banker to the German fiber-optics researcher, from the Sakha (Yakutia) nomadic reindeer herder to the Samoan fire dancer.

To the extent that an individual, whether he/she lives in a subsistence or R&D/Service-driven economy, has access to any form of print or electronic media, this person is a user of, and contributor to, the creation, accumulation, storage, retrieval, analysis, and application of knowledge. Indeed, all macro-economic forces share one thing in common which is the generation of knowledge.

From the foregoing, two conclusions commend themselves. First, the lowest common denominator of the entire matrix is *education* and particularly *basic* education (i.e. literacy and numeracy). And second, if education is the primary driving regenerative force, ICT plays a role of equivalent importance inasmuch as it is the vehicle of choice by means of which knowledge is not only shared around the globe but is also returned in the form of user feed-back. Put simply, ICT helps professional educators to re-examine some of their initial assumptions about relevance, equity, and cost-effectiveness and, where necessary, to make the adjustments needed to enrich the quality of the source from which it emanated in the first place.

Professionals working in both the public and private sectors have, for at least the past half-century, recognized the need for coherent policies in education and indeed some of UNESCO's most seminal work has been done in the fields of policy and financing in education. Yet it is only recently that they have come to realize that, by not including the place of ICT in education, the task is only half done. And the starting point, it is widely agreed, is the acknowledgment of the inter-connectedness of education and ICT. If education is the *what* of global knowledge and ICT, the *how*, then it follows that, ***together***, they furnish the answer to the question ***why***.

ICT, and ICT alone, has the capacity to provide the means by which the widely-used concept of *lifelong learning* has an operational meaning. Without it, the notion is little more than a noble aspiration. Without ICT, concepts like *equal access to education* and *education for all* are condemned to the fate of a slogan: however right they may be, without the means to share the knowledge generated by formal and non-formal educators, they can never be more than an empty call to promote equity and justice.

It was in recognition of this fact that, in the closing years of the last century, UNESCO's General Conference created the UNESCO Institute for Information Technologies in Education (IITE). Located in Moscow, it was tasked first, with developing and implementing the Organization's programmes in education and second, with serving as a centre of excellence and technical expertise in this field. It continues today as the only such body in the entire Organization and as such, plays — indeed is expected to play — not only a regional but global role in promoting the application of ICT technology to a full range of formal and non-formal learning environments.

The IITE contributes to the Organization's efforts to, variously:

- bridging the digital divide;
- promoting e-environments as a means of reinforcing national efforts to create knowledge societies;
- contributing to policy dialogue;
- supporting national and local efforts to harness ICT in the service of education and training;
- disseminating research on best practices.

I wish to draw your attention to a particularly relevant publication prepared by a number of well-known Korean policy makers, scientists and practitioners, all of whom are, in one way or another, skilled in the application of ICT to education in their country, a country that has made significant advances in respect to both policy formation and e-Learning over the past few years. In the pages that follow, the reader will find a detailed description of the challenges met, lessons learned, and corrective steps taken in such areas as the planning, implementation, and monitoring of ICT-supported programmes.

It is my view that the efforts of our Korean colleagues pass the test of excellence in its own right, the test of global relevance, and finally, the test of responding to the expectations of the participants in the Global Knowledge Society. For those reasons, I take great pleasure in commending this publication to all those who, whether personally or professionally, feel compelled to rise to what is arguably one of the great challenges of the 21st century.

Dendev Badarch
UNESCO IITE Director a.i.

Executive Summary

This survey of ICT innovations in education in the Republic of Korea (ROK) introduces the ICT policies and initiatives, including the legal framework, organizational structure, budget, and policy implementation processes with a special focus on infrastructure, curriculum, teacher training, global standards and a quality assurance system, monitoring and evaluation systems, and the global contribution. The survey describes the process of policy planning and implementation, goals, experiences, and lessons, which can serve as a useful reference to other UNESCO Member States in their policy work.

Since 1996 the development of ICTs within the education system of the Republic of Korea has been implemented under three national master plans. The first Master Plan (1996—2000) was focused on the establishment of a world-class ICT infrastructure in elementary and secondary schools. The objective of the second Master Plan (2001—2005) was to enhance the quality of education by allowing open access to educational content and providing teacher training for the integration of ICT into classroom teaching practices. In addition, the National Education Information System (NEIS) was developed as a computer network maintained by the Ministry of Education to facilitate the electronic management of all education-related administrative tasks. The third and most recent Master Plan (2006—2010) has been focused on the creation of sustainable learning environments with u-Learning and future education through more flexible and secure educational services such as the development of digital textbooks.

The use of ICT in education in ROK has been driven by a strong cooperation among three key players: Ministry of Education, Science, and Technology (MEST), Korea Education and Information Service (KERIS), and 16 Metropolitan Provincial Offices of Education (MPOEs). MEST has been coordinating the processes from policy planning to implementation. As a government agency, KERIS has been playing exclusive role in supporting and planning implementation of the national ICT policy. Sixteen MPOEs have been autonomously implementing the national ICT policy at the regional level.

The establishment of ICT infrastructure in schools was aimed to promote education equity by bridging the digital divide. The School Advancement Project, which included the establishment of school LANs, Internet-connected multimedia labs, provision of PC and information devices for classrooms, and personnel support, had been implemented according to the three national master plans. Since the mid-1990s national initiatives for supporting ICT integration into the school curriculum have been gathering momentum. The projects ranged from educational content such as supplementary materials and educational software for the development of digital textbooks. Educational content, which almost in full has been provided and shared in EDUNET, plays an important role in the curriculum integration of ICT.

Since the late 1980s the ROK government has provided teacher training for both ICT literacy and integration purposes. The focus of teacher training, however, has changed over the course of the three master plans from computer literacy to curriculum integration. In addition, the government has built the teacher training framework for ICT in education to meet the specific needs faced by teachers throughout their career. The new teacher roles and adequate ICT competencies should be taken into consideration for the future design of teacher training.

The information service system in education is comprised of three main groups: EDUNET (for teaching and learning), EMIS and NEIS (for administration), and CHLS (for home learning). EDUNET was developed to operate and provide multimedia materials, instructional lesson plans and evaluation items according to school level. EMIS focuses mostly on collecting annual statistical data from educational institutions while NEIS manages and integrates personnel, financial, and school affairs within or between institutions, regional offices and the Ministry of Education. CHLS provides individual learning materials and online tutorial support in order to bridge the education divide for after school private tutoring. These services are aimed to provide an effective environment, improve productivity and efficiency, and harness ICT in education nation-wide for teaching and learning and administrative purposes.

As e-Learning technologies become increasingly utilized for educational courses, issues related to standardization for reusability and interoperability, assurance of quality, and prevention of adverse effects become crucial. Therefore, national standards for e-Learning were developed; a prime example is the enactment of the Korea Educational Metadata (KEM). Furthermore, in 2008 it was proposed to the Joint Technical Committee (JTC) 001/SC36 of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) to integrate South Korean national standards for e-Learning in international standards. To enable quality control of e-Learning, the E-Learning Quality Assurance System (EQAS) was established using such criteria as content, service and platform. To promote and ensure a safe and sound cyberspace in the educational area, MEST set up the Education Cyber Security Center (ECSC) and implemented various e-safety and e-ethics campaigns, as well as additional training programmes.

Monitoring and evaluation systems are vital for the diagnostics of the current status of the initiatives, evaluation of the outcomes and planning of the measures for further improvement. The overall scheme of monitoring and evaluation of ICT policy in education consists of measuring ICT in education for schools, ICT literacy tests for students, as well as an external evaluation of major national ICT projects.

Beyond domestic implementation, the Korean government has expanded its cooperation with the global community to reduce the digital divide through ICT in education. Representatives of over 50 countries visit the Republic of Korea every year to benchmark best practices in this sphere. The number of requests for consulting projects for ICT in education through ODA grants and EDCF loans has increased considerably.

ICT policy in education within the ROK has been recognized as a best practice. The achievements of Korean e-Learning and ICT in education policy are recognized as a result of a solid legal framework, systematic implementation mechanism, secured budget and support, timely capacity building, successful cooperation between public and private sectors, and an effective monitoring and evaluation system. On the other hand, there were a fair number of lessons that had to be learned along the way. For the future, the ROK government is advised to continuously pay attention to further investment in ICT in education for sustainable development of e-Learning and innovation of educational practices.

Acknowledgements

The material and data on educational institutes and institutions used for analysis build on the initiatives and projects in ICT in education and e-Learning taken by MEST.

This study benefited mostly from support given by Dr. Se-Yeoung Chun, KERIS President, through sharing the most current issues and relevant research materials and results obtained by KERIS.

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National IT Industry Promotion Agency (NIPA) contributed towards multidimensional perspectives and sharing the results appeared in annual publication of "Survey of the e-Learning Industry in Korea" in 2010.

Pieter Swart and Benjamin Campbell voluntarily contributed to proofreading the text several times.

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List of Acronyms

CAI	Computer Assisted Instruction
CEN	European Committee for Standardization
CERT	Computer Emergency Response Team
CHLS	Cyber Home Learning System
DAC	OECD Development Assistance Committee
DOI	Digital Opportunity Index
EBS	Educational Broadcasting Service
ECSC	Education Cyber Security Center
EDCF	Economic Development Cooperation Fund
EIU	Economist Intelligence Unit
EQAS	E-Learning Quality Assurance System
HE	Higher Education
HRD	Human Resource Development
IDC	International Data Corporation
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ISST	ICT Skill Standard for Teacher
ITU	International Telecommunication Union
JTC	Joint Technical Committee
KATS	Korean Agency for Technology and Standards
KEM	Korea Educational Metadata
KERIS	Korea Education and Research Information Service
KICE	Korea Institute of Curriculum and Education
KNISE	Korea National Institute for Special Education
KOCW	Korean Open Courseware
KRIVET	Korea Research Institute for Vocational Education and Training
LCMS	Learning Content Management System
LLEI	Life Long Education Institute
LMS	Learning Management System
LTSC	Learning Technology Standards Committee

MERLOT	Multimedia Educational Resource for Learning and Online Teaching
MEST	Ministry of Education, Science and Technology
MHW	Ministry of Health and Welfare
MKE	Ministry of Knowledge Economy
MOPAS	Ministry of Public Administration and Securities
MOGAHA	Ministry of Government Administration and Home Affairs
MOL	Ministry of Employment and Labour
MPB	Ministry of Planning and Budget
MPOE	Metropolitan and Provincial Offices of Education
NEIS	National Education Information System
NHRD	National Human Resource Development
NIA	National Information Society Agency
NIPA	National IT Industry Promotion Agency
NSATUE	National Scholastic Aptitude Test for University Entrance
NTTS	National Teacher Training Information Service
NURI	New University for Regional Innovation
OCW	Open Courseware
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OER	Open Educational Resources
OSS	Open Source Software
PISA	Programme for International Student Assessment
RETI	Remote Education and Training Institutes
RIS	Regional Information System
ROK	Republic of Korea
SIMS	School Information Management System
TTI	Teacher Training Institute

I Introduction

1. Objectives

UNESCO gives high priority to the use of information and communication technologies (ICT) for expanding access to quality education. The Dakar Framework for Action states that the potential of ICT should be used to help achieve EFA goals. According to the Medium-Term Strategy of the UNESCO Institute for Information Technologies in Education (IITE), *"ICTs can expand access and enhance the quality of education. However, judicious choices are essential for avoiding expensive errors that can have the opposite effect to the one intended. Monitoring progress, understanding results, but also learning by doing, are all essential to advancement"* (UNESCO IITE, 2010). The majority of UNESCO Member States recognize ICT as the catalyst for educational reform and innovation leading to the increase of knowledge and information accessibility, the revision of curriculum to meet the new demands of future education, teacher development, social inclusion, and further raising the quality of education.

The major objective of this study was to analyse information on the reform of educational system and identify the best practices in e-Learning performed in the Republic of Korea. The survey describes the process of policy planning and implementation, goals, experiences, and lessons, which can serve as a useful reference to UNESCO Member States in their education policy work.

The goal of the first efforts in adopting ICT in education in Korea that date back to 1985 was to provide classrooms and teachers with computers as a means to renovate school facilities and teaching methods for primary and secondary school students. The use of ICT in education has evolved from merely improving the school environment to making education globally competitive through continuous innovation of the educational system and simultaneous nurturing of teacher capacity.

The enactment of the "E-learning Industry Development Law" in 2004 led to the development of a promising learning environment, a knowledge business, whose revenue amounted to USD 2.1 billion in 2009, and promotion of smart education to be made available to the ubiquitous society. E-learning contributed to the innovation of training methods for teachers, employees, and government officials. It has assumed an important role in the nurturing of human resources across various sectors of Korean society.

The study pays special attention to why and how ICT use in education and e-Learning have helped to innovate education and training in Korea and the ways it followed in order to effectively meet the challenges and demands of future education. This survey also discusses human factors: the characteristics of students, teachers and parents, the recognition of ICT by CEOs and the teachers of primary and secondary schools — which all constitute a significant part of the core considerations for planning policies aimed at ICT promotion.

2. Scope

This analytical study includes an overview of e-Learning policies and the implementation of ICT use in education in Korea. We will discuss the legal framework, organizational structure, and the ways of mobilizing funds necessary for this effort. We will also consider

the policy implementation process and place a special focus on infrastructure, curriculum, teacher training, global standards, quality assurance, monitoring and evaluation systems, and the global contribution. The research is underlain by the conceptual framework, which rests upon the establishment of ICT infrastructure, development of the education information service, legal foundations, and global partnerships. Each chapter is concluded by policy implications that summarize the lessons, suggestions, experiences, and raise issues to be addressed in the future.

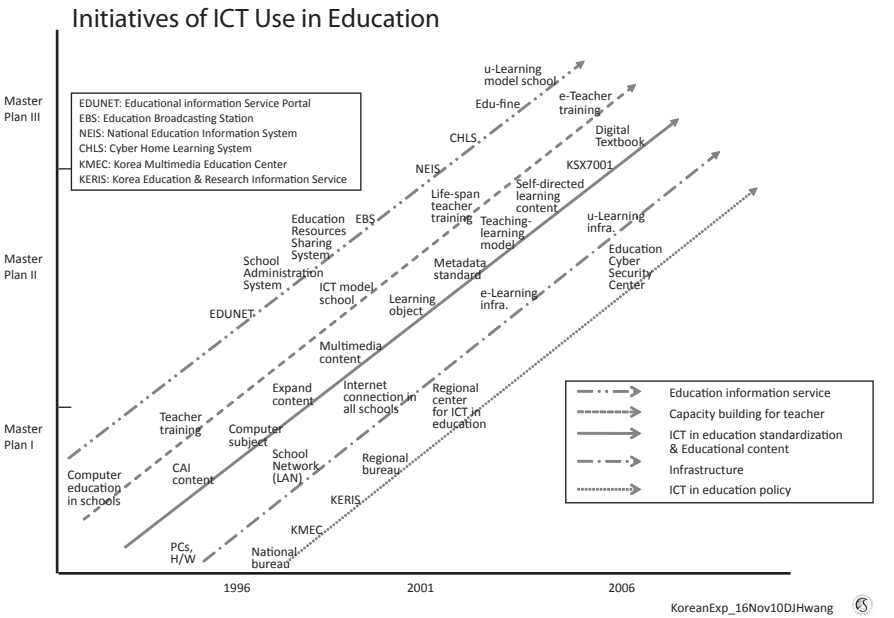


Figure I-1. Government Initiatives for ICT in Education.
Source: Hwang (2008a).

The initiatives taken during three five-year master plans to promote ICT use and e-Learning in the education system are summarized in Figure I-1. The initiatives were grouped into five categories: information service, teacher capacity building, content development, infrastructure, and organizational structures. The right line shows

the organizational structure in charge of a specific part of promotion of ICT in education. The Korea Education and Information Service (KERIS) was established in April 1999 to support, plan, promote, and monitor the adoption and utilization of ICT in education. The Education Cyber Security Centre was set up to provide education institutes with a secure environment for Internet access, use of education information services, and protection against external hacking attempts. The next line depicts the evolution of the use of ICT infrastructure from hardware facilities available in classrooms to e-Learning and further towards a ubiquitous learning infrastructure. The central line shows the migration path of educational content development from Computer Assisted Instruction (CAI) to digital textbooks, which are quite similar to e-books available at present. The line second from the left depicts the evolution of the teacher training system to nurture teachers in order to meet the demands raised by students, to become aware of technology use and the paradigm shift. The left line shows government initiatives taken to meet the demands of students, teachers, schools, and the government.

3. The Current Status of ICT Use in Education in the Republic of Korea

3.1 Overview

Rapid development of information technology helps to drive knowledge and information-based society. How to define knowledge and information-based society and what kind of trends can be expected in terms of change? In knowledge and information-based society, a new economic principle directs the society: knowledge is considered more important than any other property; knowledge and information prompt tougher competition than ever before.

The demands associated with social change lead education reform. Education must be able to respond to social changes and ensure adequate training of human resources to satisfy the demands of the changing society. No matter how hard we try to prepare for such changes, nobody can fully anticipate or predict changes to come. Therefore, a national strategic human resources development plan for the next generation should be prepared on the basis of proper foresight. Our society is increasingly multi-disciplinary. So an individual cannot live autonomously and must be able to cooperate and collaborate with others. Thus, importance of efficient and effective communication and collaborative skills becomes a critical factor in education.

3.2 High Demand for the Innovation of Education

The Republic of Korea faces such issues as the increase of private tutoring expenses, the quality of public education, the grade and competition-centred education system surrounding the National Scholastic Aptitude Test for University Entrance (NSATUE), which often results in the declining self-esteem of teachers and further discomfort of parents with the educational system. The dissatisfaction of students and parents with public education leads to extreme dependence on private education, even though it is expensive. This trend restricts access to educational opportunities for all on equal terms and impedes social harmonization in Korean society.

In order to solve the education-related problems and to respond to the new demands of the changing society, there is a need for reforming school education and the educational system on the whole. ICT use in education and e-Learning as one of its components are one of the best ways to expand educational opportunity so that students and citizens can be satisfied with education.

3.3 ICT Infrastructure

The Republic of Korea has built a world-class IT infrastructure and Internet facilities nationwide. For instance, the average number of students per personal computer is 5.8, and 70.7% of schools are equipped with 2Mbps Internet lines. The majority of the population in Korea is able to access the Internet anywhere and anytime: Internet utilization rate is 64.1% and 89.9% of the population use the Internet at home.

E-learning was adopted by 80.0% of regular education institutes in 2009. According to the national statistics, 19.6% of regular educational institutes adopted e-Learning in 2007, 17.7% in 2006 and 15.1% in 2005. However, e-Learning has been adopted in 69.7% of higher education institutes before the year 2005, which means that e-Learning began to be used in higher education earlier than in primary and secondary education in Korea. The adoption of e-Learning was the highest in primary schools followed by secondary schools and universities: primary schools (88.0%), middle schools (78.0%), high schools (68.7%), junior-high schools (47.1%), junior colleges (62.0%), and universities (78.0%). E-learning has been recognized as a major tool for nurturing and training human resources, with the reported use by 517,700 government officials in 2008, 1,550,000 employees and workers employed by companies in 2008, and 130,000 teachers per year.

With the dramatic increase in the use of e-Learning, its quality management required the attention of learners and the government. In addition, increased attention was paid to the sustenance of high quality e-Learning services running at schools, cyber universities, as well as e-Learning institutions established for job training, teacher training, and government official training. According to the results of the national poll, Korean learners found that the most attractive features of e-Learning were cost saving and learning time followed by system stability, content quality, diversity, and learning effects.

3.4 E-Learning to Reform Education in the Republic of Korea

The results achieved since the introduction of ICT in education make it possible to consider the implementation of e-Learning as an alternative way to reform education in the Republic of Korea. First, Korea has built a top-ranked IT infrastructure over the last decade. The "Facilitating E-Learning Industry Law" defines e-Learning as a "learning process utilizing electronic devices, information technology and broadcasting communication technology." According to the International Telecommunication Union (ITU) in 2003, with the "Cyber Korea 21" Plan the Republic of Korea was ranked 4th in the world in terms of PC diffusion rates and 1st in the number of registered high-speed Internet users. As stated in the Economist Intelligence Unit (2003) study, the ROK was the 5th among 60 countries for e-Learning readiness, of which all the top 10 countries, except for Korea, were English-speaking countries. The Republic of Korea is abreast the U.S in the area of e-Learning readiness in the industrial field. In addition, the Educational Broadcasting Service (EBS) programme and e-Learning service for supporting the high school graduates to prepare for NSATUE, which are part of the national initiative taken to reduce huge private tutoring expenses paid by Korean family, is a unique educational system which drives the new IT era with the convergence of Internet and broadcasting communication technology. Therefore, the existing ICT infrastructure, combined with the readiness and preparation for e-Learning lays ground for a new educational system.

Second, e-Learning drives education reform that provides access anytime and anywhere to anyone with a desire to study. Generally, e-Learning means utilizing ICT to expand education; however, this does not mean just utilizing ICT as an end. E-Learning suggests utilizing ICT to remove limitations of time and space so that anyone could have the opportunity to study and learn at an individual level.

Table I-1 shows that e-Learning became quite popular in the Republic of Korea regardless of gender, age, and educational and vocational background of learners. The highest ratio of young people is explained by the fact that they were taking courses relevant to NSATUE after school. This was also proved by the growth ratio of 19.7% in 2009 as compared to the number of high school students in 2008.

Table I-1

E-Learners in the Republic of Korea

Category		2007 (%)	2008 (%)	2009 (%)	Growth Ratio (%)
Total		39.4	45.0	48.3	3.3
Gender	Male	45.8	47.6	50.4	2.8
	Female	31.5	41.9	46.1	4.2
Age Group	6-19	67.0	70.9	72.0	1.1
	20-29	50.7	61.3	62.6	1.3
	30-39	27.2	30.5	40.8	10.3
	40-49	23.4	29.6	31.7	2.1
	More than 50	11.2	13.5	18.4	4.9
Educational Background	Pre/Elementary	61.3	70.3	62.7	-7.6
	Middle	65.6	64.5	84.2	19.7
	High	77.4	81.2	90.5	9.3
	University, Graduate School	69.5	69.3	70.2	0.9
Vocational Background	Student	66.8	70.5	NA	NA
	Professional Clerical	43.5	48.8		
	Service/Production	16.1	22.4		
	Housewife	10.0	10.5		
	Jobless	21.1	26.5		

Source: NIPA (2010). Reformulated by Hwang (2009a).

II Policy Planning

1. Overview

Introduction of ICT in education in the Republic of Korea began with computer literacy education and was further extended to nurture human capital by allowing more opportunities for learning and improving the quality of education. Policies for ICT and e-Learning were initiated by MEST in association with the projects driven by Ministry of Knowledge Economy (MKE) in 1987. Some examples are the National Basic Information System Project, High Speed Broadband Network Project, Framework Plan for IT Development, and the e-Government Project. MEST orchestrates the process of ICT policy making, establishing ICT infrastructure, teacher training, evaluation, and monitoring. MKE has been undertaking initiatives to establish communication networks infrastructure including LAN connections at each school and nationwide high-speed Internet for elementary and secondary schools. In this regard ICT policy in education has been implemented through collaboration between MEST and MKE.

Figure II-1 shows the legal framework which supports ICT initiatives and cooperation among ministries to nurture globally competitive human resources by making full use of well-established world-class infrastructure for learning.

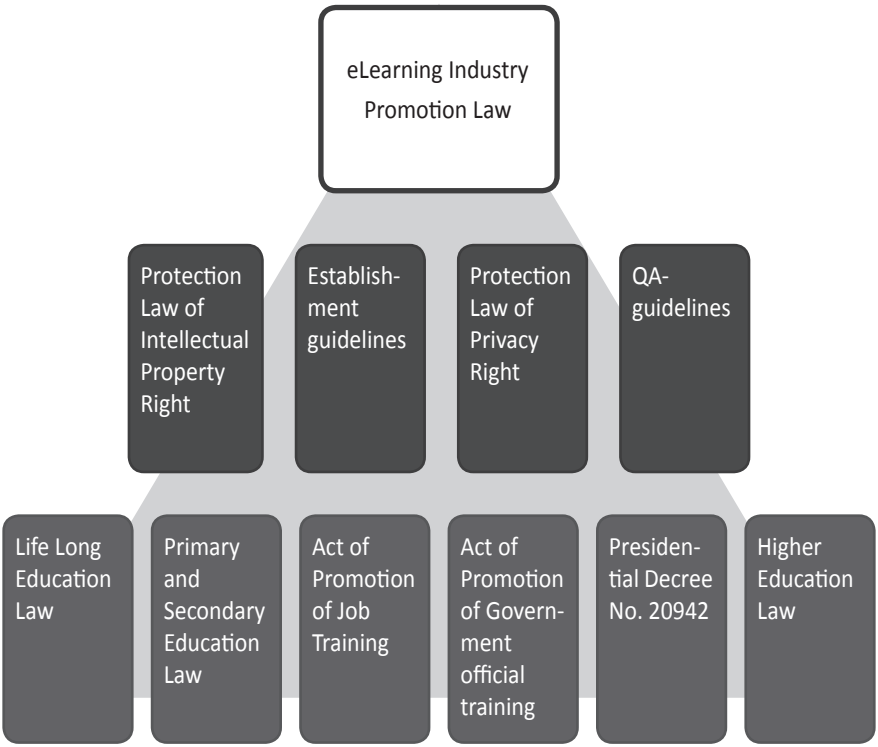


Figure II-1. Legal Frameworks for the Promotion of ICT.
Source: Hwang (2009a).

1.1 Progress of ICT Use in Education

The implementation of ICT policy in education included three stages in terms of the establishment and expansion of its usability. The first phase was focused on establishing a world-class ICT infrastructure to initiate the educational information service. The second phase was devoted on quality education and open access to the information related to the education and training

services available within the ICT infrastructure: e-Learning and capacity building programme for teachers and CEOs of elementary and secondary schools. The third phase was designed to create sustainable learning environments including u-Learning and mobile learning, which provide students with more flexibility and more secure education information service. This should be further developed to allow students and primary and secondary schools to use digital textbooks instead of printed textbooks. Expanding global cooperation with developing countries through partnerships for sharing experience and best practices in ICT in education have been emphasized to take a leading role in the use of ICT in education.

1.2 Roles of Organizations

Promotion of ICT in education has been driven by strong cooperation among three unique key players: Ministry of Education, Science, and Technology (MEST), Korea Education and Information Service (KERIS), and 16 Metropolitan Provincial Offices of Education (MPOEs). As shown in Table I-2, MEST coodinates the processes related to ICT policy making and its implementation. KERIS plays exclusive role in supporting and developing the implementation details of the National ICT policy: the guidelines for content development, CHLS, and quality evaluation, monitoring progress of government initiatives, and performance analysis. Sixteen MPOEs autonomously implement national ICT policy to achieve the goals that regional schools and students would expect to attain in terms of quality education and social inclusion: providing equal opportunities for students in their regions. The policies to be described below are grouped into those for school administration, training for students and teachers, e-Learning, and protection of individual privacy.

Table I-2

The Roles of MEST, KERIS, and 16 MPOEs

Category	MEST	KERIS	16 MPOEs
ICT policy planning	Overarching policy planning at national level	Support to MEST and MPOE in the elaboration of the action plan to implement national ICT policy	Implement and establish ICT policy for each MPOE in compliance with national policy
Improvement of Law and acts	Establish and implement laws and acts for MPOEs and schools	Study policy for establishing and improving laws and acts	Develop and execute action plans for each MPOE and supervise schools in implementing them
Infrastructure provision	Analysis of demand for infrastructure and financial support. Decision on implementation of guidelines for development and operation	Prediction for ICT infrastructure, analysis of technology trends, research for improvement	Monitoring and budget allocation for ICT infrastructure; operating maintenance programs
Content development and operation	Planning of content development, financing, and operational management	Quality control and maintenance, operation of a resource sharing system, research for e-Learning standards	Content development in compliance with national guidelines for content development and running content in conjunction with KERIS
Teacher training	Planning for teacher training and budget allocation, provide guidelines for training and operational management	Support planning for teacher training, content development, running, and research on training issues	Implementing national teacher training plan established by MPOE
NEIS development and operation	Planning national policy, operational management, auditing, and evaluation of performance	Planning for operation of Central NEIS Centre, running and maintaining its system and software and hardware resources	Planning for operation of regional centre, operation of communication systems and software
Evaluation of the use of ICT	Planning the evaluation of ICT use in MPOEs and schools; evaluation	Developing and assessing the guidelines, items, implementation and feedback of evaluation	Providing MEST with evaluation data, implementing and running an evaluation system at school level
Clearance of information divides	Planning and financing for diminishing information divides among regions, schools, and parents with different income levels	Research on how to diminish information gaps; identification of best practices	Establishing and running plans aimed at reducing information divides

Source: MEST and KERIS (2009).

1.3 Utilization of ICT Infrastructure

Reasoning from positive expectations on the use of well established ICT infrastructure, the ROK government decided to introduce e-Learning in elementary and secondary education and in National Human Resource Development (NHRD). E-Learning was adopted as national strategy to develop NHRD and to realize a lifelong learning society. First of all, e-Learning is acclaimed to be a new paradigm in the knowledge-based society. Many countries adopted e-Learning as the main educational tool to handle new knowledge in a timely manner, to obtain new knowledge, and to lead the trend in the knowledge revolution. With the onset of the knowledge-based society, economic and social development is driven by knowledge, and knowledge is considered to be the most important aspect of the learning environment. Second, e-Learning is one of the best ways to strengthen national competitiveness. One of the most important reasons for adopting e-Learning is the idea that the educational and industrial sectors should coordinate their efforts, so that e-Learning could lead to a more educated society and thus lay the foundation for national competitiveness.

E-Learning has been developed as a main national strategy with which ministries of the ROK government are drafting and implementing various policies. MEST drives educational policies with e-Learning to strengthen public education and expand lifelong learning.

1.4 Government Initiatives to Fully Utilize ICT

In elementary and secondary education, the incorporation of ICT into Master Plan I and II was implemented between 1996 and 2005. Main actions taken during this period were distribution of PCs, connecting to the Internet, and training teachers to enhance ICT skills. The utilization of existing ICT education was expanded with numerous e-Learning projects: “EBS E-Learning Project for the NSATUE,”

"Cyber Home Learning System," and "E-Learning Development Master Plan" and many others. Furthermore, in the higher education, "E-Campus Vision 2007" was established to use e-Learning as a foundation for the policy. The plan aimed to divide the country into 10 regional sectors, designate 10 universities as e-Learning Support Centres and invest approximately USD 160 million to revitalize e-Learning in universities and institutes by 2007. In lifelong and career education, distance learning centres were established and operated at the level of other higher education facilities. The Korea National Open University and Air and Correspondence High School used e-Learning to meet the demand for learning from working students, those trying to find new job opportunities, and lifelong learners encouraging them to achieve personal goals for fulfilment and self-esteem.

In 1999 the Ministry of Employment and Labour (MOL) approved the "Communication and Training through Internet Policy" to use e-Learning in career education. Moreover, the Ministry of Public Administration and Securities (MOPAS) has taken measures to utilize e-Learning to foster the training of government officials. E-learning was recognized as a major knowledge business since the Ministry of Knowledge Economy enacted the "E-Learning Industry Development Law" in January 2004 to facilitate growth of the e-Learning industry. The Ministry also issued the "Law of Online and Digital Contents" to promote the development of digital content and protect intellectual property rights of authors and developers. The most important efforts to adopt and make e-Learning popular were initiated in 1997 by the Ministry of Science and Technology. The feasibility study on adopting cyber education (the term used for e-Learning at that time) to the education system in the Republic of Korea initiated by the Ministry was the first stepping-stone that ensured the current flourishing of e-Learning in every sector. The popularity of e-Learning began gaining momentum in 2000 when

MEST established the Cyber University and allowed higher education institutes to use e-Learning in regular courses.

Since the importance of e-Learning has already been recognized, several ministries have elaborated e-Learning policies. However, the availability of several policies on e-Learning in each ministry does not guarantee their integration, as the policies tended to be rather supplier-driven, whereas the development of content for e-Learning should be user-driven and based on a more systematic national approach. Therefore, MEST elaborated the "E-learning Development Master Plan" to integrate e-Learning policies and to achieve the national goal of achieving a learning society and NHRD. The "E-Learning Development Master Plan" strived to build a "Beyond E-Learning Korea" in order to develop NHRD and bridge the information gap among social groups with the aim of reaching 'excellence' and 'equity' in education.

2. ICT Policy for Quality Education

Computer education can be considered as a starting point for ICT use in education in the Republic of Korea. With the growing needs for computer education at schools, official discussions on computer education on a national level became part of the debate on education reform. In 1987, the Education Reform Deliberation Committee, in its report "Master Plans for Education Reform", justified introducing computers to schools to improve teaching methods at elementary and secondary schools, to promote science and technology education, and to prepare for an information society.

In December 1987, to promote efficient computer education MEST announced "Measures to Strengthen Computer Education in Schools", which were the first step in national policy on education informatization in the Republic of Korea. The measures were

aimed to universalize computer education at schools and achieve an information society based on increased computer education opportunities, development of learning methods that include the use of computers, and computerization of school operations.

The "Measures to Strengthen Computer Education in Schools" eventually led to the three "Master Plans on ICT Use in Education" (see Figure II-2). In view of political and social demand, other plans were created to supplement the master plan, for example, "Guidelines on Elementary and Secondary School ICT Education", which emphasized curriculum management not addressed in the Master Plans.

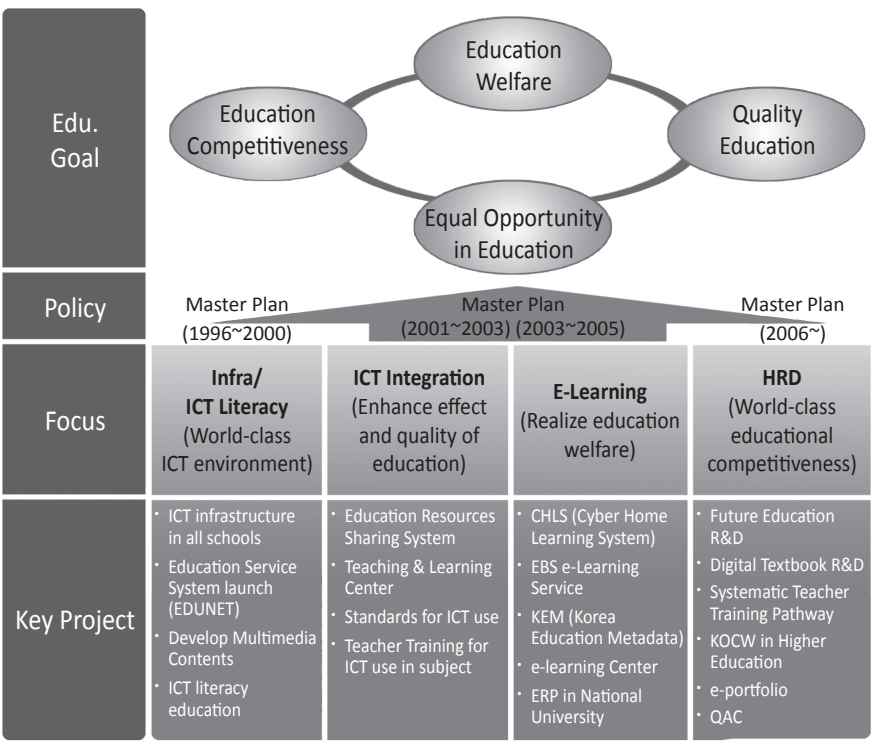


Figure II-2. Summary of Three Master Plans for ICT Use in Education.
Source: Hwang (2008b).

This provision was the main focus of the reform. To this end, several subjects included computer-related knowledge and related skills, and teachers who could teach those subjects were trained accordingly. In addition, national support systems and Computer Assisted Instruction (CAI) programmes were developed.

The first Master Plan started in 1996 strived for an ICT-friendly school environment, infrastructure and training being its main objectives. The objective of the second Master Plan started in 2001 was to activate ICT education. Educational content needed for instruction and learning were shared and distributed, and all teachers were required to receive training in ICT use in education. In 2003, education administrative tasks were automated by implementing the National Education Information System (NEIS) in association with MKEs e-Government project. The third Master Plan began in 2006 and was aimed at ICT use in education with future education and u-learning. Textbooks, which served as important tools in schooling, were to be replaced by digital textbooks and tested in schools. Other endeavours included a shift to u-learning facilities, content and projects.

2.1 The Master Plan I for ICT Use in Education

The real catalyst in shifting computer education to informatization of education was the creation of a new education mechanism proposed by the Education Reform Committee, a consultative body to the President. In the first phase of education reforms, ICT use in education was defined as "allowing everyone to receive education without time or space constraints by using state-of-the-art ICT" and various approaches were proposed. At the second session of the Committee, a more comprehensive education informatization method intended to reform the education system was announced as part of the third and fourth education reform measures. The education informatization measures introduced in these plans guided subsequent ICT use in education efforts.

In response, MEST unified numerous education informatization projects and established the 'Master Plans for ICT Use in Education', which included informatization of elementary and secondary school education, tertiary education, education administration, and development of personnel in the information industry. In 1996, the education service system EDUNET went online, and the Research Information Service was launched the following year. Also, a student record computerization programme was developed and distributed to schools, and a School Information Management System (SIMS) was implemented at that time. The President's New Year message on January 3, 2000 relayed strong impetus for informatization of education. The efforts to implement this intention resulted in the foundation for school informatization laid by connecting all schools across the nation to the Internet and the intranet by the end of 2000.

2.2 The Master Plan II for ICT Use in Education

The second Master Plan expanded the subject and scope of ICT use in education to education development and human resource development. In particular, the focus of particular attention of elementary and secondary school education was improvement of learning outcomes based on ICT use in education. Developing critical thinking and problem solving abilities was in the spotlight; plans for tertiary education, lifelong education, and job-related training all strived for similar goals. At the same time, researchers tried to minimize adverse effects of informatization through provision of support to the less privileged. Moreover, projects had to result in the development of an information and education culture for students, youths, and other participants. Since the creation of a support system was planned, these projects were effectively implemented.

The plan included improving school data infrastructure to match OECD levels (5 students per PC, +2Mbps Internet connection speed), and building an education administration information system to

share and disseminate administrative information, improve education administration transparency and efficacy, and facilitate school teacher tasks. Based on this, an online civil petition service would be provided. Furthermore, 33% of school teachers had to undergo two phases of informatization training annually to enhance ICT skills, followed by proficiency evaluation.

Textbook-appropriate multimedia education resources and teacher software and guidelines had to be created. A safe information culture had to strengthen the education regarding information and communication ethics, and establish a system to block undesirable content. The digital divide should have been bridged through the support of marginalized groups and population of remote regions. International education cooperation networks had to be built, and a practical informatization index and evaluation support network should have been developed. The educational impact beyond the application of ICT and the tools required to reflect the results in policies had to be analysed systematically.

During the implementation of the second Master Plan, an additional plan was created by the Ministry of Education and Human Resources Development to support the main plan through the establishment of an "E-Learning Systems Cluster" and "Methods to Develop an E-Learning Support System for Improving Public Education". This plan defined the e-Learning support system as 'raising the quality of teaching through the use of information and communication technology, promoting self-education, and organically connecting the school-home regional society to revitalize a learning culture community'. The plan was designed to achieve the objectives: to promote an engaging and rewarding classroom environment, revitalize student-centred learning, facilitate a sense of community of learning, and establish systematic and cultural-systematic foundations. The technology had to enable a learner to connect with an instructor (teacher, mentor, or counsellor), fellow student, or gain access to the materials and

resources needed to learn regardless of physical location. The government suggested ways to make this a reality through e-Learning.

As a result of the second Master Plan, ICT was actively applied in elementary and secondary schools, and education information services were bolstered through the implementation of Cyber Home Learning System services and Educational Broadcasting Service (EBS) lectures. Other outcomes included the enrichment of Internet-based education administration services and resource databases to support higher education. The application of ICT seemed to be linked to improved academic achievements: when the 2003 PISA aptitude tests were re-analyzed, students using ICT appeared to have higher levels of academic achievement than those not using.

2.3 The Master Plan III for ICT Use in Education

Computer literacy efforts, implementation of the first and second Master Plans, and expanding use of ICT in education led to certain quantitative and qualitative changes. The next step was to actualize a society where education was available to anyone, anytime, anywhere. More importantly, with the increasing demand for creative minds and individual knowledge and study, the role of ICT use in education became more important than ever. Furthermore, adverse effects of ICT use in education were becoming more apparent, including but not limited to a widening digital divide, unethical use of information and communication technology, and obsolete laws and institutions that stiffened the full potential of information and communication technology from being realized. The third Master Plan was initiated to address these issues. The vision of this phase was to build u-learning society and turn the Republic of Korea into a human resources powerhouse. The plan's goals were to increase knowledge creation and learning capability, create ubiquitous learning environments, bridge the digital divide, strengthen stability, and make Korea a global leader in ICT use in education. To achieve these aims, 22 projects in

eight fields were selected, and a five-year plan for implementation of these projects was developed.

An equally important element in school education is the trial process at certain schools in which physical textbooks are being replaced by digital textbooks, while policies and strategies for u-learning based school facilities and content development are being devised; the Education Public Key Infrastructure Centre and the Cyber Education Security Centre, in particular, were founded and run to protect individual and parental rights to education and information.

3. Policies for Promotion of E-learning

3.1 Goals of E-learning

E-learning policy, which was a part of the "Plan to Reduce Private Tutoring Expenses", was well received by the public. The Korean government has accelerated the expansion of e-Learning to elementary and secondary schools. These efforts aimed to strengthen public education, and the "E-learning Support Plan" is another step toward reaching this goal. The plan includes 10 specific tasks in order to support teaching and learning efforts in educational fields:

(1) Quality content service

The government ensures quality educational content so that teachers can design their lectures with account of individual levels and characteristics of students. In particular, the service focuses on developing lecture materials classified by level and selective courses and the development of teaching-learning materials for vocational high schools to improve learners' creativity and humanity.

(2) Vitalizing the teachers' participation network

In order to strengthen teachers' specializations in accordance with self-development and collaborative cooperation between them, the

government will vitalize an on- and off-line network, strengthen consulting and content service capability, operate research conferences, research institutes for specific subjects, and provide nationwide research and training networks to share the results of studies.

(3) Development of various types of self-education content services

16 MPOEs will develop self-education content so that students can choose subjects in accordance with their level or interest. The unique content of each province will thus help students better understand other regional features of Korea. At the same time, the government will integrate the item-pools serviced by the Korea Institute of Curriculum and Education (KICE) and KERIS, and build a database of quality item-pools collected nationwide. The students can then utilize the item-pool service to diagnose and assess their achievements and performance level.

(4) Support for two-way self-education

In order to facilitate students' self-education ability, the government will build the Cyber Home Learning System. This will provide for a collaborative environment, provide learning management and counselling services, organize cyber classes for students, and assign cyber teachers to manage study and learning support through systematic management and learning consultation.

(5) Strengthen school-home-community collaboration

An awareness of what is happening in school education by the community and parents promotes the development of a regional community infrastructure and database so that the community can utilize the educational infrastructure resulting in even higher involvement by community members in school education.

(6) Expanding educational opportunities for the disadvantaged

The Korean government strives to support the e-Learning environment for the disadvantaged by providing PCs and subsidizing Internet

access fees, and by operating a cyber-school in National Cyber High Schools for their benefits. The goal of these efforts is to minimize the informational divide that currently exists.

(7) Establish the e-Learning management system

With the National Teaching and Learning Centre — EDUNET — MEST has been trying to strengthen collaborative relationships with affiliated organizations and with the teaching-learning centre operated by 16 MPOEs to support public education. In addition, MEST will expand integrated quality management services and operational HRD through a nationwide, one-stop service system.

(8) Infrastructure reform for system efficiency

The infrastructure of regional schools will be reformed to maintain stability in e-Learning operations. The government will utilize the existing infrastructure to integrate the system, build management systems for content and users, and maintain efficient operation of the system.

(9) Laws and regulations

Laws and regulations must be set up to vitalize e-Learning and to build an efficient educational environment. The Elementary and Secondary Education Laws need to be revised to expand e-Learning areas, and the "E-learning Facilitation Law" must be enacted to guide the central government, the 16 MPOEs, as well as the private sectors, to build inter-ministerial cooperative relationships.

(10) Increase public awareness

To build public recognition of the necessity for e-Learning and to stimulate the desire to implement e-Learning, various channels of publicity need to be developed. The result of policy planning, pilot models of e-Learning schools and noteworthy examples will heighten public awareness and gain attention. The main purpose of this activity is to promote unbiased recognition of e-Learning so that people can tap into their great potentials.

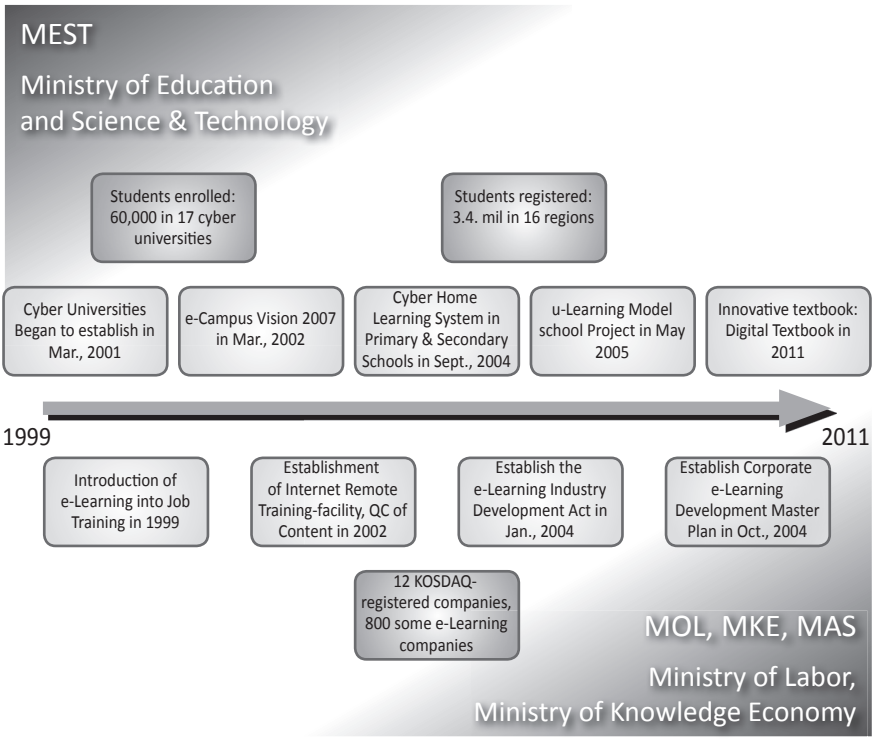


Figure II-3. Major E-Learning Initiatives by Korean Ministries
Source: Hwang (2009a).

3.2 Mobilization of ICT Policy

To implement the national policy, the government will first provide an integrated e-Learning vision with the goal of building a leading country in the knowledge society. Second, the government will build a collaborative system among ministries and associated organizations. Third, the government will initiate reforms for a well-balanced development, and support the disadvantaged. Finally, through national integrated evaluation, the government will

maximize the efficiency and effectiveness of e-Learning projects. The aforementioned four main policies will be implemented according to the following guidelines:

(1) Supplement and reform public education by vitalizing e-Learning

E-Learning is a new educational paradigm designed to provide education to anyone, anywhere, and anytime. This characteristic of e-Learning can solve the problem of inequality in educational opportunities, and achieve self-motivated and creative learning abilities. Therefore, integration of e-Learning policy must be achieved to respond to national expectations regarding e-Learning and to strengthen public education.

First, the government will support public education by integrating existing e-Learning projects. The national Teaching-Learning Center, EDUNET, Cyber Home Learning System, and the EBS e-Learning project for the NSATUE will be integrated and collaborate on to produce a synergy effect. Through these integration efforts, e-Learning will play a vital role in not only reducing private tutoring costs, but it will also offer an alternative way to solve social and educational problems. In order to drive e-Learning policy more successfully, building cooperative relationships between interested parties will be essential.

Second, e-Learning methods, which can be customized to teachers' demands, must be developed. This programme will serve as a distance learning centre during teachers' training period and will provide consulting services to strengthen teachers' e-Learning utilization capabilities. The National Teaching-Learning Centre, EDUNET, and regional teaching and learning centres operated by 16 MPOEs will provide e-Learning consulting services to teachers. In addition, an e-Learning Research and Development (R&D) Centre was established in April 2005 to systematically support the creation of e-Learning philosophy, knowledge, policies, and theories.

Third, e-Learning will promote active participation of parents. For example, e-Learning can be utilized as a personal tutor or counselling tool to increase parent involvement in e-Learning so that teachers, parents, and the community can become more closely connected to the "No Wall in School" project and the establishment of the overall e-Learning system. In particular, the "E-tutor" is an educational certificate system where certified parents are entrusted as e-tutors so they can transform their interest in private education for their children to public education. MEST will build a collaborative system for the practical use of e-Learning by teachers, parents and communities by developing and operating e-Learning programmes on EDUNET. Enabling self-education abilities will be reinforced resulting in the increased effectiveness of e-Learning. Support materials and programmes such as cyber ethics and morality will also be provided to secure a healthy e-Learning environment.

(2) Development of key human resources through e-cluster

To develop key national human resources, the e-cluster will be maintained in connection with established industry, education and research institutes.

First, high-end and R&D human resources must continuously be provided for the long term development of e-Learning and the improvement of national competitiveness. An education-industry collaborative system will be built to develop new technology and human resources to provide high quality content and solutions. In order to build the industries-education-institution cluster, the government will vitalize the E-Learning Support Centre project in universities that had begun in 2003. The "E-Learning Support Centre" project in Universities initiated by MEST and the 'Industries-Education Collaborative University' project and "Specialize for IT Industry" project initiated by MKE contributed to the creation of various business models and to establishing a self-reliant R&D basis by utilizing content and operating know-how.

Second, the government has constructed the "Regional Information System" (RIS). The E-Learning Support Centres in universities have been playing key roles in cooperating with regional strategic industries to develop key human sources and new technology in association with the New University for Regional Innovation (NURI) project.

Third, the government provided an e-Learning HRD plan to cultivate those human resources well trained in both IT techniques and educational knowledge. In this sense, the ministries have been promoting the installation of e-Learning programmes in departments of educational technology and graduate schools. According to the International Data Corporation (2003) study results, the average IT industry growth ratio was 5.3% in 2003. In comparison though, the growth ratio of the e-Learning industry was a staggering 33%, and the lack of qualified human resources became a serious problem.

Fourth, the Ministry has been striving to improve the competitiveness of higher education through the e-teaching and learning system. Particularly to help solve the current industrial problems of uneven supply and demand of human resources in terms of quantity and quality, customized education courses using e-Learning need to be developed.

(3) Support for vocational education through e-Learning

Vocational education is a leading area in adopting e-Learning into education. Existing policies and inadequate areas will be consolidated to improve the efficiency and effectiveness of e-Learning.

First, support plans will be prepared for Internet training organizations to further encourage their specialization and diversification. Currently, Internet training organizations operate mainly for the purpose of obtaining certification in the area of office management and IT. The plan includes giving incentives for specialized programmes, developing specialized models by universities and the Korea Research Institute for Vocational Education and Training (KRIVET),

and providing consulting services. The Ministry will also support education programmes for blue-collar workers, farmers, and women who have had relatively fewer educational opportunities. Related ministries will allocate a budget for development of e-Learning content, and universities will take responsibility to develop content. Internet training, which mainly focuses on obtaining licenses for office management or information technology, will be specialized and diversified by organizations. The government must constantly provide e-Learning content in the area of agriculture or productive labour groups since such areas are regarded as having an unprofitable investment return ratio. For example, as a government-university collaborative project, the responsible ministry can support collection of funds for the university and that university could in turn provide the e-Learning content.

Second, the government will find further ways to facilitate and diversify e-Learning. A five-day work-week system was initiated and it is spreading throughout society in the Republic of Korea. Therefore, e-Learning should respond to increasing demands for home learning. For example, an educational expense could be treated as a deduction from earned income tax to facilitate and expand e-Learning. The Credit Bank System is an example of such efforts and the system was initially operated in 6 pilot organizations. With the evaluation of its results, the system should be expanded. The "E-Learning School" project will be launched and qualified libraries, schools, and Internet cafes will be designated as an "E-Learning School" and a lifelong education counsellor will be assigned to each school. Vocational education will especially be reinforced to support employees of small to mid-sized companies. In order to increase the accessibility of e-Learning, a customized e-Learning system will be built upon which career education and job information will be provided. The Career Net (http://www.career.re.kr), which is operated by the KRIVET, will be reformed to support customized job information services.

Third, e-Learning utilization in public sectors will be expanded to train teachers and public employees. Especially, e-Learning programmes for continuous self-development and learning will be provided. For example, the cyber education centre, operating under the Central Officials Training Institute, will be expanded to provide knowledge anytime and anywhere. The cyber education centre will provide a user-based online training programme. Each ministry will share its e-Learning content and initiate strategic alliances with the private sector to develop high quality content, and plan a systematic approach to increase e-Learning utilization. Teachers can access the e-Learning-based online training programme anytime to minimize their work-load during a school session. The Ministry will build a collaborative relationship with universities, private organizations, and other related organizations. For example, the one-stop services of e-Learning programmes operating in training centres under the 16 MPOEs, private organizations, and universities will be implemented.

(4) Reform regional human resources through e-community

Regional HRD with e-Learning supports a balanced national development, which is a major strategic goal of the national administration.

First, "The E-learning Supporting Policy", which includes the involvement of all governmental bodies, will be launched to support the disadvantaged. Current informatization policies for the disadvantaged are executed individually by each ministry. These policies will be integrated and connected to expand learning opportunities for everyone. Preferential investment projects of social welfare and education will be implemented, such as building e-Learning infrastructure for public self-study facilities and initiating the "E-learning Zone" project providing study counsellors to support open e-Learning for all. The information divide between regular school students and alternative schools or night school students is

widening; therefore, support training and policies for students must continue to be implemented. Furthermore, the Ministry will expand learning opportunities in e-Learning for those who have difficulties getting into the regular education system such as children from North Korean defectors, those hospitalized for long periods, and juvenile delinquents.

Second, the "E-Lifelong School System" will be considered a long-term system, which can support school dropouts. The number of school dropouts has increased since 2000 and the number of those who did not complete secondary education below the age of 15 is increasing. In the current educational system, once someone drops out of the regular education system, it is very difficult to get back on track. The "E-Lifelong School System" will be operated on a regional basis utilizing Open Universities and the Air and Correspondence High School.

Third, the Ministry will build networks within regional educational facilities. This could include an integrated e-Learning portal site of regional educational information services or education information services organizations under the 16 MPOEs. Therefore, the "Regional E-learning Committee" will be established to compromise separate e-Learning projects operated by regional educational organizations. Furthermore, the system focuses on not only providing educational information, but also on the information that can be created by learning communities to help solve regional educational issues.

Fourth, the existing infrastructure will be transformed into an educational infrastructure. For instance, the lifelong learning community construction project driven by MEST and the e-Community pilot project driven by the Ministry of Public Administration and Security can be consolidated through e-Learning. Citizens can obtain e-Commerce and Internet utilization skills through the e-Community project. The e-Learning section will be established in regional community information centres so that anyone can access

e-Learning to further their knowledge and skills. The EDUNET and the e-Community project will be connected so that a collaborative relationship between the school and the community, as well as between the urban and the rural will be established. These projects will expand regional educational opportunities and learning experiences for all community members. The "IT Volunteers" project will be launched with high school and college students to support informatization of rural regions. The lifelong learning community project will be vitalized and incorporated with regional governments. All such efforts aim to support building an e-Community that all community members can actively share to acquire knowledge and information.

3.3 E-Learning in Higher Education

E-Learning in the Republic of Korea has experienced continuous growth since first being adopted into higher education institutes by MEST in 1997. Before we take a look at e-Learning in higher education institutions, it would be helpful to review the status of e-Learning on the basis of market information regarding its supply and demand.

(1) Overview of e-Learning markets

At present, e-Learning is recognized as a major knowledge business. This was made possible thanks to the MKE strategic promotion of e-Learning so as to challenge the knowledge economy through the establishment of the e-Learning Industry Development Law in 2004. E-Learning supply markets have been led by the service business sector as shown in Table II-1 and the total revenue in 2009 amounted to USD 2.09 billion with average annual growth ratio of 5.4% during the period from 2005 to 2009.

The e-Learning market is segmented into four groups in terms of demand shown in Table II-2: individuals, corporation, regular education institutions, and public institutions. The individual sector has been leading e-Learning demand since 2008 and its market share

reached up to 45.6% of total revenue in 2009. Table II-2 also shows that the share of regular education institutions has been less than 5% of the e-Learning demand market in 2009. Among the revenue of regular education institutions, higher education institutes share 33.4% (USD 32 million) and primary and secondary education institutes 66.6% (USD 64 million).

Table II-1

Survey of E-Learning Supply Market in Korea

Business Category	2008		2009		YoY (%)	Average Revenue/ Company
	Revenue (Unit: $1M)	Ratio (%)	Revenue (Unit: $1M)	Ratio (%)		
Service	1,216	65.0	1,389	66.4	14.2	1.54
Content	433	23.1	491	23.5	13.4	1.57
Solution	221	11.9	211	10.1	-4.5	1.39
Total	1,870	100.0	2,091	100.0	11.8	1.53

Source: NIPA (2010). Reformulated by Hwang (2009a).

Table II-2

Survey of E-Learning Demand Market in Korea

Groups of Category	2007		2008		2009		Avg. Growth Ratio
	Revenue (Unit: $1M)	Ratio (%)	Revenue (Unit: $1M)	Ratio (%)	Revenue (Unit: $1M)	Ratio (%)	
Individual	735	42.6	816	43.7	945	45.6	15.7
Corporation	760	44.0	812	43.5	886	42.8	9.1
Regular Education Institutions	70	4.0	71	3.8	96	4.7	36.2
Public Institutions	163	9.4	167	9.0	144	6.9	-14.0
Total	1,728	100.0	1,866	100.0	2,072	100.0	11.0

Source: NIPA (2010). Reformulated by Hwang (2009a).

(2) The Cyber University Program

The popular adoption of e-Learning in higher education institutes began after MEST launched the Cyber University pilot project in 1997. MEST ran the two-year pilot project to study the feasibility and sustainability of adopting e-Learning into higher education before its final decision on the establishment of the Cyber University as an additional type of online-based higher education institution. MEST took into account serious considerations of which one would be better suited to the legal framework on which Cyber Universities could be established. Two legal frameworks were available for the establishment of a higher education institution: "Higher Education Law" and "Life Long Education Law". The Korea National Open University was the only higher education institution established under "Life Long Education Law" at that time.

In 2001, the Cyber University was granted the right to be established as a higher education institution by either school foundations or non-profit organizations based on "Life Long Education Law". There are currently 18 Cyber-Universities providing 95,640 students with higher education services through e-Learning. Unlike at the very beginning of the Cyber University Program, e-Learning has subsequently allowed for higher education institutes, traditional four-year offline universities and Cyber Universities, to use both the "Higher Education Law" and "Life Long Education Law".

Thanks to the changes in the legal foundations, Cyber Universities can be established as two different types of higher education institutes based on the founder and the type of degree to be awarded to the students graduating from that institution. Table II-3 shows 12 Cyber Universities established with a school foundation based on the "Higher Education Law". Table II-4 shows 6 Cyber Universities established as Life Long Education Institutes by non-profit organizations based on the "Life Long Education Law". The Life Long

Table II-3

Cyber Universities

Cyber University	Quota of Students	Program to offer	Year established
Kyunghee Cyber University	2,800	18	2001
International Digital Cyber University	750	9	2003
Daegue Cyber University	1,500	11	2002
Busan Cyber University	1,000	10	2002
Cyber Foreign Languages University	1,600	6	2004
Seoul Cyber University	2,500	14	2001
Sejong Cyber University	1,300	19	2001
Wonkang Digital University	1,500	12	2002
Korea Digital University	2,500	13	2001
Korea Cyber University	1,650	14	2001
Hanyang Cyber University	2,800	13	2001
Hwasin Cyber University	360	4	2009
Total	20,260	143	

Source: NIPA (2010). Reformulated by Hwang (2009a).

Table II-4

Cyber Universities: LLEI

Cyber University	Type	Program running	Quota of Students	Year established
Digital Seoul Culture & Arts Univ.	A	BA	1,000	2002
Open Cyber Univ.	A	BA	1,000	2001
Seoul Digital Univ.	A	BA	3,000	2001
Youngnam Cyber Univ.	A	BA	600	2001
World Cyber Univ.	B	Diploma	1,300	2001
Youngjin Cyber Univ.	B	Diploma	800	2001
Total	6:4 (A), 2(B)	7,700: 5,600 (A), 2,100 (B)		

Source: Hwang (2009a).

Education Institute (LLEI) is further classified into the two types as shown Table I-6 in terms of degree programmes: four of them offering BA programs and two of them offering diploma programmes.

(3) E-learning in higher education institutions

MEST initiated the "e-Campus Vision 2007" to establish the Regional E-Learning Support Centers in ten regions to promote e-Learning in universities and encourage them to embrace their major role as the regional hub for lifelong learning in that region. The impact of the project on universities was huge. It was so successful in terms of not just the promotion of e-Learning but also in providing the regional universities with opportunities for collaboration by allowing the member universities to engage in developing e-Learning courseware and to share their operational experience with the e-Learning system, applications of e-Learning pedagogies, and management of virtual classrooms on the Internet. As a direct result of dedicated government initiatives and strong interest from higher education institutes in e-Learning, 78% of universities and 62.0% of junior colleges in 2009 were running e-Learning systems to achieve various goals as shown in Table II-7[1]. Universities seem to be more interested in improving the quality of education and supplementary use of e-Learning than junior colleges. A massive 87.7% of higher education institutes were running their own e-Learning platforms, 28.0% of them through outsourcing of e-Learning platforms from e-Learning service institutes, and 9.1% of them through leases.

The "e-Campus Vision 2007" was also recognized as the most successful integrated approach taken by MEST in respect of extending higher education space to the Internet, fostering motivation of all of universities in the Republic of Korea, and securing the best practice of collaboration among higher education institutes.

[1] The total number of higher education institutions in 2009 was 407, of which are 146 junior colleges and 177 are universities.

Table II-5

Goals of E-Learning in Higher Education Institutes
(unit: %)

Classification	Junior college	University
Supplementary	69.2	55.4
Improve quality of education	55.5	73.7
Extend educational space	43.2	56.0
Extra-curricular activity	12.1	0.5
Certificate	5.6	3.2

Source: NIPA (2010). Reformulated by Hwang (2009a).

83.2% of universities and 65.9% of junior colleges were operating centres dedicated to innovation of education and administration systems through adopting the potentials of technology based learning: e-Learning, mobile learning, ubiquitous learning, and Internet TV based learning, and smart learning. Table II-6 shows the average number of e-Learning courses available at universities as 78.6 and 22.1 at junior colleges in 2009.

Table II-6

Types of Available E-Learning Courses in Higher Education Institutes

Classification	Number of e-Learning courses	E-learning		Offline + e-Learning		Offline supplementary	
		No. of courses	Ratio	No. of courses	Ratio	No. of courses	Ratio
Junior college	22.1	12.5	56.6	4.0	17.9	5.6	25.4
University	78.6	30.5	38.9	11.2	14.2	36.9	46.9

Source: NIPA (2010). Reformulated by Hwang (2009a).

Table II-7 shows that 54.6% of universities were running more than 30 courses, compared to that of 23.3% of junior colleges in 2009. According to the analysis of student's interests in e-Learning courses, 5,479 students took their courses through e-Learning at universities

and 1,215 at junior colleges. Among the total courses available in higher education institutes, 16.9% of them were provided by e-Learning at universities and 9.2% at junior colleges. The availability of e-Learning courses is expected to gradually increase to 18.2% and 10.8% at universities and junior colleges, respectively, in 2012.

Table II-7

Availability of E-Learning Courses
(unit: %)

Classification	University		Junior College	
	2008	2009	2008	2009
Less than 10 courses	26.1	19.1	36.1	32.4
10-30 courses	26.1	26.3	40.2	44.3
30-50 courses	15.1	17.8	18.6	15.4
More than 50 courses	33.7	36.8	5.1	7.9
Total	100.0	100.0	100.0	100.0

Source: NIPA (2010). Reformulated by Hwang (2009a).

An analysis of the way in which the students in higher education institutes were provided with e-Learning service shows that 87.7% of higher education institutes were running their own e-Learning platforms, 28.0% of them outsourcing e-Learning platforms from e-Learning service institutes, and 9.1% of them by leasing.

Table II-8 shows that the students in higher education institutes adopting e-Learning responded that their interests in e-Learning use was more focused on regular curriculum, supplementary curriculum, and foreign languages followed by taking courses in IT, preparation for the Scholastic Aptitude Test (necessary to enter universities), and technology. One of the most interesting points is that 13.6% of students continue to prepare for the university entrance examination through e-Learning because they want to move to universities with better recognition and higher competence after they become university students.

Table II-8

Analysis of Student Preference in E-Learning
(unit: %)

Classification	Junior college	University
Supplementary	56.3	50.8
Regular curriculum	70.1	91.3
Foreign Languages	24.5	25.6
IT	26.9	18.2
Scholastic Aptitude Test	9.0	13.6
Technology	3.4	1.5

Source: NIPA (2010). Reformulated by Hwang (2009a).

In universities that adopted e-Learning, Table II-9 shows expectations on various opportunities for education and level-based education to be the highest followed by a decrease in overheads of space, and management and student's motivation.

Table II-9

Expectations for E-Learning in Higher Education Institutions
(unit: %)

Classification	Junior college	University
Opportunities for various education and level-based education	53.3	74.6
Activation of student's participation	65.9	46.6
Personalized education	8.4	9.6
Decrease overhead for space and management in education	49.7	46.9
Save cost for education operation	14.8	18.4
Others	0.0	0.8

Source: NIPA (2010). Reformulated by Hwang (2009a).

However, universities not using e-Learning (Table II-10) indicated their most immediate concerns lied with e-Learning content support and utilization, followed by support for learning platforms, authoring tools and consultations on e-Learning.

Table II-10

Major Problems Faced by Higher Education Institutions not Using E-Learning
(unit: %)

Classification	Junior college	University
Support for e-Learning content and their utilization	66.7	65.9
Support for e-Learning Management System and authoring tools	70.1	62.9
Consulting on adoption of e-Learning	46.2	40.1
Retraining of HRD personnel for e-Learning management	4.2	9.0
Provide ASP for pilot test	4.8	13.9

Source: NIPA (2010). Reformulated by Hwang (2009a).

E-learning in the Republic of Korea was recognized as the most efficient tool to realize a lifelong learning society and provide life long learners with equal opportunities. Now, such recognition was extended to nurture competitive human resources, and to challenge the changes in every sector of global society. According to a national web pool taken from 3,000 teachers and students from October 10 to December 18, 2008, over 50% of higher education institutions operating e-Learning courses are still facing problems in hiring experts with comparable experience and knowledge about e-Learning, and are unsatisfied with the availability of tools for evaluating the quality of e-Learning in use.

(4) E-Leaning in teacher training

Adoption of e-Learning in teacher training became popular since MEST allowed ICT and broadcasting technologies to be used in teacher training from March 2008. In the past, MEST appointed KERIS as an e-Teacher Training Support Centre in February 2008. Thanks to MEST Enforcement Decree enacted in December 2008, training teachers was opened to e-Learning institutes. They are allowed to participate in e-Teacher training by establishing Remote Education and Training Institutes (RETI) complying with the

specifications of MEST Enforcement Decree 24. E-Teacher training was recognized as a stable business servicing 130,000 school teachers annually. The roles of RETI specified in MEST Enforcement Decree are as follows:

- Establish a system of operation and management;
- Consult on the establishment and closing of remote teacher training centres;
- Set up quality assurance (QA) guidelines for RETI and review content;
- Select best RETI and advertise;
- Support and operate the Association of RETIs.

Teacher training institutes can be categorized into two different types: confirmed and licensed. Of 74 Teacher Education and Training Institutes, 23 institutes were confirmed in their operation through the MPOE or by MEST, but 51 of them are licensed to private, public, and university operations. Table II-11 shows that in 2009 40% of teacher training has been carried out through RETIs, supported with statistics of teacher training from 2000—2009. There are 726 resources certified for teacher training and education by KERIS.

Table II-11

Analysis of RETI and Teachers Trained

Category	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
No. of institutes confirmed	17	15	8	6	7	2	5	5	4	5
No. of confirmed content				11	68	73	135	59	258	122
No. of teachers trained	1,820	38,202	37,216	59,836	78,567	95,575	142,429	172,386	193,621	40% of training

Source: Hwang (2009a).

Table II-12 shows that the total number of teachers participating in the courses offered by different types of teacher training institutes was 523,995. The Remote TTIs took 40% of secondary school teachers and 35% of primary school teachers during 2008—2009.

Table II-12

Participation of Teachers in Training Programs (March 2008 — February 2009)

Category	No. of Teachers Completed Training	TTIs operated by MPOEs		TTIs attached to Universities		Remote TTIs		TTIs for Special Education	
		No. of teachers	Ratio (%)	No. of teachers	Ratio (%)	No. of teachers	Ratio (%)	No. of teachers	Ratio (%)
Kindergarten	18,069	6,169	34	1,348	7	5,488	30	5,064	28
Primary School	279,613	85,336	31	18,648	7	98,671	35	76,958	28
Secondary School	226,313	58,744	26	19,381	9	89,462	40	58,726	26

Source: Hwang (2009a).

4. Alignment of National Strategy

The Republic of Korea is one of the highest ranked countries in terms of the use of ICT and e-Government readiness, which is attributed to a well-established and world-class ICT infrastructure and the use of information services popular in every single sector. Such a great achievement in ICT and economy over two decades was made possible through strong collaboration among ministries, public, and private sectors in implementing various government policies and initiatives, and due to the aggressiveness of the challenging paradigm shift towards an information society, as well as to putting a high value on education for Korean parents.

The e-Government initiative of the Republic of Korea has evolved in three stages and was successfully achieved through the consistent

leadership of successive administrations. The visions and objectives were clearly established and instrumented on e-Government infrastructure to challenge ever changing demands from the public and the private sectors in accordance with the IT development process. The expansion of public services and transparency in the administrative process could be achieved through collaboration between the dedicated organizations, NIA and MKE, and effective management of the Informatization Promotion Fund established for promotion of ICT.

The government initiatives have been taken under the various names of projects: the National Basic Information System Project (1987—1996), High Speed Broadband Network Project (1995—2005), Framework for IT Development (1996 to present), and e-Government Project (2001 to present).

The National Basic Information System Projects contributed to establish IT infrastructure and prepare the e-Government of the Republic of Korea. The e-Government was propelled in three stages pursuant to the Act on IT Network enacted in 1986. During the first stage (1987—1995), the IT Network Development Committee played key roles to improve the administrative process of government through building nationwide data bases to gather information about citizens, real estate, and automobiles. The second stage of e-Government (1996—2000) known as the growing stage was partly attributed to the explosion of Internet use and popularity of Internet services and mobile telecommunication services thanks to the high speed broadband network project launched in 1995.

A special e-Rate programme for primary and secondary schools was adopted during the same period to encourage the students to use Internet in classrooms. With the e-Rate programme each school was able to save on Internet usage fees up to 70% and was further introduced to the potentials of using the Internet in education.

The third stage of the e-Government (2001—2007) has been known as the maturity stage. During this period the Special Committee on e-Government under presidential leadership was formed in February 2001, which made the public recognize the importance of the e-Government project. The web-based government administration service became available and the civil service was also greatly improved. This is the same period in which NEIS began to provide the students and the teachers of primary and secondary schools with administration and finance services to improve the education environment through cooperation between MEST and MKE.

5. Implications

The success of Korea's e-Learning policy has been recognized as a result of the successful cooperation between the public and private sectors. Let us consider in more detail the factors that affected the success of implementation policies and initiatives of ICT and e-Learning.

5.1 Systematic Policy Implementation

Korea's present success in e-Learning was made possible by the construction of a system that promoted efficient delegation of responsibility. KERIS and the Korea Educational Broadcasting Service (EBS), as institutions greatly responsible for e-Learning policy on national level, organically link the central institution, provincial offices, and education sites, and are leading both projects and policies in that area.

(1) MEST: Policy planning and overarching

MEST as the central government, oversees all operations of informatization in the area of education, while also drafting new policies, and securing financial support. An examination of the

recent direction of the MOE and HRD policies indicates a movement away from policies based on elementary and secondary education to the development of new policies from a more macro perspective centred on NHRD.

(2) KERIS: The institution solely responsible for e-Learning on the national level

KERIS tasked with building a lifelong learning society and reforming the national HRD system, is an institution that has strengthened individual intellectual capacity, and accumulated social intellectual capital. Furthermore, in order to contribute to a balanced national development, it has taken the lead in e-Learning projects and policies for elementary, secondary, higher, lifelong, and business education.

(3) Metropolitan and Provincial Offices of Education (MPOEs): Regional e-Learning policy implementation agency

Sixteen Metropolitan and Provincial Offices of Education (MPOEs) implement action plans set by MEST and KERIS for schools, providing educational information services to people, thus solidifying the successful outcomes of government projects and ensuring the effectiveness of e-Learning at school level as well.

5.2 Analysis of Major Factors in the Success of E-Learning

By examining the internal and external factors that have contributed to the success of Korea's e-Learning policy, we can get a better idea of what direction the cooperation between public and private sectors should take.

(1) Support and interest in e-Learning by policy decision makers

The most decisive factor in the success of e-Learning policy is the interest and support of decision makers (especially CEOs). The Republic of Korea instituted an informatization oversight system

wherein specialists such as CEOs in informatization are given a director or vice-ministerial rank so as to effectively manage policy.

(2) Capacity of implementation organizations

Another factor in the success of e-Learning implementation was securing the implementation of the system through the effective delegation of responsibilities. In the case of Korea, the central administrative organ, the Human Resource Development Bureau of MEST established the basic policy proposal, prepared a budget, and set up guidelines for the implementation of policy by MPOEs. In this process, related organizations such as KERIS took the lead in drafting policy and supporting MPOE implementation.

(3) Implementing policy through liaison and cooperation between the main and branch organizations

The degree of cooperation between main and branch departments of the same organizations greatly influences the success of the education implementation project. In particular, not only such factors as liaison, standardization, and circulation are important in informatization, but what was initially a project affected by specialized branches, making such intra-organizational contact and cooperation is even more important. This is especially important for the promotion of e-Learning policy, which seeks to develop national human resources.

(4) Sustainable financing of ICT in education

In the beginning of the adoption of computers to primary and secondary schools, MEST encountered numerous problems relevant to securing budgets, and one of the ideas the government took over was to gather the change from public telephones installed in the Republic of Korea for investing to ICT in education. Upon recognition of such unstable funding MEST tried to secure stable budgets guaranteeing continuous investments for ICT in education in association with

MKE, which established the Informatization Promotion Fund to support building up ICT infrastructure. Thanks to the Informatization Promotion Fund, the Republic of Korea was able to become a country equipped with a well-established and world-class ICT infrastructure. Installation of high speed Internet at schools and major ICT initiatives taken by MEST and construction of the Information Super Highway geared by MKE were attributed to the funds.

Around 2005 the responsibility for securing budgets for ICT in education was given to each MPOE, and it became very important for MEST and MPOEs to closely collaborate in order to address this matter.

(1) Changing environment for ICT in education projects and the need for budget efficiency

Keeping in mind Korea's attempts for innovative education through adopting new advances in education technologies, MEST should prioritize policy in setting aside financial resources and manage them efficiently. Therefore, relevant budgets should be meticulously analyzed, and based on the results, resources must be secured and efficiently managed.

(2) Securing stable budgets for ICT in education

As ICT rapidly advance, some parts of equipment including computers installed and operated by schools need to be replaced year by year. Securing stable financial resources would be the most important and urgent matter for both MEST and 16 MPOEs to innovate education through fully harnessing ICT in education. So a long-term, multi-year budget to promote ICT in education should take into account the priority of ICT policy planning.

(3) Strengthening cooperative mechanism

MEST and MKE have shown the best practice in establishing ICT infrastructure and Internet connection for primary and secondary

schools through strong cooperation. Promoting ICT in education is not just a matter of specific ministries securing budgets and justifying investments and outcomes, but also the collaboration and cooperation among ministries, organizations, as well as the public and private sectors, in order to realize the desired outcomes of the parties involved. Long-term perspectives should be taken into account prior to initiating projects to promote ICT use in education from each government. A short-term framework would be unsatisfactory to justify investment and to perform evaluations on the different aspects of ICT in education.

(4) Systematization of relevant statistics

Budgetary statistics on informatization need to be systematically organized for efficient management and an assessment of optimal budget. Currently, metropolitan and provincial offices of education have their own classification rules and statistics on the informatization budget.

In order to successfully guide e-Learning policy, the appropriate budget must be secured. Since the policy is based on IT, the initial investment costs are relatively high, and support for maintenance and management must be continuously provided. Also, to prevent inconsistencies, deficiencies, or other lack of integration that may occur in the implementation process as a result of discrepancies between the nature of the project and the nature of the budget, a flexible budget policy must be established.

(5) Establishing a policy monitoring and evaluation system

E-Learning policy is not merely the mechanical introduction and establishment of technology and systems in educational institutions. Just as important for the success of e-Learning is the preparation of legal systems and a change in the way of thinking about this policy by teachers and other personnel accompanying technical implementation. Together with this, a monitoring and evaluation system for the

implementation process must be established. The Republic of Korea has been evaluating informatization implementation since 1997. Other essential elements required for success are risk management and standardization to deal with appropriate outsourcing, and outside order services.

(6) Consumer-centred policy implementation

The most important external factors in the success of e-Learning policy are the consumers, teachers and students. While informatization utilizes technology, its effects can only be realized through human involvement. That is, only through the active utilization of this system by teachers and students can the policy succeed. No matter how large is the budget of the informatization system, if teachers oppose it or if it is not properly utilized, the system will essentially fail. With this in mind, the e-Learning project in the Republic of Korea was designed and implemented as a consumer-oriented system.

(7) Shift in policy to respond to technological and societal change

Internal and external environments of 'Education informatization' affect the success and failure of e-Learning policy. E-Learning policy should incorporate the nature of rapidly changing telecommunication technology. The educational paradigm shift accepted by the society will play a critical role in the success of the e-Learning policy. The emphasis on democracy rather than efficiency in society is reflected by the substantial importance placed on personal privacy and human rights protection in formulating e-Learning policy.

III Policy Implementation

1. Infrastructure

National initiatives for education equity through ICT are related to building ICT infrastructure so that all teachers and students could have opportunities and access to quality teaching and learning materials. It finally lessens the digital divide. This section presents ICT infrastructure focusing on national initiatives such as the School Advancement Project and support for disadvantaged students.

1.1 School Advancement Project

The scope of the School Advancement Project includes the establishment of school LANs, multimedia labs with an Internet connection, PC and information devices in classrooms, and personnel support. The Project had been implemented based on national master plans as follows.

The first National Master Plan for ICT in Education provided elementary and secondary schools nationwide with computers and the Internet. As much as 11,000 schools were equipped with school intranet systems and 13,000 multimedia labs (MEST and KERIS, 2009) and the Internet. Classroom teachers were individually supplied with PCs and information devices such as projection TVs, projectors, TVs, digital cameras, scanners, etc. Therefore, all teachers could integrate ICT into their classroom activities. In order to stay within

school budgets and provide Internet services, the Korean government entered into an MOU with telecommunication companies in 2001. The ROK government supported the full budget of Internet use for national schools and partial budgets of regional schools for five years.

The second National Master Plan for ICT in Education (2001—2005) focused more on the utilization of ICT for educational achievements since ICT infrastructure projects had been completed previously. The ROK government enhanced ICT infrastructure. Accordingly, the number of students per PC was lowered from eight to five and Internet speeds were enhanced up to more than 2 Mbps from the previous 1.1 Mbps (MEST and KERIS, 2009). In addition, a comprehensive maintenance system was established at the MPOE level by allocating regular budgets.

The third National Master Plan (2006—2010) has continuously focused on enhancing infrastructure through replacements and repairs. In order to plan future infrastructure policies, the Korean government established a maintenance system relying on statistics and monitoring activities. Table III-1 presents the number of students per PC as of 2008: 5.5 students per PC in elementary schools, 5.4 students per PC in middle schools, and 3.8 students per PC in high schools.

Table III-1

The Number of Students per PC

School level	Total number of students	Number of students per PC	
		All PCs	Pentium or better PCs
Total	7,641,215	4.9	5.0
Primary	3,672,207	5.5	5.7
Middle	2,038,611	5.4	5.6
High	1,906,978	3.8	3.9
Others	23,419	1.1	1.2

Source: MEST and KERIS (2009).

By 2010 MEST provided Pentium IV PCs to support students' creative problem solving skills through e-Learning. MEST also provided tablet PCs for digital textbooks to prepare for future education in the ubiquitous society. In addition, MEST provided IPTV to all schools nationwide for innovative and creative teaching and learning environments.

Implementation mechanisms included various government departments such as MEST, MKE, Ministry of Planning and Budget (MPB), MPOEs, schools and the private sector. MEST was in charge of planning and supervision, while the MKE and MPB cooperated with MEST on ICT expertise and budgets. Responsibility for implementation was given to MPOEs, sub-regional offices of education, and individual schools in addition to the private sector.

1.2 Disadvantaged Student Support

Students from low-income families and rural areas have less access to ICT than others, which results in digital and educational gaps. These disadvantaged students include students from low-income families and rural areas, as well as the disabled. To lessen the digital and educational divides, the ROK government has implemented several projects related to both ICT education and ICT in education.

(1) Low-income student support

In 2000, to lessen digital and education divides, MEST launched 'the programme for students from low-income families including ICT education, PC supply, and subsidized Internet use. As e-Learning had been increasingly adopted in 2004, MEST utilized e-Learning solutions to support students from low-income families by supplying EBS broadcasting learning and Cyber Home Learning programmes. For effective implementation, MEST included the results of this project in the evaluation of MPOEs and led MOUs between MPOEs and relevant business sectors (MEST, 2009). Thanks to this project,

in 2006, MEST evaluation indicated that the educational gaps had in fact been reduced. MEST also defined the new disadvantaged groups including multicultural families, foreign labourers, and refugees from North Korea and launched customized programmes for each group.

(2) Support to handicapped students

The purpose of ICT in special education is to narrow the digital divide experienced by handicapped students and finally to enhance accessibility and quality of education through increasing students' ICT literacy and the use of ICT to support the needs of special education. The designated government agency, the Korea National Institute for Special Education (KNISE) has been in charge of ICT in special education. Its main projects include development of special educational content and e-portal sites, operation of the Internet broadcasting system, distance teacher training, and development and promotion of a website for a better understanding of what it means to be handicapped.

In particular, the educational content for the handicapped have been in development since 2003, based on the types and levels of handicaps and curriculum. In addition to development, existing content has been revised and shared with other institutes such as KERIS to reduce redundancies and lower the development budget. Several websites have been developed and implemented for effective support for handicapped students. The e-portal site for special education, Eduable (www.eduable.net) was developed for comprehensive support for teaching and learning of special education. The website of E-YAB (blind.knise.kr) was developed to aid blind people with learning, and the website of Handicap Literacy (edu.knise.kr) was developed to promote a better understanding of the handicapped. Also, the Cyber Home Learning site was developed for severely disabled students in learning so that the handicapped students can use the site for home learning.

To enhance accessibility, KNISE established the evaluation committee of the handicapped students' web accessibility. Accordingly, in 2009, websites such as KNISE, Eduable, and Handicap Literacy were revised with a specific focus on web accessibility.

Suggestions for the future include the development of special education content for the new national curriculum, e-Learning expansion based on particular needs for teacher training for special education, and development of digital textbooks for the handicapped (MEST and KERIS, 2009).

1.3 Implications

For successful supply and maintenance of infrastructure at schools, collaboration with private sectors, MPOE-based implementation, budgets secured at the government level, and support for Internet expenses have an important role to play.

However, seamless succession strategies became necessary when infrastructure projects were handed over to MPOEs from the central government in terms of their budget and administration. In addition, further staff training and technical personnel are currently needed at the school level. Although a Help Desk existed at the MPOE level, real-time help and support can only become available along with technical help at schools.

2. Curriculum Integration

National initiatives for supporting ICT integration into the school curriculum have been implemented increasingly since the mid-1990s. Although all national policies and initiatives are related to curriculum integration, this section focuses more on the educational content and digital textbook development.

The scope of the projects includes several areas in development and promotional events and support. The development projects range from educational content as supplementary materials and educational software to the development of digital textbooks. Since almost all educational content was provided and shared in EDUNET[2], it plays an important role in curriculum integration of ICT.

2.1 Educational Content

Development of curriculum materials for ICT in education is critical as an effort to integrate ICT into regular teaching in classrooms. Educational content in the Republic of Korea had been developed since the late 1980s and more increasingly since the mid-1990s. Educational content as curriculum materials include single texts, graphics and pictures, and video clips as well as multimedia materials and educational software compiled. The initial content development between the late 1980s and mid-1990s focused on computer-assisted instruction (CAI) for students' self study and did not easily contribute to curriculum integration in regular classrooms. Instructional materials have been developed since the mid-1990s based on "The Comprehensive Plan for ICT in Education" including the school advancement project so that individual teachers can use digital materials in their classrooms. With the completion of ICT school infrastructure in 2000, instructional materials were increasingly developed. In 2001, MEST approved "The Five Year Plan for Development of Educational Contents" in order to enhance school education quality through quality instructional materials. Educational content was developed to integrate the new 7th National Curriculum. In addition to instructional materials, learning materials were developed for students' self-study and supplementary study.

[2] EDUNET will be presented in the following section, 3.3 Information Service Initiatives, because of its comprehensive functions and services, not limited to e-portal service for educational materials.

The type of educational content for curriculum integration of ICT is presented in Table III-2.

Table III-2

Types of Educational Content for Curriculum Integration of ICT

Category	Area	Audience	Type of content
Audience	Learning	Student	Cyber Home Learning content (basic, supplementary, advanced, core, creativity, etc.)
	Teaching	Teacher	Multimedia instructional materials, ICT-applied lesson plans, instructional software, etc.
Content	Curriculum	Student, teacher	Cyber Home Learning content (basic, supplementary, advanced, core)
	Extra-curriculum	Student, teacher	Creativity, authoring tools, traffic security materials, etc.

Source: MEST and KERIS (2009).

Instructional materials for teachers were divided into multimedia instructional materials, ICT-applied lesson plans, and instructional software. These types of content were integrated into 10 major national subjects such as language education, mathematics, science, social arts, etc. As educational content was developed by various developers, MEST established Content Development Guidelines and Metadata Guidelines in order to share content nationwide, to avoid overlapping development, and to assure the quality of content in early 2000. The Cyber Home Learning (CHL) content has been developed for e-Learning students since 2004. CHL content development was started for teachers and students from late 2000 based on the 7th National Curriculum so that teachers could use e-Learning content in regular classrooms. As a result, all educational content was developed for all grades and subjects by 2009 to support curriculum integration of ICT. Table III-3 summarizes the history of development of educational content for curriculum integration of ICT.

Table III-3

Evolution of Educational Content in Korea

Year	Curriculum integration	Content type
1980s	Mathematics, science, etc.	• CAI for students
Early 1990s	Several subjects	• CAI for students
Mid-1990s	Various subjects	• CAI for students
Late 1990s	Various subjects	• CAI and WBI for students and teachers
Early 2000s	Various subjects	• Multimedia instructional materials, ICT-applied lesson plans, and instructional software for teachers
Mid-2000s	Various subjects	• Multimedia instructional materials, ICT-applied lesson plans, and instructional software for teachers • Cyber Home Learning for students
Late 2000s	Various subjects	• Multimedia instructional materials, ICT-applied lesson plans, and instructional software for teachers • Cyber Home Learning for students

Source: MEST and KERIS (2009).

2.2 Digital Textbooks

Digital textbooks present an advanced level of curriculum integration of ICT because the content of digital textbooks follow traditional textbooks in terms of national curriculum while digital content is embedded and integrated into the textbook as main content and are not merely supplementary. In this respect, MEST officially defines that the digital textbook as "*the student's main book which includes existing educational content from textbooks, supplementary textbooks, workbooks, and glossaries; which can be used anytime and anywhere; which combines movies, animation, virtual reality, etc.; and which allows customized learning based on the learner's characteristics and knowledge level.*" MEST launched the Digital Textbook programme (http://www.dtbook.kr) in 2007 to overcome the limitation of paper-based textbooks and to support innovative education and future students.

The expected impact of digital textbooks has been identified as follows. First, digital textbooks allow teachers and students to use cutting-edge technology for movie, animation, virtual reality, and hyperlinks in new devices such as Tablet PCs and mobile devices. In addition, digital textbooks enable teachers and students to access the most recently updated content by connecting to various professional databases and to actively and interactively study with real life professionals.

Accordingly, the government proclaimed its "Plan for Common Use of the Digital Textbook" and the plan for free distribution in 2013. It launched 16 policy projects in six areas such as the development of 25 digital textbooks, appointed 100 pilot test schools, established relevant laws and infrastructure, educational and cost-effectiveness analyses, and implemented teacher training, maintenance, and quality assurance. As of 2009, 18 digital textbooks have been developed for primary and middle school subjects, including mathematics, science, English, language, arts, etc. Digital textbooks will be provided for free to all schools by 2013. The Microsoft Windows-based platform for digital textbooks was developed in 2007, and the Linux-based platform was also developed in 2008. Since 2009, the digital textbook platform has been undergoing enhancements to eventually support all types of operating systems including Windows and Linux.

The results of effectiveness analysis for digital textbooks in pilot test schools indicated that the student groups with digital textbooks showed higher academic achievements than the student groups without digital textbooks. Furthermore, the students using digital textbooks showed higher abilities of self-education and problem solving than other groups. Interaction analysis during teaching and learning processes with digital textbooks indicated that digital textbooks facilitated students' learning motivation and the sharing

of information. As to teachers, digital textbooks enabled them to reduce preparation time, expand teaching and learning resources, and monitor student activities at any time (MEST and KERIS, 2009).

Table III-4

Current Status of Digital Textbook Development

Category		Year	Subjects	Number of digital textbooks
Level	Grade			
Primary	4	2009	Science and social arts	2
	5	2008	Language arts, social arts, science, mathematics, music, and English	6
	6	2008	Language arts, social arts, science, and mathematics	4
	Customized to student level	2009	English	4
Middle	1	2009	English and science	2
Total				18

Source: MEST and KERIS (2009).

To enable common use of digital textbooks in 2013, future plans include continuous maintenance of pilot test schools, research and development of various types of content and devices, and systematic planning and implementation for the common use of digital textbooks. In particular, future devices for digital textbooks need to be studied in terms of cost effectiveness and appropriateness. In addition, effective collaboration approaches with the private sector should be developed to ensure synergy.

2.3 Implications

Timely established infrastructure was an enabler to facilitate the development and utilization of educational content in schools. Also, the government provided guidelines and authoring tools for content

development to MPOEs. Other enablers also include promotional events such as the National Educational Software Contest. Most of all, teacher training for both computer literacy and educational use are catalysts for technology integration into the regular curriculum of schools.

However, educational content still needed to be developed to satisfy the specific needs of teachers and subject matters. Also, proper guidelines on how to adopt and implement educational content into classrooms should be provided. As cutting-edge technology develops, new common usage plans including new devices, new content and platforms, and user training needs should necessarily be considered.

In conclusion, policy makers should decide on the level of integration, cost and effectiveness, and a new paradigm of education to effectively integrate ICT into schools.

3. Teacher Capacity Building

Teachers are considered to play crucial role for the success of ICT implementation in education. As the end users, teachers are the ultimate decision makers regarding the ways in which ICT is used within their classrooms. In this respect, MEST has launched national initiatives to build teacher capacity, such as the development of teacher competency indicators and teacher training.

3.1 Teacher Competency Indicators

Two types of teacher competency indicators for ICT in education have been developed in 1999—2002 and 2004. The first indicator, the ICT Skill Standard for Teacher (ISST), was focused on teacher computer literacy and information processing based on the teaching career while the second indicator was focused on teacher use of ICT for education based on career and subject.

MEST established the ICT Skill Standard for Teacher in the late 1990s to facilitate teacher skills of ICT literacy and information processing. ISST was developed for both the certification system of teachers' abilities in ICT and teacher training. For certification, the ISST-based assessment instrument was developed for the teacher, ICT master teacher, vice-principal, and principal levels. The government supported the ISST certification system for 10% of all teachers annually. The ISST certification system had an important role in motivating teachers to improve their ICT skills. The government offered incentives to applicants with ISST certificates in teacher recruitment. Several MPOEs also provide incentives to promotion and transfer candidates.

Table III-5

A Summary of the ICT Skill Standard for Teacher

Category	Area
Information gathering	• Identify location, access, and read • Gather and evaluate • Store and manage
Information analysis & processing	• Produce, edit, and word-process materials • Process and analyze spreadsheet materials • Produce and edit multimedia materials • Produce and edit presentation materials • Use and manage the NEIS system
Information transfer and exchange	• Present and transfer • Communication and exchange
Information ethics and security	• Understanding the information society • Prevent distribution of harmful materials • Protect intellectual property • Manage personal information • Keep netiquette

Source: Song et al. (2003).

The specification of ISST include category, area, and standard details for teacher, ICT master teacher, deputy head, and the school CEO. Table III-5 summarizes the classification and areas of ISST. The standards are focused more on a teacher's ability to use information technology to solve problems rather than simple ICT literacy.

In addition to ISST, research on the development of teacher's ICT competency based on teaching career and subject was conducted in 2004. This teacher competency was developed based on the teacher's work area such as teaching and learning, guidance, management, and professional development. However, the standard has not been implemented nationwide.

3.2 Teacher Training

At the early stages of introduction of ICT in education, ICT education in the sense of computer literacy generally is as the primary focus, rather than ICT in education (i.e. curriculum integration). This was the case for Korea in 1988—1995. Topics of computer education generally include hardware and software programs such as programming programs, operating systems, word processors, spreadsheets, presentation programs, etc.

In particular, the Computer Assisted Instruction (CAI) was included in teacher training at that time, but many limitations for integration into classroom teaching were reported, because CAI did not fit into school teaching methods. Accordingly, several authoring tools such as New Korea Net, GREAT, and GREAT II were developed to support teachers in their development of teaching materials (Son, 2009). Regional offices of education implemented teacher training to facilitate the effective use of these tools. The arrival of 32-bit PCs, Windows OS, and the Internet supplies in 1995 was followed by teacher training for development of multimedia

materials and Internet, and the number of teachers participating in training programmes radically increased.

Table III-6

Teacher Training for ICT in Education since 1988

Period	ICT infrastructure and training policy	Training topics	No. of Trainees
1988—1995	• Master Plan I • 1988, PCs (XT), 1995, 32-bit PCs	• ICT literacy • Teacher ability to develop multimedia materials and use the Internet	260,000
1996—2000	• Master Plan II • 2000, Teacher computers with Internet connection and a projector per classroom in primary and secondary schools • 1997, 1st phase of ICT teacher training for over 25% of teachers annually	• Teacher ability to use and produce educational content and materials	340,000
2001—2005	• Master Plan II • 2001, 2nd phase of ICT teacher training for over 33% of teachers annually (mandatory course) • Also, voluntary courses (15 hrs. per year)	• 2001, 2nd phase of ICT teacher training • Training focus shifted from ICT literacy to ICT integration	580,000
Since 2006	• Master Plan III • Training based on teacher career stages • Continuously facilitating teachers' integration of ICT into schools	• Teaching with emerging technology such as web 2.0, IPTV, etc.	In progress

Source: MEST and KERIS (2007).

Beginning from 1996 teacher training was conducted within the Second Master Plan for ICT in Education and had a stronger focus on technology integration. Teacher training at this phase was divided into general courses for classroom teachers and special courses for training-of-trainers and inspectors. Teacher training was focused on the development of multimedia materials and the introductory level

of integration. The first phase of ICT teacher training covered over 25% of teachers per year. At that time training had limitations for teachers' ICT integration into both their pedagogy and curriculum (Son, 2009).

Provision of ICT infrastructure to schools was completed in 2000, teachers got computers and Internet connection, each classroom was equipped with a projector, thus teachers had to use computers in teaching. Therefore, in 2001-2005, teacher training was oriented to ICT integration into curriculum rather than ICT literacy. Training programmes included mandatory and optional courses. The mandatory ICT courses delivered by the regional offices of education provided official training credits upon completion. This training involved 33% of teachers per year. Optional ICT training programmes offered by schools for at least 15 hours per year included various topics based on the individual school training needs with no official training credits.

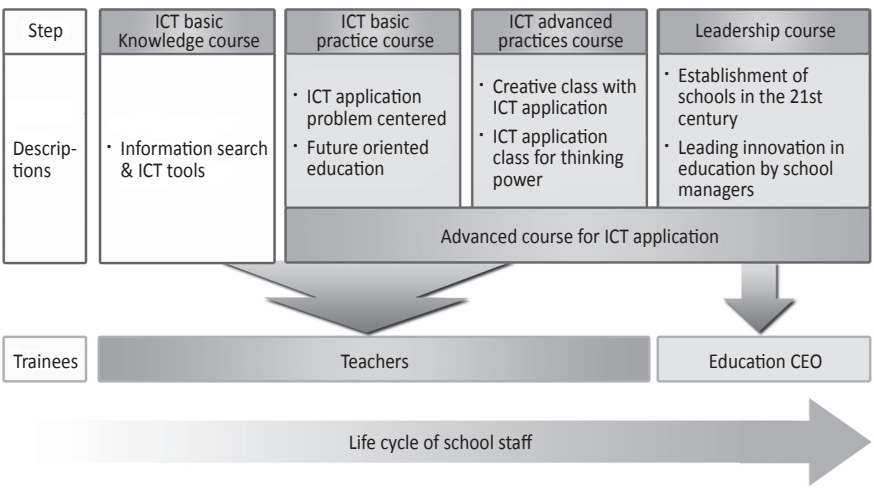


Figure III-1. ICT Teacher Training Map.
Source: MEST and KERIS (2007).

Since 2006 teacher training for ICT in education within the National Master Plan III has entered the mature stage and focused on u-learning and the knowledge society. The ROK government built the teacher training framework for ICT in education based on teacher career stages, from induction to retirement so that teachers and supervisors could know what training programmes was needed for each stage. School CEOs have played a critical role in ICT in education within each school. In addition to ICT literacy, training programmes for school CEOs included supervision for ICT in education, ICT-applied school management, building a learning community through a school website, and case studies of ICT in education. As a result, 33% of school CEOs received annual ICT training during the period between 2001 and 2008.

Cutting-edge technology continuously evolve, thus the ROC government designed training programmes for integration of emerging technologies such as the Establishment of schools in the 21st century (web 2.0), IPTV, etc., which at all times help teachers to integrate ICT into teaching practice. Since its development in 2008, the National Teacher Training Information Service (NTTS) system helps teachers find appropriate information on teacher training, conduct self-assessments of teacher competency, and offers information on the current status of teacher training programmes.

The main agencies — MEST, KERIS, and 16 MPOEs — contribute to ICT teacher training in the Republic of Korea, each playing its role in this process. MEST elaborates ICT master plans, including a wide spectrum of teacher competency development such as teacher training, teacher competitions, standards development, etc. Final decisions and support for teacher training are the responsibility of MEST. Based on MEST master plans and budgets, KERIS plans, implements, monitors and evaluates teacher training programmes. KERIS has developed teacher-training programmes (e.g. Creative

Lesson Planning and Teaching 21st Century Learners) and customized external programmes (e.g. Microsoft and Intel programmes). In addition, KERIS implemented T-T-T (Training-The-Trainers) sessions for all developed and customized training programmes.

This is the cascading approach that can effectively diffuse training programmes to a number of trainees in a short time. KERIS activity focuses on master teachers and pilot sessions. All training programmes are implemented by designated MPOEs. Generally, MPOEs customize training programmes to suit their own training needs. Due to the fact that MPOEs are able to make the final decision with respect to the training budget, they build annual operation plans for the training programmes.

3.3 Implications

Several factors encourage successful teacher training for ICT in education in the Republic of Korea. First, teacher training is implemented on the basis of the national ICT in education master plan. Master plans generally include comprehensive plans such as content development and ICT infrastructure; therefore, the topics of teacher training programmes are in line with these priorities and support national initiatives. This approach contributes to the effectiveness of teacher training. The cases of several countries demonstrate the gap between teacher training topics and national status of ICT readiness. Thus, teachers are frustrated if they cannot apply the knowledge they acquired during the training to their classroom activities due to lack of infrastructure and content.

Second, the comprehensive framework of teacher training associated with teacher career stages provides a sense of complete integration of such competency into career development. This can facilitate continuous sustainability for teacher training over time.

Third, training focuses have changed with account of new training needs. Trial and error is unavoidable yet not everything can be learned from these lessons. Initial teacher training prior to 2001 indicated some trial and error in terms of training needs. Teachers quickly familiarized themselves with ICT and requested various types of training. To satisfy teacher training needs, teacher training in the Republic of Korea was developed by KERIS or customized by external programmes. Teacher training has also been developed more in pursuit of emerging needs and cutting-edge technology.

Lastly, the implementation mechanism is also a success factor to effectively diffuse training programmes. This can also monitor the quality of teacher training from three different perspectives.

For future teacher training, the definition of new teacher roles and competencies for ICT in education should be considered. In view of the fact that teacher expertise becomes more and more important, ICT in education should continuously facilitate teacher expertise in teaching and learning. Additional training for school CEOs and administrators is needed as they play a key role in the decision-making process for future education.

4. Information Service Initiatives

4.1. Education Information Service Framework

The information service system in education addresses three main groups of needs. First, for the purpose of teaching and learning in school and classroom environments, appropriate teaching materials and instructional software are needed according to the curriculum. Teachers can search for educational resources on the Internet to prepare their own lessons and create some educational content such as video clips during instruction. The nationwide service system

EDUNET was developed in the Republic of Korea to operate and provide multimedia materials, instructional lesson plans and evaluation items for different school levels.

Second, there are information needs related to management and administration within schools, regional education offices and the Ministry of Education. For this purpose two information services are used in Korea: EMIS and NEIS. Whereas EMIS focuses mostly on collecting annual statistical data from educational institutions, NEIS manages and integrates everyday routine such as personnel, finance and school affairs within or between institutions, regional offices and the Ministry of Education.

Third, there is a Cyber Home Learning System (CHLS) for home-learning support, which can provide individual learning materials and online tutorial support in order to bridge the educational divide in terms of after-school private tutoring.

The purposes of the educational information services are as follows:

- Provision of an appropriate environment to support teaching, learning and administration;
- Improving the productivity and efficiency of teaching, leaning and administration;
- Harnessing ICT in education nationwide.

The three types of educational information services were designed and implemented at central governmental level with the collaboration of regional offices and school teachers. At the central government level, the Education Ministry played the role of planning and financing the projects. KERIS, as a public institute in the area of ICT in education, played the role of the coordinator and flagship model implementer. The other stakeholders have been the regional offices with the role of spreading prototypes and launching their own version of the information service system based on the context of each region.

The framework of educational information services is presented in Figure III-2. Each initiative is described in more detail below.

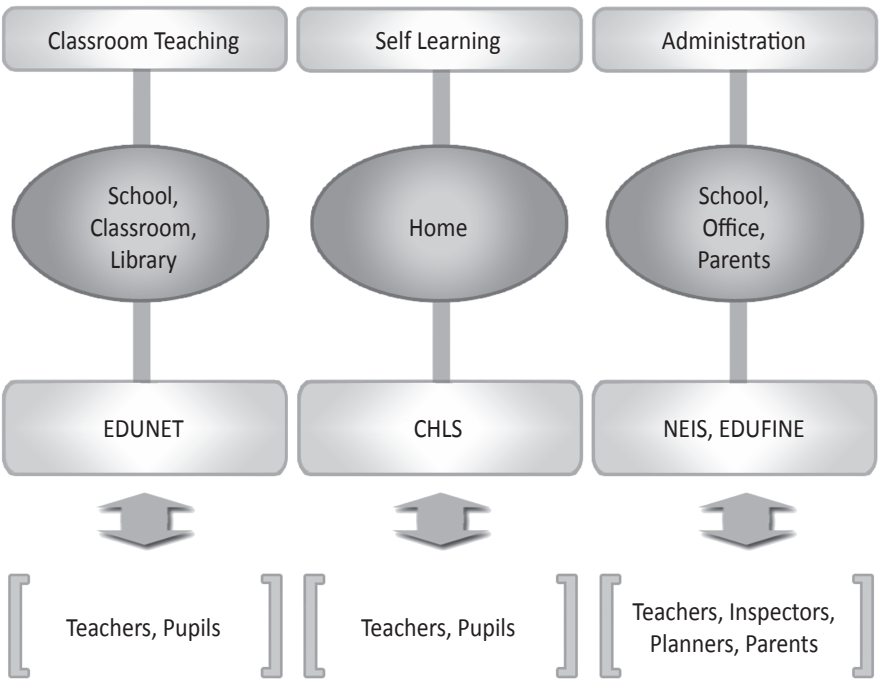


Figure III-2. Education Information Sharing Framework.

4.2 EDUNET - National Centre for Teaching and Learning

EDUNET is a comprehensive educational information service system, which provides various educational materials for teachers and students from primary education to the upper secondary education level. EDUNET was officially launched in 1996 when many

education planners were inspired by the potential of the Internet as a way to innovate the legacy education system. In 1995, the Education Reform Committee at the President of the Republic of Korea set the agenda of an 'open education and lifelong learning society' as a primary vision. Following the action plans announced in 1996 by the Education Informatization Advancement Subcommittee, EDUNET took priority of ICT use in education.

EDUNET provides a one-stop service as an educational portal which has vast amounts of multimedia materials (audio, video, animation, photos, etc.), instructional content which can be used directly in the classroom, and flagship lesson plans using ICT with various learning models including inquiry, discussion, and problem solving learning methods. In order to implement the EDUNET service appropriately, it was necessary to systemize a nation-wide structure for collecting, sharing and distributing educational information while systemizing and standardizing educational content.

The development of already existing content was prevented and the mutual sharing of developed education information was possible. This was under the domain of the "Education Information Sharing Service", which connects 16 MPOEs around the country into one network (EDUNET), and creates standardized metadata called Korea Education Metadata (KEM), thus creating a single database available to users.

KERIS, as an operating organization of EDUNET, has developed multimedia educational content in cooperation with 16 regional education offices. Each regional office has produced a specific part of required educational content according to the national curriculum for basic education in order to avoid redundancy of efforts and improve efficiency. Table III-7 shows the production of digital educational content for teachers and students in 2000—2006.

Table III-7

Development of Digital Content

	Type	2000	2001	2002	2003	2004	2005	2006	Sub total
Teacher	Multimedia education materials	58	44	22	8	3	4	4	143
	Teacher's guide on ICT use	–	107	152	93	49	49	192	642
	ICT teaching resources	–	76	80	80	62	62	63	423
	Total	58	227	254	181	114	115	259	1,208

Source: Son (2009).

EDUNET has several distinctive features. First, it is a national content repository and metadata referatory which has established an educational resource collecting system from the 16 regional offices and relevant organizations such as the Korea Institute of Curriculum and Education (KICE) and KNISE. MEST designated EDUNET as a national teaching and learning centre which combines the hierarchy of 16 regional teaching and learning support centres and sub-regional teaching and learning help centres. Most digital content produced by each regional teaching and learning support centre have been collected under the quality guidelines of KERIS and MEST, formulated into the national standard metadata and redistributed and shared with other regional centres.

Second, EDUNET is a venue for free exchange of knowledge between regions and grades, and among individuals. Such exchange takes place both on and off-line to foster an array of learning. There is also a 1:1 consultation service and other types that consist of many classes to facilitate the exchange of ideas on class planning, methodology, and experiences. The national research network is another element that helps to improve professionalism and the performance of teachers.

To better serve the community and reflect its constantly changing information and communication environment, EDUNET has

enacted a number of projects such as customized services that have continuously experienced improvement based on an analysis of personal preferences and needs. Evaluation of client usage habits is part of the system. One such example is the implementation of the Usability Test among online teachers, which resulted in the menu structure being adjusted by adding two steps to all services. For search engines, Open API was used and key study words would pull up the matching lesson plan to the benefit of the user.

Second, users worked together to create a community service and 189 teaching school teachers were chosen for their expertise in EDUNET to manage, plan, and foster its development. Some activities included awarding superior resources, monitoring overall quality, and assisting with consultations to take into account user needs.

Third, continued joint efforts with public institutions in the Republic of Korea and abroad made it possible to collect fragmented education information and then share it to enhance diversity and reduce redundancy. The annual amount of information shared and used is shown in Table III-8.

Table III-8

Education Information Acquired and Used through EDUNET

Division	2003	2004	2005	2006	2007	2008.9
Number of resources (accumulated)	280,000	330,000	390,000	528,036	687,765	697,209
Number of hits	–	–	2,809,839	4,949,016	9,802,945	9,220,267
Number of downloads	–	–	4,578,053	9,373,588	7,583,661	9,969,689

Source: Son (2009).

As of September 2008, the number of registered EDUNET users reached 5,810,000. The annual rate of increase is shown in Table III-9.

Table III-9

EDUNET Membership
(unit: 10 thousand)

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008.9
Registration	1	437	488	555	518	550	591	553	570	581
User/day	29,052	88,954	158,518	145,786	123,774	129,946	266,300	410,819	480,659	438,950

Source: Son (2009).

About 440 thousand EDUNET users were recorded per day (as of September, 2008). Considering the fact that special measures were taken since then for troubleshooting, user feedback, and improvement of the system, the number of users should have increased significantly today. Some of these changes include the change to the central teaching and learning resources service in 2004, customized services in 2006, user interactive services (content error feedback, suggestions, UCC sharing), and fortifying the link to regional counterparts.

Consequently, in 2007, EDUNET was utilized by 67.6% of all instructors, 76.8% of professionals in the field, and 19.4% of students from across the nation — thus fast becoming Korea's leading online education service. Its share in the online education services market has gone up from 12.96% to 16.46% (source: rankey.com, 2006). Perhaps most importantly, the qualitative performance of EDUNET can be credited for an improved quality of life for both teachers and students. Teacher research time went down by 22% and student academic performance increased by 9.4%, with concentration improving by 4.4%. All this and more was included in a satisfaction survey for EDUNET. Overall satisfaction rose from 70.6% in 2004 to 76.5% in 2007, which evidences a consistent improvement in service.

4.3. Cyber Home Learning System

The conceptual model of the Cyber Home Learning System (CHLS) was launched in 2004 to alleviate regional, economic, etc. education gaps and to reduce private tuition expenses. CHLS is the representative learning system at schools and is still in operation today. Following the "Policy Measure for Reducing Private Education Costs through Education Normalization" regulation, passed in July 2004, the system was initially served through e-Learning revisions, cyber teacher counselling and consultations functions.

Since its trial inception in September 2004 CHLS, an education service providing an Internet environment for individuals, directed learning at home through the use of custom content and by cultivating an online community of students at the same grade level. It has been successfully implemented and disseminated the service with the help of the experience accumulated among the 16 regional offices of education and agencies. Each of the regional offices of education has been operating a unique service suited to each environment. The number of tutors designed to help cyber teachers is directly proportionate to the increasing number of students using CHLS, as well as parents and college students, which demonstrates the more dynamic aspects within the tutoring field. Under these circumstances, which involve plans for replacing several regular classes, connecting home and school can be understood as an effort to improve public education with the support of parents and to narrow the socio-regional educational gaps.

The core services of CHLS, as shown in Figure III-3, consist of the individual Learning Management System (LMS) and are based on study administration services, study guidance and counselling from a cyber teacher or tutor, self-education services which implement CHLS content, and additional services such as study diagnostics and video conferences.

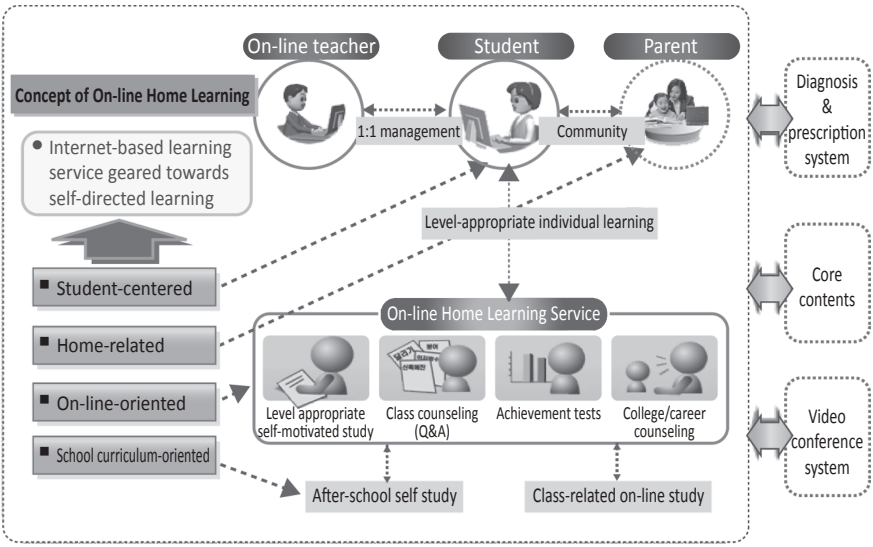


Figure III-3.The conceptual structure of the Cyber Home Learning System. Source: Son (2009).

Students who wish to study through CHLS should register through the system homepage run by their local office of education. If the course is class-specific, the student is assigned to an online class and begins e-Learning with the content provided by the teacher; if the course is term-based, questions may be directed to available cyber teachers or discussed among fellow students. Cyber teachers are chosen among current instructors known for their strong sense of responsibility and must be evaluated by students to continue the next term. Class-specific students are managed by means of LMS where the cyber teacher can monitor student progress at any given time. For those who are non-class-specific systems, learning is self-regulated. By logging in to the self-directed system, the

student can study at his or her leisure regardless of one's academic history and without class management or learning administration services.

CHLS content expanded for each grade phase-by-phase to service elementary grades 4-6, middle school, and 1st year high school students by the first semester of 2007. One basic set of content has been available for each year. However, it caused too many concerns over content shortages. In order to truly foster self-education, additional content, including supplementary study, intensive study, and video lectures was developed. Supplementary study content was delegated to the regional offices of education for development and later passed through quality inspections by the e-Learning content quality-control office and KERIS. To address such issues as standards, level of content, and timetables that arise from such division of labour, the central CHLS Service and KERIS drew up guidelines for developing content and oversees all administration.

Intensive study content, on the other hand, was created by joint efforts from the 16 regional offices of education with KERIS supervising their progress. This sort of content made it possible for learners to study cooperatively and was later reconfigured for the Learning Content Management System (LCMS).

According to student surveys, current animation-oriented content has the advantage of facilitating a range of different learner interactions, which has led to a growing demand for even more diversity in video content. Consequently, plans are underway to package video content for 4th graders to 1st year high school students aired on EBS from 2006 to 2008 to be serviced from 2007 to 2009 for a total of 6,539 episodes. As the CHLS flourished, various services were developed to reflect student demands such as core material reviews and quizzes. Current services include three core content modules for each of the

nine subjects per exam period (2007 1st semester final, 2nd semester midterms and finals, 2008 mid terms) for the biggest market of 3-year middle school students.

The main function of CHLS is to provide a venue where the cyber teacher and student can come together. Certainly, interaction is best achieved face to face and there was criticism regarding the limitations of the System in this respect. It is important to foster a longer-lasting relationship with the learner, so the central CHLS Service introduced real-time video consultations.

Supplementary coursework geared towards enriching level-specific study and performance is available on the System as well. However, shortcomings in the current system in reaching these aims have prompted the development of a new system management tool in which the learner's scholastic ability and study style can be diagnosed, the appropriate study material and strategies can be suggested, and the content for the diagnosed intellectual standard can be generated. Cyber teachers will be able to implement the resulting analysis of the learner's standing and study patterns in counselling the student and students can make up for their weaknesses via the correction clinic, revision, and extra problem-solving content prescribed to them.

Since its trial operation in September 2004, CHLS usage has been growing fast through a collaborative effort from MEST, KERIS, and 16 regional offices of education. Table III-10 shows the major usage statistics of CHLS.

The number of CHLS users has increased considerably since 2005. The total number of registered users as of August 2008 was 3.09 million, a 400% increase over four years. This increase is also reflected in the number of class-oriented classes and students as well as the number of self-regulated learners. The number of logins has increased by

562% since 2005 with an average of 300 thousand per day. A steady increase in cyber-teacher and parent/college tutor participation has reached 60,900 and 4,500, respectively.

The major objectives of CHLS are to provide individual learners with customized learning services for academic success and to reduce private education fees. These objectives target those in farming or fishing villages or less financially fortunate homes.

This user bracket is shown in Table III-10: 53% of service priority students use the same services and these students show higher rates of academic improvement than regular students. This may be considered as an evidence of the fact that the system contributes to narrowing the educational gap between different regional and social groups.

Table III-10

Cyber Home Learning System Usage Statistics

Year	Student members [A+B]	Class-oriented		Self-regulated students [B]	Online teachers	Parents and tutors	Log-ins/ day*
		Number of classes	Number of students [A]				
2005.8	769,840	1,987	42,100	727,740	3,154	1,064	54,142
2006.8	1,608,997	3,999	178,705	1,430,292	6,147	2,692	107,787
2007.8	2,903,635	28,821	511,721	2,391,914	27,483	1,371	187,743
2008.8	3,089,303	53,625	1,022,866	2,066,437	60,891	4,508	304,236

* Log-ins per day include some day re-log-ins

Source: Son (2009).

Bridging the education gap and reducing private education costs can each seem viable. The latter has had savings of approximately 400 billion won (2005) and 2,061.4 trillion won (2007). Student satisfaction rates for CHLS show a steady increase year to year, from

57.1% in 2005 to 69.6% in 2007 with 81% of those responding that CHLS has helped their academic improvement.

According to the 2006 Research and Analysis on the Efficacy of CHLS, the highest ranking element was 'increased interest in the subject' at 32.5%, followed by 'became more autonomous' at 25.3%, 'improved grades' at 20.7%, and 'more confident in the subject' at 20.1%. Interestingly, 'increased interest in the subject' and 'more confident in the subject' were found to be higher in self-motivated learners at 36.1% and 22.2% respectively, while 'improved grades' and 'became more autonomous' were high in those who were introduced to the service by parents or friends.

The higher the grade of the student, the lower is the appraisal of the service. Respondents from lower school grade more often believe that this might be an alternative to private education. Those who have ceased or plan to cease private education have reported that CHLS alone would be sufficient, whereas those who continue or plan to resume have reported that the Service 'merely supplements school lessons'. Overall satisfaction levels are on the rise as services stabilize, however, because new content for different levels have not yet been added, numbers are not expected to make a sudden leap. With the introduction of new content in late 2008, and added services including diagnostics, prescribed learning, and videoconferences, satisfaction levels are expected to rise. Regarding the socio-educational effects of CHLS, 24% of instructors replied that it has played a part in resolving knowledge gap issues. Approximately 30% of respondents believed it might have aided the unprivileged students, and approximately 25% claimed that it reduced private education fees. Though these effects are lower than initial expectation in terms of the nature of the current CHLS, these statistics should be considered as a proof that the system is well on its way to fulfilling the project aims.

4.4. National Education Information System

Since 1997, ICT use in education has been an integral part of education reform in the Republic of Korea. In late 2000, each instructor had at least one PC, with LAN-based networks being widely available in every elementary and secondary school classroom. Such world-class infrastructure naturally required a new education information system that could support education and improve administrative functions. Flaws in the existing Client Server (C/S) system were exacerbating circumstances and the National Education Information System (NEIS) was developed. The C/S system is an information server installed and operated on school premises. Many schools operated them independently, which resulted in high costs in security, maintenance, operation, and personnel. C/S systems could no longer be operated in an era of nationwide Internet access.

The ROK government planned to increase the efficiency and quality of public services. The push for electronic government was initiated in May 2001, and consisted of eleven major tasks including the creation of NEIS. The system decentralizes the sixteen municipalities and provinces and electronically connects all education-related administration related to school affairs, student records, human resources, budgeting, and accounting in offices and elementary and secondary schools via the Internet. What was previously managed within the internal school networks was now converging into a nationwide network following the development of technology and infrastructure.

Initially NEIS was deemed to achieve three objectives. The first was to enable the teaching staff to allocate more time to actual education by reducing administrative tasks and thus improving the quality of education. Teachers were no longer required to manually enter new student information or prepare transfer student disks.

Second, the scope of parental rights to know about their children was expanded to build cooperation in student education. By making the student's records and coursework information available on the Internet and stimulating discussions through the utilization of objective resources, parental rights are observed, sound relationships are established between the school and home, and the quality of student guidance also improves. The division of labour greatly contributes to the overall enhancement of public education: parents can check on their children from home; how they are doing in class; their attendance, physical development, vaccination, scheduled events, etc.

Third, the public benefits from a radical civil services reform. A wide variety of documents such as diplomas and school records can be issued on the Internet, eliminating the need to make trips to schools or offices and even to submit request forms. The advent of the Internet exposed school servers but NEIS, installed as regional education office units, boasts security at the highest level and minimizes security leaks and identity theft.

NEIS, being in operation since 2003, initially serviced 27 fields including general administration, academic administration, education statistics, civil services, college admissions services, and services for students' parents. General administrative tasks covering areas of human resources, payroll, budgeting and financing, and qualification exams of NEIS are mainly related to metropolitan, provincial and regional offices of education with aims to facilitate smooth processing and increase efficiency. General NEIS administration services were applied to offices and organizations in November 2002 to reform front-line education administration institutions. This effort reduced processing time, costs, and redundancy, particularly by connecting personnel management and finance. The school affairs task system was created by dividing

the databases from three of 27 NEIS areas, including school affairs and student affairs.

Protection of personal information was improved through the operation of multi-layered security systems, strengthening user authorization systems, and encrypting important personal information. The school principal has access to the database and system operation is delegated to the information system centres at each regional education office.

Basic statistical data is available through NEIS to be used by the education statistics system and regional education administration finance-integrated systems. Therefore, the data inventory of personnel, payroll, and student academic affairs has made it possible to reduce administrative tasks (i.e. eliminate redundancy and promote simplification) and improve statistical reliability.

The Home-Edu Service is a pool of administrative services accessed online to reduce the need for paper documents and to promote inter-agency cooperation. It came into effect in March 2006, and as of 2008, thirteen types of certificates can be issued. Meanwhile, ten ministries, including MOGAHA, share 23 types of administrative resources and support the offices of education and schools in their efforts to reduce civil affair document flow.

College entrance support services save time and costs for schools and students' parents by switching from the old method of providing colleges with digitalized student records on CDs to a new method using the Internet. When students enter a desired school code or their social security numbers into the college admissions servers they can view the appropriate admissions guidelines and prospectus online. Since 2006, approximately 2,000 high schools and 400 universities have sent and received encrypted admissions information online.

"Getting to Know My Child" is a school-parent education service that allows parents to view their child's education curriculum, grades, attendance, student affairs and events, and permanent records at home. As of 2008, there are currently 32 types of enquires that can be made on the Internet, which include not only information regarding school life, but also college entry, career guidance, personal issues, and academic counselling.

The NEIS project aims to install the software and hardware mechanisms within the scope of the sixteen regional offices of education including the Ministry of Education and Human Resources Development, thereby creating a physical basis and environment conducive to processing 27 types of education-related administrative tasks on the Internet. The initial budget was estimated at $52.1 billion won with the Academic Affairs System at an additional $42 billion won for a total of $94.1 billion won.

4.5 EDUFINE

EDUFINE is an integrated system for administrative and financial affairs of regional education. Since 1998, the government of the Republic of Korea decided to introduce accrual basis — a double-entry bookkeeping system led by the Ministry of Strategy and Finance for the central government and the Ministry of Public Administration for the regional governments. In this context, the 'digital financial system' was derived as a major project of e-Government initiatives as well as NEIS for general administration and academic affairs.

MEST decided to implement the EDUFINE system to integrate special accounts for the Ministry of Education and regional offices of education, the school accounting system and link to the Electronic Funds Transfer (ETF) system. The BRP and ISP started in 2005,

followed by three years of implementation of the system and pilot testing. The system officially launched in 2008 with 6 parts, 17 sub systems and 55 unit processes. Figure III-4 shows the main functions of the EDUFINE system.

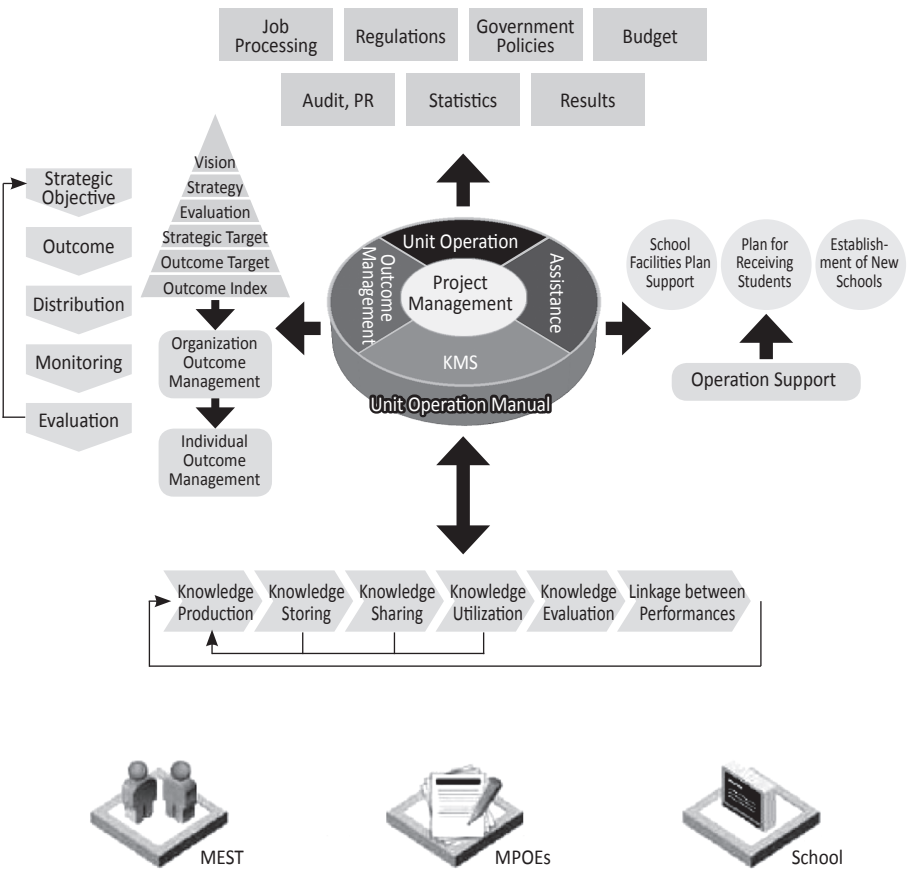


Figure III-4. Major functions of EDUFINE.
Source: MEST and KERIS (2008).

EDUFINE has the features of a performance-based budget structure. The central and regional governments can allocate their own budget according to the programme, project, and task units. The system is based on a medium-term, expenditure-financing plan, and integrates the allocation and execution of budget and accounting at a one-stop service level. Therefore, it can combine performance, knowledge and tasks, thus adding transparency and efficiency to the management of the financing system.

Another important feature of EDUFINE is the integration of school accounting systems for public and private schools. Managers and CEOs of schools have more accountability for their execution of the school budget. By using EDUFINE it became possible to switch to a double-entry bookkeeping system in accordance with the requirements of central and regional governments. The utilization of EDUFINE enables a school to allocate and execute the school budget with fewer efforts.

4.6 KOCW: OER initiative in the Republic of Korea

In addition to the digitalization of knowledge, increasing accessibility through e-Learning, increasing availability of digital technologies, and a paradigm shift toward web 2.0, global open access has also taken its importance from the institutes for higher education institutes and primary and secondary education. The term 'Open Educational Resources' (OER) was first adopted at UNESCO's 2002 Forum on Impact of Open Courseware (OCW) for Higher Education in Developing Countries. The domains of OER are categorized according to open courseware, open source software, and policies and practices.

Out of those three categories, open courseware has been attracting the most attention from higher education institutes in the US, China,

India, Korea, and Japan, since MIT had launched its OCW project. According to the current usage statistics of the MIT OCW in 2009, the US was ranked first, China second, India third, and Korea followed fourth. The total number of those who access the OCW from the Korean HE institutes was 588,385.

The history of OER in Korea began with the adoption of Open Source Software (OSS) in 2004 in developing NEIS to handle the administrative information relevant to the affairs of students, teachers, and of primary and secondary schools. It was reported as the largest governmental OSS project ever taken in the world. The collaboration for promoting OSS among the Republic of Korea, China, and Japan has been consolidated considerably since the Republic of Korea developed the NEIS. Promotion of OSS further extended from merely an adoption of the open source system software to UX, and the My SQL data base management system, to the applications of virtual servers.

However, the use of OER was still quite limited to the use of OCW at 40 higher education institutes and lagged behind at primary and secondary schools. Some of the reasons that hinder the promotion of OER use are clearance of IPR (Intellectual Property Right) issues and the high dependency of primary and secondary schools in utilizing commercial software developed by major companies. They were attributed to the government-initiated policy taken during the first Master Plan for providing school teachers and classrooms with PCs and notebook PCs.

KERIS has been striving to promote the use of OER at HE institutes by participating in the GLOBE project for primary and secondary education and by joining the Curriki community. There are a number of lectures available through the KOCW (http://www.kocw.net), which was established in 2007 when 40 universities joined to share 200 lectures. It now provides HE institutes in the Republic of Korea

and abroad in association with ARIADNE, OER Commons, LORNET, MERLOT, and NIME with 811 lectures from 85 universities, 296 lectures for World Class University developed by 26 universities, 602 video lectures developed by world-renowned universities and 40,000 syllabi from world-renowned universities.

The KOCW took its place in the centre to promote the use of OER at HE institutes in the Republic of Korea and serve as the gateway to resources beyond Korea. It was set up for the ubiquitous environment from which the users are allowed to access the service from their mobile and smart phones as well. The new service has been available to the learners using smart phones since June 2010.

4.7. Implications

EDUNET launched as an educational Internet portal in the 1990s when there was no other Internet portal service in the education sector to provide quality educational content and community. Since the decentralization process of educational administration prevailed in the 21st century, EDUNET transformed into networks of teaching and learning centres, which are run by 16 MPOEs. In addition, the flourishing private Internet services in the education sector made EDUNET set school teachers its major target group. EDUNET has positioned itself as a sharing centre for digital content for quality school education.

Teachers can reduce their classroom preparation time by using EDUNET for educational materials, lesson plans and sharing practices with other teachers. After the foundations for ICT use in education were completed, schools were encouraged to comply with the related ICT guidelines in 2001 and to use ICT in at least 10% of all classes. Every year one out of three teachers underwent ICT training in order to nurture application and proficiency of ICT use in

the classroom. The main objective of EDUNET is to enhance public education through promoting best practices of ICT in education, share quality materials and serve as a community network of teachers and classes all over the nation.

Whereas EDUNET focuses more on the school environment, which is often the case of many other countries, the Cyber Home Learning System is a unique model of public service that concentrates on the environment of students after official school time. It has bridged the education divide among students and schools of different socio-economic backgrounds in that CHLS provides supplementary tutoring services for those who cannot afford private tutoring after school.

Furthermore, CHLS supports student-centered self-learning environments, which fortify long-lasting academic confidence. There is plenty of interactivity between the service system and designated tutors and other learners. Students can select tutoring class and digital content based on their own learning style and level of achievement. CHLS has also made attempts to provide parents with tutors as well as to further qualify tutors through teaching certificates. The tutors for CHLS are selected by each regional education office from the pool of volunteer candidates. Parents can participate as tutors and they can give meaningful feedback on the operation of the CHLS system. CHLS can motivate parent groups to engage in the implementation of e-Learning policy in their daily life. Unlike EDUNET, CHLS was designed from the beginning as a decentralized e-Learning system with a strong focus on individual learning. Therefore, it is essential to have a powerful quality-assurance system. There are quality guidelines for distributed production of digital content and e-Learning systems including metadata and a learning management system. By adopting standard metadata and LMS, it is possible to efficiently mobilize human and physical resources.

Son (2009) summarized the main performance outcomes of NEIS as follows:

> *First, it is the world's first Internet-based national education information system. Over ten thousand schools around the nation and 27 office administration-related tasks have been automated on NEIS; due to the Internet-based nature of the mechanism, security is reinforced with certified verification. This system is now attracting interest from a number of countries including Japan, Malaysia, Thailand, and Lebanon.*
>
> *Second, it serves as a model example of conflict resolution between the government and civil groups. Early plans were met with resistance from some teachers. The collection of student information on servers led to concerns that the information could be leaked on a large scale causing the rights of students to be violated or causing the system to be used as a means to control teachers. Other groups felt differently, arguing that the NEIS would reduce the amount of clerical work for the instructors, in turn allowing them to concentrate on education practicum. The dissent brought operations to a standstill, which prompted the government to assemble a task force to resolve the situation and commence with system operation. Increased government spending was inevitable in the process; however, the resulting benefit would make up for extra budgeting.*
>
> *Third, the performance outcomes set a new institutionalized standard regarding the use of personal information on the system. At the time of initial plans, the legal foundation appeared sufficient. Opponents disagreed citing various acts on information privacy, e-Government, and fundamental education. The government then expressly stipulated related details including personal information articles in new statutes.*

Today, the NEIS case sets a precedent when discussing personal information on information systems in the Republic of Korea.

Fourth, it appeals to the global community since it is arguably the largest site (approximately 2,300 servers running on LINUX) to successfully implement open source S/W. Open source software has numerous benefits including non-exclusive distribution, user flexibility and lower costs. Many countries are thus striving to implement open source S/W, and several offices in and outside the country are benchmarking the software. Following the NEIS case, 37 projects in 23 central government agencies in the Republic of Korea implemented open source S/W in 2006. Before this, public sector offices cited security vulnerabilities for avoiding this software but NEIS eventually played a role in removing those concerns and prejudices.

The government should now consider the participation of civil society in policy making. From the perspective of governance, civil society is quickly becoming a partner to the government. The mutual relationship of the government and civil society should be recognized and they should seek ways to increase mutual trust. Privacy rights, which can be seen as a type of an information right, are not absolute. According to the Republic of Korea constitution, privacy rights can be restricted to uphold national security, order and public welfare. Meanwhile, the 'Law on Protection of Personal Information by Public Agencies' prohibits the violation of personal privacy through unauthorized use or leakage of personal information. Personal information may be used and provided only if the person agrees or if it is permitted by provisions in other laws. Informatization and human rights should support each other without clashing. If a country resists the trend of informatization, it may lead to rights violations or oppression from countries that are more informatized. To protect personal information and

> *respect human rights, the question is not where the personal information exists but whether it can actually be protected. The implementer of informatization must guarantee information and privacy rights to the greatest degree possible, and information rights groups must support national development through informatization. Working together in this way, they can help introduce a mature information society.*

The implication of EDUFINE would be the fact that it couples with the government reform agenda that harnesses decentralization. Under the legacy budget process, which is operated on a short-term basis, i.e. yearly terms, and is highly tilted toward a bottom-up approach, national policy objectives received less than proper consideration in the resource allocation process. This contributed to the lack of transparency in decision making for resource allocation and setting policy priorities. There was a lack of managerial flexibility and limited autonomy in line ministries both in planning policies and implementing the budget. The Republic of Korea introduced major fiscal reforms, which include medium-term expenditure framework, top-down budgeting, strategic decision-making mechanisms and decentralization. Therefore, EDUFINE provides systematic support for the implementation of the governmental financial reform.

5. Development of National E-Learning Standards

5.1. Overview of E-Learning Standardization

The use of information and communications technology in education for the past decade has brought tremendous changes in the education field, both quantitatively and qualitatively, in proportion to the speed of development of ICT. For example, EDUNET's

sharing system has enabled 16 provincial and municipal education offices to share high-quality teaching and learning resources and to distribute educational content across the country. The Cyber Home Learning System, which has contributed to reducing the nation's private education costs, is also known as the representative e-Learning service not just in the Republic of Korea, but globally as well. Furthermore, the on-going development of digital textbooks will bring greater changes in education in the coming decade. These projects for the use of ICT in education have broadened learning opportunities extensively beyond temporal and spatial limitations. The use of various media in schools has also dynamically changed class lessons. In particular, e-Learning has been commonly used for regular educational courses including primary, secondary, and higher education and further expanded to include corporate and lifelong education.

Table III-11

E-learning in Various Educational Areas

Educational areas	Representative projects	Remarks
Primary and secondary education	Cyber Home Learning System	Being operated by 16 provincial and municipal offices of education
Higher education	University E-learning Support Centres	10 centres being operated as regional bases
Lifelong education	Air and Correspondence High Schools, cyber universities	19 cyber universities in operation
Corporate education	On-the-job training by business and commissioned training	

Many factors have been at work aiding the success of these e-Learning projects, such as a well-equipped infrastructure, participation of capable and competent teachers, active support by the ROK government and provincial and municipal offices of education.

However, what is notable is the enhancement of efficiency through standardization and improvement in the quality of services through increased accessibility.

Standardization in e-Learning is expected to have a major impact on educational and technological perspectives. From the educational perspective, it will have the effect of developing high quality educational content and systems by reducing overlapping work in the process through the development, sharing and distribution of content and educational resources, and by investing more time and money in raising learning effects. From the technological perspective, it will have the effect of increasing the reusability and interoperability of educational content and systems.

Standardization must also be taken into consideration to enhance the level of various information services in accordance with the common use of e-Learning. When the second Master Plan for ICT use in education was implemented, emphasis was placed on the importance of sharing educational information and an idea of sharing experience and high quality educational data began to spread widely. Standardization generally develops in a form reflecting contemporary demands and trends. A leading example is the enactment of KEM — an educational information metadata standard developed by KERIS in December 2004 — as national standards (KS X 7001).

Metadata, being "information about information," can be defined as "structured data about data", which serves to manage and search such resources as documents, multimedia and websites. Suppose, for example, that we found a file named "edunet.pdf" while searching data on the Internet. Before we open the file, there is no way of knowing who and when created the file, and what it contains. Even if we read the file, in most cases there would be no additional guidance, about the general and attribute information of the file such as how

to use the file or whether the file can be copied and used without permission. Metadata is one method of standardization to solve this problem.

Metadata is standardized as a certain frame and designated as a national or international standard to enable a consistent explanation and search for data regardless of who or where produced the data and to increase compatibility so that service providers could systematically manage the metadata.

KEM was first applied to the National Teaching and Learning Centre EDUNET and the Education Information Sharing System at the teaching and learning support centres of 16 MPOEs in 2002, to the Cyber Home Learning System in 2004, and to the digital textbooks in 2007. Applied not only to primary and secondary education but also to higher education in 2008, KEM is now used in all areas of the educational information service as a national standard both in name and reality.

With its successful common use through the sharing system in 2002, KEM was also enacted as the first national standard in education in 2004. In 2007, KEM expanded its area to include higher education as well as enlarging its content to the copyright protection area, going beyond a simple use of educational resources. On top of this, it was proposed in 2008 to the ISO/IEC JTC1 SC36 to include it in international standards.

With the arrival of a ubiquitous environment in the future, KEM will evolve even further as a standard for intelligent search and its area is expected to expand to embrace education and academic research in educational information metadata.

5.2. Status of E-Learning Standard

(1) National standards

While the purpose of standards in the past was to secure compatibility for mass production and to set a standard for efficient production, today's standards have become a means for management strategies, allowing the state and businesses to pre-empt and expand the market. In this regard, the Korean Agency for Technology and Standards (KATS) under the Ministry of Knowledge Economy has designated and operated cooperating organizations for standards development to encourage proactive national and international standardization activity and to increase professional competencies within the private sector. Whereas the government-led implementation of standardization in the past greatly contributed to Korea's achievement of rapid industrialization, the content of standards today has quickly changed from industrialization to knowledge and services, as Korea's economy and the world have changed to a service-centred economic structure rather than an industrial one.

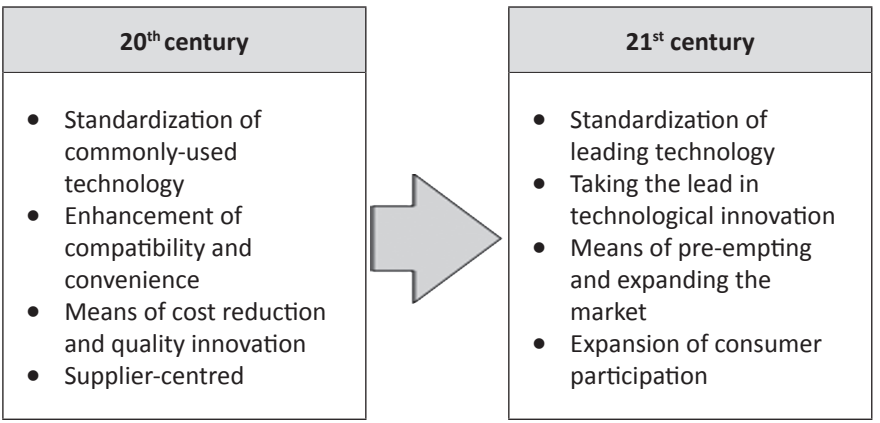


Figure III-5. Paradigmatic Changes in Standards.
Source: MKE (2006).

As shown in Figure III-5, if standards of the past were a means of supplier-centered cost reduction and quality innovation, today's standards have clearly changed as a means of creating added value through pre-emption of standards for advanced technology as well as a means of pre-empting and expanding the market through expansion of consumer participation.

Table III-12

Status of Korea Industry Standards (2004—2008)

Classification	Number	Name of standards	Year	Remarks
Metadata	KS X 7001	Metadata for K-12	2004. 12	commencement
	KS X7001-1	Metadata – Overview	2006. 07	enactment
	KS X7001-2	Metadata – K-12	2006. 07	amendment
	KS X7001-3	Metadata – Higher Education	2006. 07	enactment
Quality Assurance (Content)	KS X7002-1	E-Learning QA Guideline-Content: Overview	2008. 10	enactment
	KS X7002-2	E- Learning QA Guideline-Content: K-12	2008. 10	enactment
Quality Assurance (Service)	KS X7003-1	E- Learning QA Guideline-Service: Overview	2008. 10	enactment
	KS X7003-2	E- Learning QA Guideline-Service: K-12	2008. 10	enactment

Source: KERIS (2010).

To cope with these changes, KATS selected professional agencies for undertaking standards by area and designated and operated them as cooperating organizations for standards development. For educational information (E-learning: SC36), KERIS and the National IT Industry Promotion Agency were chosen to undertake research and industrial areas, respectively. The cooperating organization for standards development consists of about 20 experts from the government, private sector, industry, and academic circles serving as committee members for standards development in charge of

Table III-13

National Standards in Conformity with International Standards (2009)

Number	Name of standards	Description
KS X ISO/IEC 19778-1:2009	Collaborative workplace – Part 1: Collaborative workplace data model	Collaborative technology to support communication among learners, teachers and general participants
KS X ISO/IEC 19778-2:2009	Collaborative workplace – Part 2: Collaborative environment data model	Information model for collaborative environment, including collaborative tools and functions
KS X ISO/IEC 19778-3:2009	Collaborative workplace – Part 3: Collaborative group data model	Information model for collaboration group including definition of roles between participants
KS X ISO/IEC 19780-1:2009	Collaborative learning communication – Part 1: Text-based communication	Information model for text-based communication
KS X ISO/IEC 24751-1:2009	Individualized adaptability and accessibility in e-Learning, education and training – Part 1: Framework and reference model	Common framework to explain the demand and preferences of particular learners, including learners with disabilities
KS X ISO/IEC 24751-2:2009	Individualized adaptability and accessibility in e-Learning, education and training – Part 2: "Access for all" personal needs and preferences for digital delivery	Information model to simulate particular learners, including learners with disabilities, and to communicate users' demand and preferences
KS X ISO/IEC 24751-3:2009	Individualized adaptability and accessibility in e-Learning, education and training – Part 3: "Access for all" digital resource description	Common language to explain learning data for improvement of learners' accessibility
KS X ISO/IEC 24703:2009	Participant Identifiers	Information type related to participants
KS X ISO/IEC 23988:2009	A code of practice for the use of information technology (IT) in the delivery of assessments	Technology related to providing IT-based testing and assessment in education
KS X ISO/IEC 19796-1:2009	Quality management, assurance and metrics – Part 1: General approach	Framework for explanation, comparison, analysis, and application of quality assurance and quality certification

Source: KERIS (2010).

developing and reviewing national standards. Developed standards (proposals) are submitted to KATS for enactment of national standards.

By vitalizing standardization in e-Learning, which is in the initial stage of introduction compared to other industrial sectors, the Republic of Korea expects to achieve complete conformity with international standards and lay the foundation for the advancement of related industries into overseas markets through the cooperating organizations for standards development and by implementing international standardization based on demand for standards in the domestic educational field. In addition, the Republic of Korea will directly participate in elaborating national and international standards, which is the ultimate goal of standardization projects, to take the lead in international standardization and contribute to protecting related industries from barriers to entry when the education market is opened.

A total of three types and seven cases of national standards in e-Learning had been enacted by 2008 and 10 international standards (ISO) were conformed and developed as national standards.

(2) International standards

Since 2000, international standardization in e-Learning has been pursued. Previously, five major groups and organizations including ISO/IEC JTC1 SC36, IMS Global Learning Consortium (GLC), ADL under the U.S. Department of Defense (which proposed SCORM), the Learning Technology Standards Committee (LTSC) under IEEE, and the European Committee for Standardization (CEN) had discussed international standards in e-Learning. However, most group activities for standardization have recently decreased or been discontinued and ISO/IEC JTC1 SC36 and IMS GLC are currently the two major groups for standardization (see Figure III-6). What is

particularly noteworthy is that an increasing number of standards developed by IMS GLC have been proposed by ISO/IEC JTC1 SC36 to be enacted as international standards (ISO/IEC). For instance, an accessibility standard called IMS Access for All, as well as additional IMS Content Packaging standards have already been developed. ISO/IEC standards and other standards are still under discussion and review by SC36 for ISO/IEC standardization.

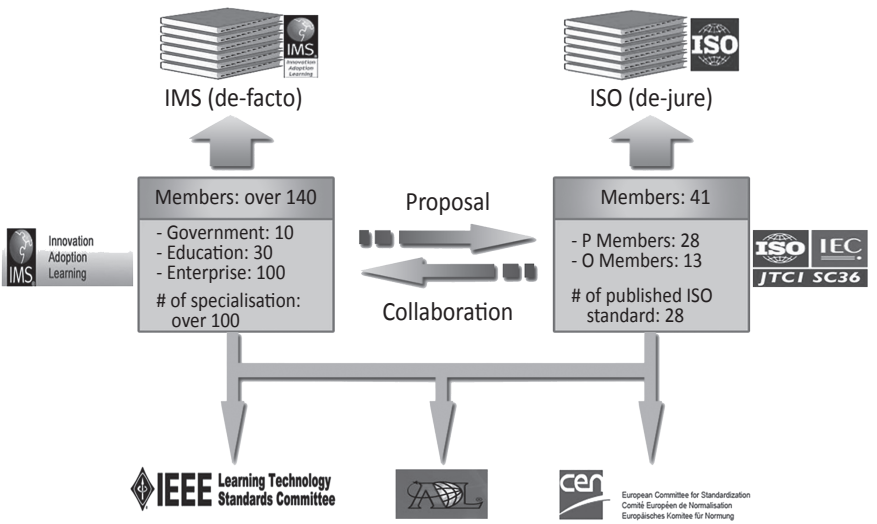


Figure III-6. E-learning International Standardization System.
Source: KERIS (2010).

As shown in Figure III-6, ISO/IEC JTC1 SC36 is the committee for standardization in a total of 36 participating countries. In South Korea, the Korean Agency for Technology and Standards under the Ministry of Knowledge Economy is designated as a national body and through KATS private experts participated in plenary and

working group meetings for international standards and carried out standards development projects. The ISO/IEC Joint Technical Committee 001/SC36 "Information Technology for Learning, Education and Training" developed standards for information technology for learning, education, and training. Representative standards developed by SC36 include standards for e-Learning terminology, collaborative learning technology, learner information, metadata and accessibility. As of September 2009, a total of 29 international standards were under development. South Korea has been very actively involved in international standardization: Korean experts participate in development of 13 out of 29 standards (45% participation rate).

ISO/IEC JTC1 SC36 develops international standards in practical educational information as a committee for making de-jure standards; however, attention must be paid to the activities of groups that lead the research and development of de-facto standards. In particular, IMS GLC is an international e-Learning standardization group that investigates and develops de-facto standards in the e-Learning market. SCORM, a standard applied to the Cyber Home Learning System, has largely conformed to IMS standard specifications. IMS joins over 140 organizations, businesses, and universities as regular members and contributors from all across the world. Its major members are the education ministries of Australia, New Zealand and the UK, public agencies such as JISC/CESTIC and Becta, global corporations such as IBM, Microsoft, and Oracle, as well as publishers and universities.

(3) Group standards

IMS GLC is an international leader in standards for the e-Learning market. In 1997, EDUCASE's National Learning Infrastructure Initiative (NLII) launched a project (completed by now), which developed into a global consortium consisting of the government,

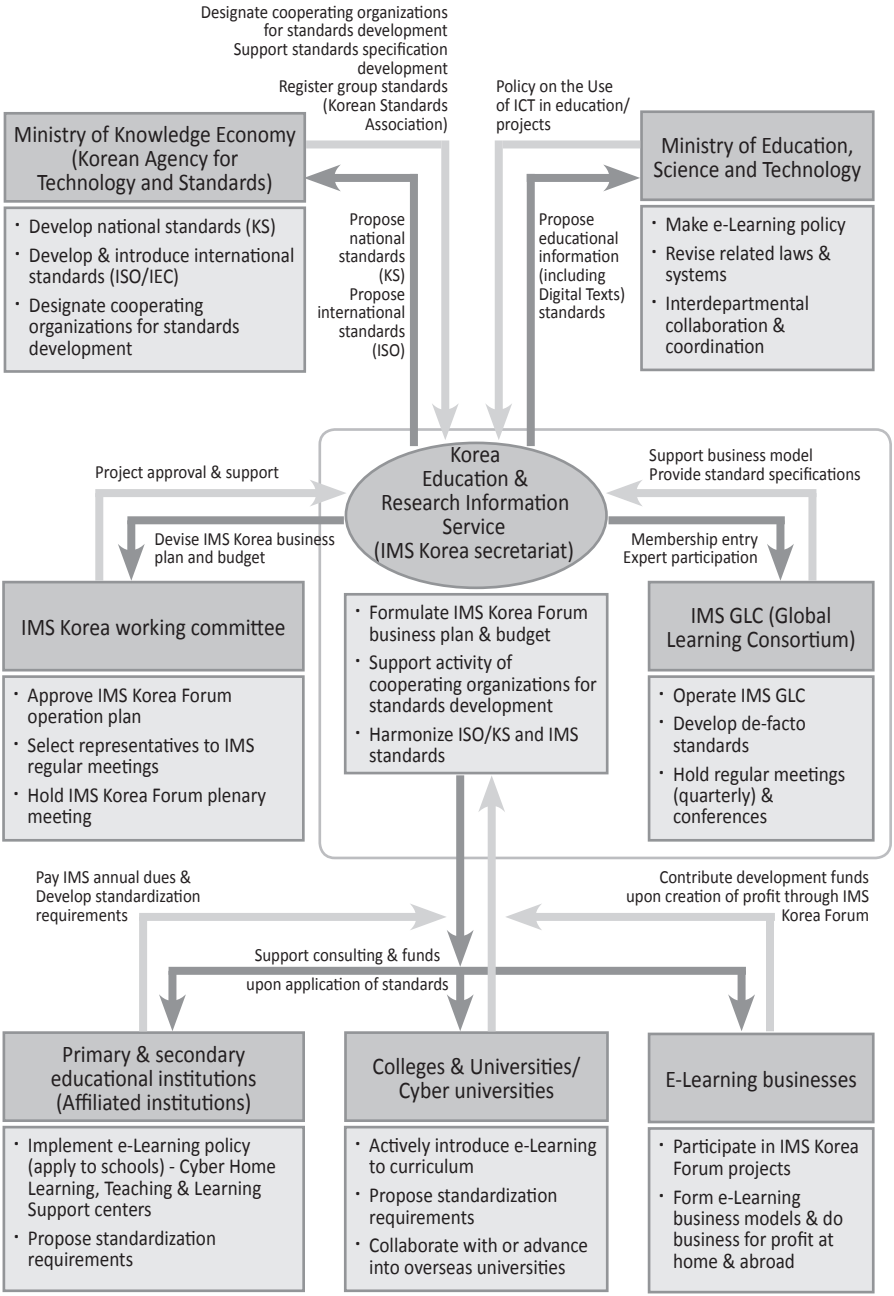


Figure III-7. IMS Korea Standardization Form System.
Source: KERIS (2010).

industry, and the research and academic communities and is recognized as an unrivalled group for research and development of de-facto standards in almost every e-Learning area.

KERIS was the first Asian organisation to join the consortium as a regular member in 2007 and agree to constitute a regional consortium called IMS Korea by entering a bilateral memorandum of understanding. In February 2008, with the participation of Korea's leading e-Learning businesses IMS Korea was established. In October 2008, this regional consortium developed into the IMS Korea Standardization Forum to develop IMS GLC standards as group standards.

As of July 2010, public institutions, private businesses, and educational institutions are a part of IMS Korea. The IMS Korea Standardization Forum is selected by the government to promote private standards and has been selected to receive government funding for three years (2008—2011). With this support, nine group standards were enacted in 2008 for the first time and a total of 18 group standards were established in five areas in 2009.

The IMS Korea Standardization Forum has supported the participation of Korean representatives in IMS quarterly meetings, thus Korean companies and educational institutions can systematically respond to IMS GLC's standard development in order to fully reflect the domestic situation in international market standards. In order to deal with IMS GLC's project groups, the forum has also provided opportunities for extensive discussion of e-Learning standards among private experts by forming project groups (Common Cartridge, Learning Tools Interoperability, and e-Portfolio) in IMS Korea. The forum holds workshops on global e-Learning trends and strategic use of standards for institutions participating in IMS Korea to nurture professionals and experts. In addition, it holds regular open seminars for the general public as well.

In September 2009, the IMS Korea Standardization Forum promoted the Asia-Pacific regional competition 'Learning Impact 2010' during the e-Learning Exposition held in Korea in an effort to make its diverse activities widely known within and beyond Korea. Korean businesses and educational institutions won grand and silver prizes in the main competition held in May 2010, and the forum has become Korea's one and only institutional base for group standards.

5.3. E-Learning Quality Assurance System

Quality control of e-Learning emerged as an important factor to assure the quality of learning services and content for the promotion of lifelong education. Quality Assurance guidelines need to be established to quantitatively evaluate e-Learning services and outcomes. Different quality aspects, where higher education, job training, teacher training and the training of teachers and government officials should focus on, are to be evaluated.

The E-Learning Quality Assurance System (EQAS) operates along with national guidelines and community guidelines. E-Learning institutes for job training are handled by MOL and KRIVET. MEST and KERIS take care of cyber universities and teacher training institutes. MOPAS and the Institutes for Government Officials Training are in charge of the training of government officials.

Therefore, the National EQAS can be grouped into four categories: higher education, teacher training, job training and government official training. The evaluation categories are content, service and platform. Figure III-8 shows the overall structure of government initiatives in e-Learning quality assurance.

The major aspects of EQAS for higher education are education planning, learning and teaching, staff members and equipment, management and administration, and outcomes.

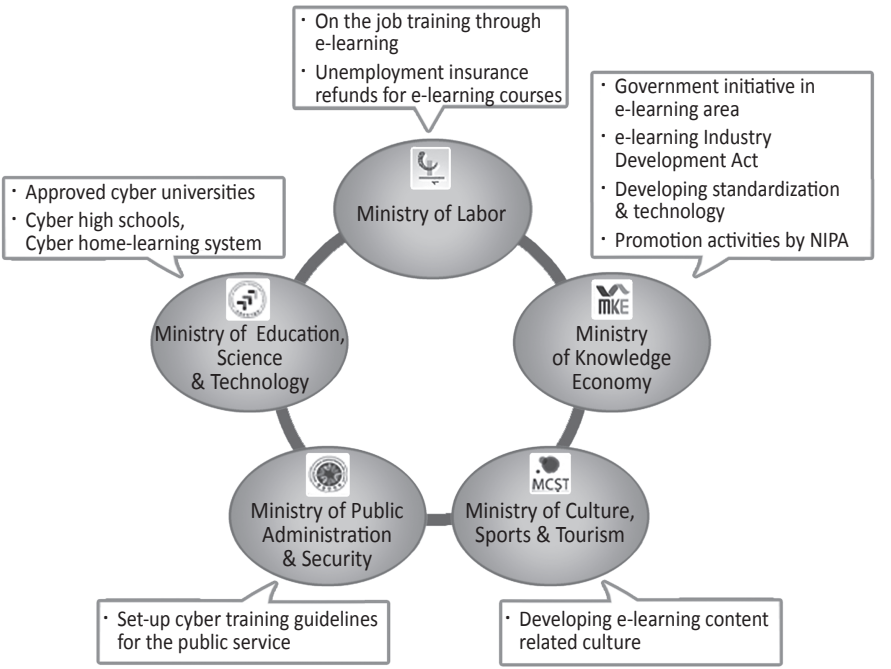


Figure III-8. Government Initiatives in E-Learning.
Source: NIPA (2009).

The major aspects for job training are as follows:

- Improve objectivity of jury review guidelines,
- Direct relevance to performance of employees' duties,
- Fairness of training content,
- Appropriateness as being remote training process,
- Fairness of content and training methods,
- Share of training market.

Major aspects of EQAS for teacher training are content, service licenses, service operation and service management. The major aspects of EQAS government official training can be divided into

two sub categories. One is for the product perspective such as student-centric design, goal of learning, learning content, evaluation and screen design and user convenience. The other is related to the design perspectives such as screen organization, arrangement and user interface.

EQAS offers primary and secondary education applied to the Cyber Home Learning System, which can be controlled according to a phase-based approach. In the planning phase there is curriculum analysis, instructional design strategy review, content development guideline review and sample content review. In the design phase the storyboards are reviewed. At the development stage the e-Learning product can be evaluated based on the content and integrity review.

5.4 Implications

Since ICT in education in the Republic of Korea has been driven by a top-down approach with three master plans and efficient organizational structure in the context of decentralization and role redistribution between the regional and central government, the setting of standards and the coordination of stakeholders are very critical tasks that are to be fulfilled by a central agency like KERIS. Efficiency and flexibility are the driving forces of Korean initiatives in ICT in education. One of the core functions of KERIS is to establish a harvesting and sharing system. By standardizing the format of digital media and the metadata of digital content, harvesting and sharing information can be more efficient.

Another implication for the standardization planners would be harnessing the e-Learning industry and the power of globalization. Even though the initiatives origin from a public agency, the policy impact can spread to the private sector such as media production and Internet service businesses, system-solution venture companies and hardware vendors. The process of formulation of national standards

in e-Learning calls for the participation of all stakeholders. It could serve as the most desirable partnership between the public sector and private sector.

The importance of national initiatives for an e-Learning quality assurance system is to guarantee the innovation of education through quality e-Learning in primary and secondary education as well as in higher and lifelong education. Since the advance of technology does not imply high-quality e-Learning, it would be beneficial to create high-quality core guidelines across the nation according to the level of education. Whereas standardization of the e-Learning system, content and service provide a minimum level of educational quality in terms of structural format, the quality assurance system takes into account the effectiveness of e-Learning in the context of education and learners.

The spectrum of the quality assurance system may vary according to the needs and readiness of the e-Learning in each country. For the emerging phase of e-Learning as a supplementary function for regular education, it would be sufficient to establish a quality control and management system. However, if the country is in the phase of incorporating e-Learning into its education system, there should be authorities that will be able to attend to the overall quality-assurance system, and thus further contribute to the quality of the legacy education system. In Korea, private cyber universities and other job training institutes should be able to provide quality e-Learning based in accordance with national standards.

6. Prevention of Adverse Effects

Information technology and the Internet are rapidly developing, which is accompanied by an unfortunate increase in security and ethical problems. In Korea, the appropriate government departments have issued laws (e.g. The Law on the Protection of Privacy) and

launched national initiatives for a safe ICT environment. The national initiatives for the education sector have been implemented by the Education Cyber Security Center (ECSC) as a policy body and the Computer Emergency Response Team (CERT) as the task force team.

6.1 Internet Security

In 2006, MEST established ECSC to strengthen a safe and sound cyberspace in the educational area. The main tasks of the ECSC are to operate the response system against cyber-attacks on educational institutes and oversee a 24-hour security system for MPOEs and universities in 2006-2010. In 2009, its projects included the enhancement of the response system to cyber-attacks, development of the content for information privacy, enhancement of infrastructure, and establishment of the cyber security operation centre (MEST and KERIS, 2009). In addition to the establishment of relevant systems, promotional events and materials were also provided to personnel in educational institutes. Table III-14 presents the status of ECSC service coverage for type of each educational institute.

Table III-14

Educational institutes covered by ECSC (as of 2009)

Educational type		Number of institutes	Service covered institutes	%
MPOEs (K-12)		11,080	11,080	100%
University	Public universities	53	35	66%
	Private universities	246	12	4.9%
Other institutes (e.g. admin offices)		203	203	100%
Total		11,582	11,330	97.8%

Source: MEST and KERIS (2009).

In addition, as personal information is increasingly being stored and shared in networked databases such as NEIS, personal privacy becomes an issue. Accordingly, MEST distributed three publications. "The Guidelines for Privacy Protection in Educational Institutes and Educational Administration Offices" (2005) is one example of the publications. Also, MEST supervised and monitored the current status and extent of 16 MPOEs and K-12 schools and universities' privacy protection on their websites. Every educational institute has established guidelines for privacy protection and has a Chief Privacy Officer to manage privacy protection as of 2009.

6.2 Ethics in ICT

While Korea possesses an advanced ICT infrastructure, it does however lack awareness of ethics in ICT. Adverse effects include cybercrime, privacy violations, Internet addiction, illegal copying and sharing of software, and unsolicited or spam mail. In particular, Internet addiction is a condition where the user becomes unable to self-regulate his or her Internet use to such an extent that it negatively influences his or her daily life. Internet addiction is on the rise and juveniles are especially susceptible to this social problem. Accordingly, the Korean government launched and implemented various e-safety and e-ethics programmes and campaigns such as the Month of Information Culture to diffuse sound culture and e-ethics in ICT.

In particular, MHW launched a comprehensive programme aimed at juveniles called the Youth Programme, which includes Youth Participating, Youth Protecting, Youth Patrolling, and Youth Powering based on project-based activities. Students, teachers, parents, and local community members, work together on these projects. In addition, the National Information Society Agency (NIA) launched various campaigns and educational programmes for ethics in ICT.

NIA developed six extracurricular textbooks for K-12 students from 2005-2006 for educational programmes. NIA has also made efforts to integrate ethics content in ICT to regular subject textbooks.

6.3 Implications

This comprehensive approach from various sectors for security and ethics in ICT is an important success factor. Not only MEST but also the MHW, NIA, schools, and other sectors have launched various programmes in accordance with the common purposes of all sectors. However, the numerous efforts may yield overlapping and redundancy of similar projects. Each sector should have clear and appropriate understanding of the importance of security and ethics in ICT so that synergy from various programmes can be created.

IV Monitoring and Evaluation

1. Monitoring and Evaluation Scheme

The overall scheme of monitoring and evaluation of ICT policy in education consists in measuring ICT in education for all schools from primary to upper secondary level, conducting ICT literacy tests for students and performing an external evaluation of major national ICT projects.

Measuring ICT in education determines the status of the ICT infrastructure, integration of ICT in classroom activities and other school-level outcomes of using ICT in education. There are about 43 performance indicators to measure and analyze the progress of ICT use in school education according to region and school level.

ICT literacy tests target student populations from 2nd to 10th graders according to school level, gender and regional variation. ICT literacy testing tools have three stages based on a curriculum for primary schools and two stages for secondary schools.

The annual external evaluation of major ICT projects focuses more on the cost-benefit analysis, return on investment, and efficiency of the projects funded by the national budget. Every major project funded by national budget more than USD 100,000 is to be evaluated by the Council of ICT Evaluation attached to the Prime

Minister's Office. Each central authority conducts self-evaluation for their own ICT projects and the external experts group performs peer reviews.

2. Measuring ICT in Education

Since 2003, KERIS has conducted a nation-wide survey to investigate the status and the progress of the levels of ICT use in education. It has developed 43 indicators for ICT use in elementary and secondary education. The indicators can be divided into three categories: input, utilization, and outcome. Through the process of measuring ICT in education, KERIS analyzed the main aspects of ICT in education in the Republic of Korea:

- Descriptive statistics to reveal the characteristic of each target group;
- Analysis of what and how much the school characteristics are responsible for the overall indicators;
- Time series analysis of common indicators to compare the progress of ICT levels.

The 'input' indicators can be divided into two sub-categories: support and hardware/software. The sub-category 'input — support' deals mostly with human resource development and planning issues. The sub-category 'input — hardware/software' covers provision of computer equipment for teachers and students, relevant software and network environment. Most utilization indicators deal with the issues of Internet usage in teaching and learning activities, school homepage operation and community of practice. The 'outcome' indicators are about certificates of ICT, educational software contests, etc. The indicators are described in detail in Table IV-1.

Table IV-1

Description of indicators

Category	Sub-Category	Indicators
Inputs	Supports	Training hours of the principal Training hours of teachers implemented by the school itself Training hours on ICT use in education per a teacher Percentage of operating budget among the total budget Percentage of teachers in the department of ICT Whether to lay out a year plan for ICT use Whether to have an incentive system for ICT personnel
	H/W, S/W	Number of students per a computer Number of computers per a teacher Percentage of computers less than 3 year old Percentage of computers connected to Internet Speed of Internet connection Number of educational software (Cd-Titles) Percentage of computers equipped with 5 basic applications
Utilization	Teachers	Percentage of subjects utilizing multimedia materials for teaching and learning through WWW Percentage of classes using web-board Percentage of subjects using web-board Percentage of teachers participating in an association regarding ICT use Percentage of subjects using computer lab Percentage of functions of the Information System being used Whether to use electronic decision system Number of posts written for and by parents
	Students	Hours of use of computer per a student Percentage of students participating in the special programs after school regarding ICT (Elementary) Whether to teach on computer (Secondary) Percentage of subjects collect assignments through web-board Number of searching library DB per students Percentage of student-governing community utilizing web environment Whether to have a program regarding Internet ethics Number of web communities per a class
	Internet	Usage of Internet Number of Access to school website per week How often to revise school website
Outputs	Teachers	Percentage of teachers having email address Percentage of teachers having homepage Percentage of teachers having certificates regarding ICT Percentage of teachers participating in educational S/W contests
	Students	Percentage of students having email address Percentage of students having homepage Percentage of students having certificates regarding ICT Percentage of students participating in educational S/W contests Percentage of students completing the ICT course (32 hours)

Source: Kim (2009).

3. ICT Literacy Assessment

The knowledge-based society in the 21st century requires creativity, problem solving abilities and communication skills. ICT literacy has been focused on these fundamental characteristics to cultivate those comprehensive capacities. In Korea, ICT literacy research has been conducted since 2001. KERIS has developed an Internet-based ICT literacy test system, which annually measures the level of students' ICT literacy.

To develop appropriate test tools and eventually assess the level of ICT literacy for students with the test tools nationwide, it is necessary to define ICT literacy for primary and secondary school students. In Korea, ICT literacy was defined operationally based on internal and external ICT-related curricula. Moreover, it has domains and sub-elements of ICT literacy and presented accomplishment levels. An expert group identified four content domains (computers and networks, presentation and a logic of information, algorithm and modelling, and information society and ethics) and six types of abilities (Define, Access, Evaluate, Create, Manage, and Communicate) for the evaluation model of ICT literacy. Testing tools of three stages were then developed based on the curriculum for primary and secondary schools. The testing tools were examined and revised by the experts.

Whereas measuring ICT in education deals with schools as an entity, the ICT literacy test deals with students' ICT capabilities. NEIS uses the Internet to present the survey questionnaire, collect responses and automatically analyze cases according to their location, school level and gender.

Each of the four content domains can be split into four categories. First, the Computer and Network Content domain handles the hardware and software such as computer structure and architecture, network and communication, and operating systems. Second, the Representation and Logic Contents domain is about data

representation for texts, images, sound, animation and video clips and arithmetical logic based on multimedia and a discrete structure. Third, the Algorithm and Modelling domain deals with data structure, algorithm, programming, hypermedia, data processing, database, system structure and so on. Fourth, the Information Society and Ethics domain handles changing life styles in cyber space including privacy protection, security, intellectual property rights, and the adverse effects of the Internet.

The six ability elements can be summarized as follows:

1) Define: Ability to recognize the problem and the information necessary to solve it
   - To recognize the problem confronted
   - To recognize the necessary information to solve the problem
   - To adapt the information to the condition of the problem
   - To understand basic digital technology and digital information

2) Access: Ability to collect and explore relevant digital information
   - To find potential digital resources for solving the problem
   - To access relevant digital information
   - To understand the access method in the digital environment
   - To understand the information retrieval method
   - To understand the methods of collecting of digital information
   - To retrieve the appropriate information

3) Evaluate: The ability to critically analyze the information
   - To analyze the quality of the digital information
   - To analyze the validity of the digital information
   - To analyze the appropriateness of the digital information
   - To analyze the propriety of the digital information
   - To analyze the reliability of the digital information

4) Create: The ability to design and create new information
   - To reorganize the collected information for practice
   - To integrate new information into legacy knowledge
   - To amend and modify collected information
   - To design new information structures
   - To create new information

5) Manage: The ability to organize and secure massive amounts of information
   - To adopt information to the legacy scheme
   - To manage and create new schemes for different information
   - To secure information
   - To manage and operate IT machinery

6) Communicate: The ability to communicate with information
   - To understand the process of communication exchange with digital information
   - To understand the skills needed for communication
   - To communicate via relevant medium efficiently
   - To communicate with other persons using digital information
   - To communicate within a digital environment

4. ICT Policy Evaluation

Since ICT in education requires huge investments, the effectiveness and performance of the national intervention should be reflected regularly and systematically. There has been an annual ICT policy evaluation process for major interventions for ICT in education in the area of basic education, higher education and lifelong learning. The evaluation was expected to provide critical and analytical information to project implementers, to support the policy-decision

making process, and to raise the management capacity of each actor. The Council for ICT Policy, chaired by the Prime Minister and mandated by 24 ministers of the central government, is the control tower of the overall evaluation process.

The basic strategies of the annual evaluation of ICT projects are as follows:

- Combine self-evaluation based on autonomous optional indicators upon the specific context of each unit and external reviews of expert committees;
- Provide feedback of the evaluation results with the next-year national budget planning;
- Embed with the overall governmental performance evaluation process within the commitment of the office of the Prime Minister.

Table IV-2

Core Indicators to Assess Feasibility of a Project

Category	Indicators	Description
Feasibility of the plan	1-1. Validity of the Objective	Check the alignment of the ultimate goal and the objective of the project
	1-2. Redundancy with other projects	Check the redundancy and linkage with other projects
	1-3. Verification of the strategy	Check whether the selected strategy is based on the adequate analysis of the context
	1-4. Appropriateness of the plan	Check the relevance of performance indicators of the project with the objective
Efficiency of Implementation	2-1. Alignment with the plan	Check whether the project is conducted in accordance with the schedule and planned resources
	2-2. Appropriateness of the risk management	Check whether the risk management is conducted effectively
Achievement of goal	3-1. Achievements of the objective	Check the achievement based on the planned objective
Impact	4-1. Consultation of the evaluation feedback	Check that the prior evaluation results are reflected in the project implementation

Source: Kim and Yang (2006).

The performance indicators include common core indicators and optional indicators. The Council for ICT Policy designates common core indicators, which should be applied to every national ICT project to be evaluated. As shown in Table IV-2, the core indicators check the feasibility of the project plan, the efficiency of the project implementation, the achievement of the goal and the impact of the project.

5. Implications

The monitoring and evaluation of national projects receives increasing attention from policy planners and legislators with due understanding of the importance of accountability and dissemination of information on benefits of public investments to the public. The main purpose of using ICT in education is to help students become competent in a globalized knowledge-based society. Schools are equipped with ICT facilities to provide an environment for students in which they have opportunities to adapt technology in their learning process as well as for teachers to integrate technology in pedagogically meaningful ways in their classroom activities. Therefore, it is very important to establish a monitoring and evaluation system to diagnose current status, check the outcomes and improve the ongoing initiatives. Measuring ICT in education at the school level, ICT literacy tests for each student and external evaluation for the performance of major ICT projects serve as a good model for monitoring and evaluation.

V Global Partnership

1. Overview and Status

The Republic of Korea has expanded its cooperation with the global community to reduce the digital divide through ICT in education. Korea has transformed from an ODA recipient country into an OECD DAC member, which has helped to attract the global attention to Korea's development cooperation for ICT in education. As a greater number of developing countries consider ICT in education as a paradigm for educational innovations, demand from developing countries to actively benchmark Korea's ICT practices is increasing. Requests for cooperation from the international community multiply. For example, such requests were received from Laos, Uzbekistan, the Dominique Republic, Colombia and Thailand. Representatives of over 50 countries visit Korea every year to benchmark best practices of ICT in education. Interest to consulting projects for ICT in education through ODA grants and EDCF loans have also intensified. Two good examples of building-up cooperation are the EDCF loans for ICT in education project in Uzbekistan (2008) and the feasibility study for EDCF loans for ICT in education project in Colombia (2009).

Furthermore, such international organizations as the World Bank, UNESCO and the Inter-American Development Bank often make requests for joint participation in ICT in education projects targeting developing countries, which helps to diversify ODA projects with international organizations.

Education projects, as projects in other development cooperation sectors, should satisfy two essential requirements of ODA: effectiveness and efficiency. Education is recognized as an effective long-term aid tool that can enable developing countries to build their capability for self-reliance and self-sufficiency, leading to economic development through the strengthening of human resources. Korea is favourably positioned to efficiently operate ODA for ICT in education. Korea is an educational powerhouse with the top ranking at PISA run by OECD, an ICT powerhouse with the world's second ICT infrastructure, being ranked number one in technological excellence and penetration.

Korea has provided quality-consulting services for various projects on ICT in education in developing countries including master planning of ICT in education and e-Learning system development. It has provided consultancy services to 11 countries in 2006—2009.

There are projects to donate ICT infrastructure for education to developing countries and educate teachers of developing countries. In 2006—2009, Korea donated over 16,000 PCs to 18 countries, trained more than 1700 trainees from 19 countries and dispatched Korea's best teachers to train teachers in developing countries in 2009.

Korea arranges joint training for teachers in developing countries and research on the international indicators on ICT in education together with international organizations including the World Bank and UNESCO. Korea invited policy makers from more than 20 countries for training organized jointly with the World Bank in 2008 and 2009. It conducted research on the development of an international index for ICT in education in 2008 and 2009.

Korea has also joint-hosted the e-Learning Asia Conference and e-Learning Expo Korea. The Ministry of Education, Science and Technology, the Ministry of Culture, Sports and Tourism and the

Ministry of Knowledge Economy jointly hosted several e-Learning events in 2006—2009. More than 20,000 visitors, from Korea and overseas, participated in the e-Learning Expo; the Conference is attended by more than 2,000 visitors each year.

2. Implications

The fact that Korea is the only country in the 20th century to transform from one of the least developing countries into a donor country gives insights into the global community and serves as a new model of successful development. The economic development of Korea results from the human development, and for the most part, the human development of Korea was in line with the national initiatives. The national interventions in ICT in education are harmonized with the national ICT strategy, which encourages sharing the Korean experience and knowledge model with the international community.

The aim of the global development cooperation efforts undertaken by Korea is to expand opportunities for education in developing countries and to support educational innovations through bilateral and multilateral cooperation. The ROK government recognizes the importance of support to the cultivation of human resources in developing countries through active engagement in the international community for development cooperation and strengthening of the leadership. Moreover, Korea can contribute to encouraging social development and poverty reduction by supporting policy-making and capacity development in developing countries, which includes training for policy makers, educational administrators and teachers of developing countries.

Each country has its own context and it would be meaningful to consider global cooperation in the area of ICT in education as applied to the conditions of each particular country. Since ICT in education

suggest integrating digital technologies in an educational context, it is a prerequisite to equip them with technical infrastructure such as network connections and digital devices. There are many indices to regularly collect and analyze the current status of the digital infrastructure of each country worldwide. The ITU's ISI-Digital Opportunity Index is a good example.

According to ITU (2009), the Digital Opportunity Index (DOI) is based on internationally comparable ICT indicators for measuring the extent to which the Information Society has been achieved. As a composite index, the DOI allows tracking and comparison of the achievements of countries in different aspects related to the Information Society. It measures countries' ICT capabilities in infrastructure, access path and device, affordability and coverage, and the quality. The DOI is based on 11 ICT indicators grouped in three clusters: opportunity, infrastructure and utilization. The DOI has been compiled for 181 economies over a period of three years — 2004—2006 (ITU, 2007).

The World Summit on the Information Society (WSIS) stated:

> "*governments and world leaders made a strong commitment towards building a people-centred, inclusive and development-oriented Information Society for all where everyone can access, utilize and share information and knowledge. WSIS has identified the need to measure the advances made in breaching the digital divide and in promoting the broad development goals included in the United Nations Millennium Declaration through increased access and use of ICTs. To this end, the WSIS Plan of Action*[3] *prioritizes evaluation and tracking of countries' progress in adopting ICTs by establishing a composite DOI to track each country's evolution towards the Information Society*" (ITU, 2007).

[3] WSIS Plan of Action includes 10 targets for ICT connectivity to be achieved by 2015.

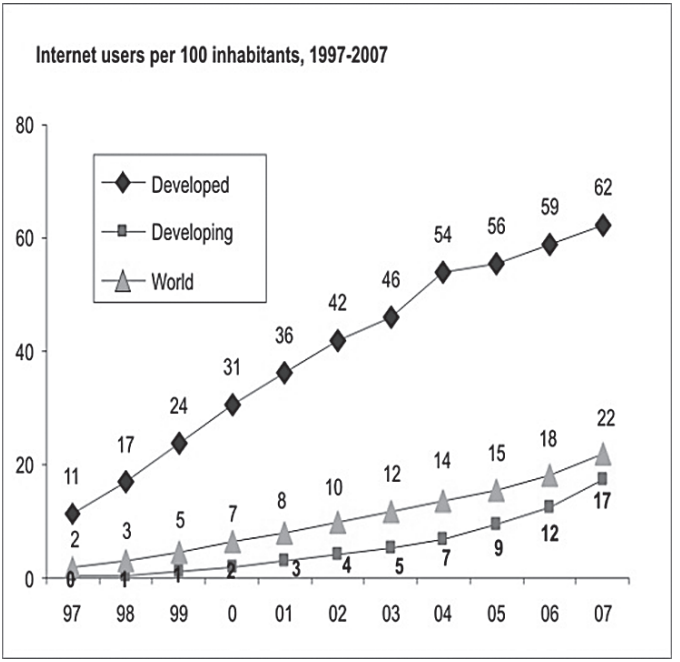
Figure V-1 shows the digital divide trends according to economic development in terms of Internet users and mobile telephone penetration in 1997—2007 (ITU 2009). There are three times more Internet users in developed countries per 100 inhabitants than in developing countries whereas mobile telephone subscription trends show more rapid growth in developing countries.

It is also important to mention the internal digital divide within countries that usually exists between rural and urban areas. According to Hammond (2007), the rural BOP[4] households have significantly lower ICT spending and are significantly less likely to own a phone than rural mid-market households or even urban BOP households — consistent with the broad lack of access to ICT services in rural areas. Therefore, it is imperative for government to reduce the gap between regional disparities in order to develop the capacity of the nation to a maximum level. In addition to rural-urban disparity, it is also important to know how ICT can contribute to reduce gender disparity issues. Chen (2004) noted that increases in the level of ICT infrastructure tend to improve gender equality in education and employment.

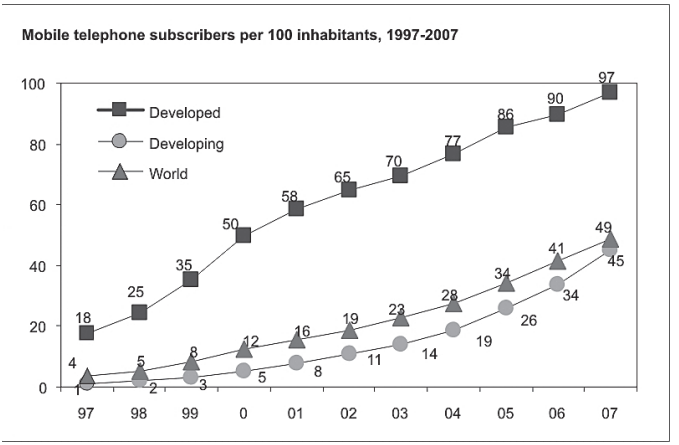
The World Bank (2006) and ITU (2004) surveys showed that developing countries have relatively young populations; reaching this target would have a strong impact in those countries. It is, therefore, perhaps even more relevant for developing countries than for developed ones. Connecting schools also provides access to huge amounts of information and allows teachers to use resources on the Internet that expand and enrich the curriculum.

Implications from the review of disparities in ICT development among countries can be drawn along a handful of issues. National policy

[4] The 4 billion people at the base of the economic pyramid (BOP) live in relative poverty. Their incomes in current U.S. dollars are less than $3.35 a day in Brazil, $2.11 in China, $1.89 in Ghana, and $1.56 in India (Hammond, 2007).



Source: http://www.itu.int/ITU-D/ict/statistics/ict/graphs/internet.jpg



Source: http://www.itu.int/ITU-D/ict/statistics/ict/graphs/mobile.jpg

Figure V-1. Digital divide among countries

intervention should focus on reducing and diminishing disparities with respect to gender, region, and economic status. It should strive to improve and achieve sustainable equity in the education sector through public resource mobilization and establishing public-private partnerships. Though accessibility is one of the key issues in policy, especially in developing countries non-technical issues, for example, the development of the social and cultural environment and soft-skill human resources such as digital literacy should also be considered (Yang, 2009).

VI Conclusions

Korea's ICT policy in education has been recognized as best practice. The success of Korea's e-Learning and ICT in education policy was recognized as a result of a solid legal framework, systemic implementation mechanisms, secured budget and support, timely capacity building, successful cooperation between public and private sectors, an effective monitoring and evaluation system, etc. The important factors that affected the success of implementation policies and initiatives of ICT and e-Learning can be summarized as follows:

- Systematic policy implementation;
- Capacity of implementing organizations;
- Implementing policy through liaison and cooperation between organizations;
- Sustainable financing of ICT in education;
- Well-established policy monitoring and evaluation systems;
- Consumer-centred policy implementation;
- Shift in policy to respond to technological and societal change.

On the other hand, many lessons have been learned. The Republic of Korea needs to continuously pay attention to investment in ICT in education for sustainable development of e-Learning and innovation of education in some areas.

First, existing ICT infrastructure is getting old; its maintenance and renewal is very important. Technical personnel is needed at the

individual school level rather than at the MPOE level in order to address this issue properly.

Second, teacher capacity building has always been considered to be an important factor for ICT in education. The new paradigm of education needs new ways of teaching and learning. However, as new media is created, teachers tend to be overwhelmed by the new technology. Because new media continuously emerges to support the new paradigm of education in the future, teachers need open, flexible, and creative mindsets for new ICT technologies. Accordingly, future directions for teacher training and development should include comprehensive topics not limited to ICT technology to develop innovative ways of teaching with ICT for future students and future education. Finally, teacher training for ICT in education should facilitate teachers' pedagogical mind and performance in innovative ways.

Third, though curriculum integration of ICT is not easy because it requires more than the quantitative use of ICT, it rather ensures quality use of ICT for meaningful education. Large amounts of digital educational content in Korean led many teachers to use ICT for their teaching. Moreover, the recent development of digital textbooks has provided a great opportunity for curriculum integration of ICT because these are textbooks and much more than that. However, if digital textbooks are successfully integrated into regular curriculum and add values to traditional printed textbooks, school curriculum should be well understood by policy makers and developers. Also, promoting strategies and events for school principals and teachers should be considered. Still many teachers are not familiar with digital textbooks.

Fourth, information service initiatives can be provided in three ways. It is important to establish collecting, creating and sharing processes and an organizational structure for quality educational

resources for teaching and learning. EDUNET has evolved from an educational portal to the national teaching and learning centre, which coordinates and facilitates the efficient collaboration between the central government and regional government. Services as CHLS were developed to support after school learning opportunities specially focused to bridge the socio-economic divide among student backgrounds. Innovation of the national governance through the initiatives of e-Government can be formulated by participation of various stakeholders and beneficiaries.

In accordance with the implementation of the information service system, it is essential to develop national standards for educational resources and an adequate quality assurance system. Since each country has its own context, the specification of standardization processes and quality assurance categories and guidelines can vary.

Fifth, as the monitoring and evaluation of national projects become increasingly important, the Korean government should continuously enhance the efficient and effective monitoring and evaluation system to diagnose current status, check the outcomes and improve ongoing initiatives.

Lastly, national policy intervention should focus on reducing and diminishing disparities among gender, region, and economic status to improve and achieve sustainable equity in the education sector through mobilization of public resources and establishment of public private partnerships. Though accessibility is one of the key issues in policy, especially for developing countries, the development of the social and cultural environment and soft-skill human resources such as digital literacy should also be considered.

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