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Building and Sustaining National Educational Technology Agencies

Lessons, Models and Case Studies from Around the World

Michael Trucano & Gavin Dykes (eds.)

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WORLD BANK GROUP

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

Lessons, models and case studies from around the world

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Acknowledgements

The *World Bank Education, Technology & Innovation: SABER-ICT* publication series explores a variety of topics and issues related to the use of information and communication technologies (ICTs) in the education sector.

It is part of the World Bank's Systems Approach for Better Education Results (SABER) initiative, which seeks to improve the global knowledge base related to education systems analyses, assessments, diagnoses, and opportunities for dialogue. SABER-ICT aims to improve the availability of policy-related data, information, and knowledge on what matters most in using ICTs to improve the quality of education.

Some of the content appearing in this publication first appeared, in draft form and in slightly different formats, on the World Bank's EduTech blog. Content from individual chapters have also appeared as part of the World Bank's SABER-ICT Technical Paper series.

Building and sustaining national educational technology agencies: Lessons, models and case studies from around the world was born out of discussions between policymakers at the annual Global Symposium on ICT use in Education (GSIE), which takes place each in year in Korea, sponsored by the World Bank and the Korean Ministry of Education and hosted by the Korea Education & Research Information Service (KERIS). It was made possible through generous support from the Government of Korea, most notably through the Korea - World Bank Partnership Facility.

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Acronyms and Abbreviations

Becta – British Educational Communications and Technology Agency

CoSN – Consortium for School Networking (CoSN)

DepEd – Department of Education (Philippines)

EAP – East Asia and the Pacific

EdNA – Education Network Australia

EMIS – Education Management Information System

FIT-ED – Foundation for Information Technology Education and Development (Philippines)

FOD – Omar Dengo Foundation (Spanish acronym)

GENIE – Global Exchange of Networks in Education

ICT – Information and Communication Technology

KERIS – Korean Education & Research Information Service

JEI – Jordan Education Initiative

KEDI – Korean Educational Development Institute

KIE – Kenya Institute of Education

KICD – Kenya Institute for Curriculum Development

LATU – National Technological Laboratory of Uruguay (Spanish acronym)

MICDL – Maine International Center for Digital Learning

MLTI – Maine Learning Technology Initiative

MOE (MoE) – Ministry of Education

MoIT – Ministry of Information Technology

MSSI – Malaysian Smart School Initiative

NaCET – National Center for Education Technology (Armenia)

NCET – National Center for Educational Technology (China)

NECTEC – National Electronics and Computer Technology Center (Thailand)

NGO – Non-Governmental Organization

ODF – Omar Dengo Foundation (Costa Rica)

PUSTEKKOM – Pusat Teknologi Informasi dan Komunikasi untuk Pendidikan (Indonesia)

UNESCO – United Nations Educational, Scientific and Cultural Organization

about the editors

Michael Trucano is the World Bank's Senior Education & Technology Policy Specialist and Global Lead for Innovation in Education, working on issues at the intersection of technology use and education in middle- and low-income countries and emerging markets around the world. At a practical working level, Mike provides policy advice, research and technical assistance to governments seeking to utilize new information and communication technologies (ICTs) in their education systems and leads related analytical work under the World Bank's SABER-ICT initiative. Over the past 20 years, Mike has been advisor on, evaluator of, and/or working-level participant in, educational technology initiatives in over 50 middle- and low-income countries. A frequent public speaker and interview subject on the use of technology in education around the world, and on ICT use for development (ICT4D) purposes more broadly, he is the principal voice behind the World Bank's influential *EduTech blog*. He also regularly serves as a 'master of ceremonies' or moderator at conferences and industry events, including the annual global symposium on ICT and education in Seoul, which he helped to establish in 2007. In addition to his advisory work on projects funded by the World Bank and other international aid agencies and donors, he serves on a number of external advisory boards for non-profit groups, international development agencies and prize committees, including Digital Promise Global, Dfid's Digital Advisory Panel and the International Literacy Prizes of the U.S. Library of Congress, and is a Distinguished Fellow of the Research Centre of Fundación Ceibal in Uruguay. You can follow Mike on Twitter @trucano.

Gavin Dykes is an independent education and technology advisor who works with governments, agencies, major corporations and institutions across the world on policy and strategy. His current roles include Programme Director for the Education World Forum, the world's largest annual gathering of education ministers, Senior Director of International Relations for the New Media Consortium, and Fellow of Education Fast Forward. Following a successful first career as a civil engineer, Gavin spent 20 years developing Technical Vocational Education and Training. He was later seconded to the UK government to support development of technology and learning in schools in England, and also worked on innovative projects in further and higher education. Current and past roles in this regard include time spent as International Strategy Consultant and Advisor for Becta, Associate Director of Futurelab and Associate Director of the Innovation Unit at England's Department for Education & Skills. His work with governments worldwide has seen him in leadership roles for projects such as the development of the Maltese Government's e-learning strategy and Azerbaijan's first national ICT conference. Gavin is also co-author of the recently published book, *Aspire High: Imagining Tomorrow's School Today*. Gavin's key interest is in development of learning supported by technology to allow learners of all ages to enjoy education and realize their potential.

Preface

For over a decade, the *Global Symposium on ICT Use in Education* (GSIE) has brought over a thousand high level government policymakers and practitioners from over 50 countries to Korea to share information about emerging uses of information and communications technologies (ICTs) in education around the world. Given its experience in exploring cutting edge approaches to educational technology use across the Korean public school system, the Korea Education & Research Information Service (KERIS) has proved to be a great host for the event in numerous ways.

In the course of its support for policy dialogues at the GSIE over this period, the event organizers -- the World Bank, the Korean Ministry of Information and KERIS -- observed that, as technologies have changed, excitement about particular individual technologies and their specific uses to support teaching and learning has ebbed and flowed over time. A few interests have remained constant, however.

While GSIE organizers had planned from the beginning to support knowledge exchanges around a few 'evergreen' general topics (e.g. like the use of new technologies to support teachers; monitoring and evaluation; and digital competencies for learners) in which KERIS had notable experience and expertise. What organizers did not initially anticipate, however, was the extent to which policymakers were interested *not only* in learning about what KERIS itself knew, and was learning, about uses of new technologies in education, but also in *learning about the institution of KERIS itself – as well as institutions like it*. As it happened, people responsible for starting, leading and/or overseeing national institutions in their countries which performed similar sorts of functions to that of KERIS -- an institution commonly referred to as a national education technology, or ICT/education, agency -- increasingly made the trek to Korea to participate in the GSIE, sharing with their counterparts information and insights about national institutions emerging in countries around the world to help introduce, support, fund, share information about and evaluate the use of ICTs in education at a large scale.

This publication, ***Building and sustaining national educational technology agencies: Lessons, models and case studies from around the world***, attempts to document and take stock of this phenomenon. It is one output from the World Bank's Systems Approach for Better Education Results (SABER) initiative, which seeks to improve the global knowledge base related to education systems analyses, assessments, diagnoses, and opportunities for dialogue.

Michael Trucano and Gavin Dykes begin by providing a **general overview of the phenomenon of national educational technology agencies**. Drawing heavily on the case studies that follow, they examine how and why such institutions are often created, what functions they often perform, and the forms they often take. They then explore what appears to be a typical 'life cycle' that characterizes how many such institutions evolve over time before attempting to identify a set of general related lessons for policymakers.

Youngsun Kwon and Sanghyun Jang then tell the story of the founding and initial years of **KERIS in Korea**, which has served as a model for numerous other national educational technologies agencies around the world. Using its stewardship of Korea's Cyber Home Learning System as an example, Kwon and Jang explore key factors which influenced the building and course of KERIS over the years.

Molly N.N. Lee and Soon Seng Thah examine the founding and evolution of the much-admired **Malaysian Smart School Initiative**. Unlike many other countries, Malaysia did not create a single institution, but rather used the MSSI as a sort gravitational force around which public and private institutions orbited, partnering to provide coordinated sets of inputs and activities to support the larger goals of the initiative. The role of Malaysia's Smart School Qualification Standards (SSQS) is given particular attention.

Gavin Dykes explores the case of **Becta, the British educational communications and technology agency**, which was considered by many practitioners to be one of the world's best examples of a national

educational technology agency -- at least until the institution itself was shuttered. Dykes pays particular attention to how Becta evolved over time, and to how a particular instrument, the government 'remit letter', helped define the course of this evolution.

Eugenio Severin analyzes the evolution of **Chile's Enlaces program**, which grew from a small pilot project overseen at a university to encompass all schools across the Chilean education system. The freewheeling, 'start-up' nature of the early years of the initiative is contrasted with its later incorporation as a formal part of the Ministry of Education's apparatus, demonstrating the tension between what can be competing goals: introducing new innovations; and supporting such innovations at an institutional level over time, at scale.

Edmond Gaible and Anush Shahverdyan examine the growth of the **National Center for Education Technology (NaCET) in Armenia**, which was formed to help meet the technical needs of the Ministry of Education related to the rollout of computer equipment and connectivity in Armenian schools, and which along the way picked up a set of complementary responsibilities.

Eugenio Severin then looks at the case of **Plan Ceibal in Uruguay**, which helped that small South American country become the first in the world to provide every student with a free laptop and connect (almost) all of its schools to the Internet. The Uruguay case is notable for a number of reasons, including the deliberate decision to create an institution from scratch outside traditional education authorities, and then over time to increasingly coordinate and harmonize its activities with those authorities as various programs and activities matured.

Neil Butcher and Petra Bodrogini explore the establishment and changing role of **PUSTEKKOM in Indonesia**, the Centre for Information and Communication Technology (ICT) for Education, which is part of that country's Ministry of Education and Culture. Originally established in the late 1970s to help lead some of that vast country's efforts in distance education, the advent of the Internet and new technologies meant that the institution was given a new mandate and challenged to change its role.

Carla Jimenez Iglesias examines **Costa's Rica's Omar Dengo Foundation**, which was created as a private institution by government explicitly to support and complement that country's Ministry of Education by exploring and supporting the use of new technologies in schools. While not technically a government agency, the Omar Dengo Foundation is one of the earliest examples of an institution that performs many of the functions now commonly attributed to national education technology agencies. Jimenez Iglesias pays particular attention to the role of official laws and policies in establishing and directing the activities of the foundation.

Saowaruj Rattanakhamfu looks at the case of **Schoolnet Thailand** and its emergence out of another institution, NECTEC, documenting how an initial effort overseen within the Ministry of ICT that benefited from the expertise from a number of leading academics eventually was absorbed as an ongoing program of that country's Ministry of Education.

Benjamin Vergel De Dios analyzes the particular case of **the Philippines** in 2012, where **no institution** existed that performed the functions typically associated with a national education technology agency. Along the way, he highlights the challenges and issues in one country seeking to do many of the things related to the use of ICTs in its schools occurring around the world, but without the sort of coordinating institution common to many other countries around the world pursuing similar objectives.

Gerald White and Lesley Parker examine the case of **EdNA in Australia**. While different in many ways from Becta (including the fact that, as a network, many of its key functions were 'virtual'), an analysis of EdNA offers the opportunity to examine the full life of a national education technology agency, from birth through its growth and maturation to its eventual demise.

Michael Trucano concludes the publication by identifying a number of **additional institutions** not examined at length here, but which might offer additional lessons for consideration. The activities and

histories of many of these institutions have not been well documented for external audiences; all are worthy of additional study and analysis.

By documenting emerging lessons from the histories of various national educational technology agencies and their functional equivalents, which are typically responsible for similar roles but which can differ radically in form by country and over time, it is hoped that this publication can help inform perspectives of decision makers considering how to create and support such an institution, the forms it might take, what roles it might take on, and how these forms and roles might be expected to evolve over time.

The specific country experiences considered are the result of requests from policymakers in East Asia who wished to learn more about experiences in these countries, and represent experience both from with East Asia itself, as well as global experience considered to be of relevance to policymakers in the region. The observations, analyses and conclusions contained in this paper were first shared and discussed in sessions at the Global Symposium on ICT Use in Education in Korea from 2013-2015. This publication represents both the culmination of a multi-year effort of engagement with policymakers across East Asia and the Pacific on these topics, and benefits from feedback and insights gained as a result of this engagement.

Any errors of fact are those of the authors. The views and opinions expressed here are those of the authors as well and do not necessarily reflect the opinions of the World Bank, the government of Korea, or any affiliated institutions.

It is hoped that this paper may help to catalyze interest in documenting and exploring the experiences of such national educational technology agencies, which play increasingly key roles in activities that are growing in strategic importance -- and cost -- in many countries, but which have to date only been the subject of minimal critical and academic interest.

- Michael Trucano & Gavin Dykes

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

1

Lessons from International Experiences

Michael Trucano and Gavin Dykes

in this chapter …

Executive summary

National educational technology agencies ('ICT/education agencies', and their functional equivalents) play important roles in the implementation and oversight of large scale initiatives related to the use of information and communication technologies in education in many countries. That said, little is known at a global level about the way these organizations operate, how they are structured, and how they typically evolve over time.

Through an examination of lessons from the development and history of a set of representative ICT/education agencies in East Asia, and, to better understand East Asian experiences, other countries around the world, this publication seeks to identify common challenges and issues and potential relevance to leaders of such institutions. Some areas of common interest across countries relate to legal frameworks and laws; oversight; autonomy and independence; links to policy; collaboration with key stakeholders; leadership; human resources; selling services; evolution; and decentralization.

Many, if not most, national ICT/education agencies were formed explicitly to help oversee and/or implement a large project in the education sector to help build out ICT infrastructure (e.g. connectivity, computer labs, laptop deployments) in schools. Over time, the responsibilities and functions of such institutions may change. A typical 'life cycle' of such organizations can be observed, characterized by different attributes and characteristics of, and different challenges faced by, such institutions depending on which of the five stages of development they typify.

National ICT/education agencies assume one of six common models or institutional structures, based on country contexts and needs. Over time, these models can -- and do -- change.

A set of twelve key commons lessons can be identified from the experiences of national ICT/education agencies:

1. Leadership is important – critically important
2. Enabling legislation can make life much easier
3. Especially in the early years, 'getting the little things right' helps to build credibility
4. Funding and financial autonomy need to be ensured
5. Managing transitions successfully is key if ICT/education agencies are to remain relevant and useful
6. Tensions between building capacity versus creating dependence should not be underestimated
7. Remaining flexible and innovative becomes increasingly challenging over time
8. To ensure their relevance, agencies should evolve to become focal points for communication, consultation and cooperation
9. Where they are most successful, ICT/education agencies are one constituent part of a larger holistic vision related to education, technology – and the intersection of the two
10. Organizational structures may change, even if core functions do not
11. Focus on supporting and meeting the needs of teachers
12. Learning from experience is a vital ingredient for success

a. Introduction

Many developing countries have embarked upon – and others are seriously considering – large-scale roll-outs of information and communications technologies (ICTs) in their education sector. Similar processes began in most OECD countries 10-20 years ago, in many middle income countries more recently. Structurally, education systems organize themselves in various ways to fund, implement and oversee these sorts of initiatives, which are typically quite expensive – and complex – and the related organizations evolve, in ways incremental and radical, over time. Despite the highly varied local contexts, in most countries, **a single institution is core to the implementation of educational technology (ICT/education) initiatives.**

KERIS, the Korean Education & Research Information Service, is in many ways the prototypical model for this sort of institution: a semi-independent, quasi-governmental organization under the direction of the ministry of education that assumes lead responsibilities for helping to oversee and implement key elements of a country's activities related to the large scale use of ICTs in education. A number of countries have attempted to model themselves, in whole or in part, on KERIS – sometimes in active partnership with KERIS itself and/or with the help of KERIS staff or consultants. While KERIS is a prominent – and good – example of this sort of institution, it is certainly not the only one.

For the past decade, the World Bank and the Korean Ministry of Education, Science and Technology (MEST) have supported an annual global symposium on ICT use in education in Seoul to help policymakers learn more about the KERIS model and experience and to connect them with specific related expertise in Korea, in the hope that such connections might be of value to planning processes in other countries. Over 1000 people from over 50 countries with related interests, including policymakers with responsibility for ICT and education issues and key stakeholders from other government ministries, civil society, academia and the private sector active on related topics, have to date participated in the international sharing of lessons, questions, concerns and experiences at the global symposium. During this period of time, many key figures from national ICT/education agencies have participated in the annual symposium, sharing information about how they have organized themselves to help implement and sustain large scale investments in technology use in education.

The November 2010 global symposium ("Building and Sustaining National ICT/Education Agencies") was specifically focused on helping to share such experiences and to make connections between key actors within such organizations around the world, with a decided focus on experiences and questions relevant to middle and low income countries in East Asia and the Pacific. At this event, *policymakers from across Asia specifically asked for further documentation on key issues of relevance to the creation, oversight, evolution and activities of such organizations*. At that event, it was apparent that, while many countries had made, or were considering, a number of decisions related to how to organize and provide structure for their efforts related to large ICT/education initiatives, they had been doing so largely in isolation, not informed by or connected to similar experiences and lessons in other countries. In part, this was because little related publicly available documentation was thought to exist for a global audience (beyond, perhaps, PowerPoint slides occasionally made available on institutional and conference web sites) about how national ICT/education agencies were formed, how they were organized, and what functions they performed. Given the fast pace of activity in this regard -- most such institutions were formed since the mid-1990s – and the speed at which related decisions often had to be made (which made the typically laborious and time-consuming process of international outreach difficult), this lack of documentation is perhaps not surprising. Information circulated largely informally, incompletely, and sporadically, often as the result of chance meetings at international conferences, the work of a small number of consultants and

staff at international development agencies who moved from one country to another, sharing lessons from personal experiences of working with such institutions, or bilateral governmental efforts (such as those by KERIS as part of Korean overseas developmental assistance activities). Where documentation did exist, it was largely of experiences from OECD or 'developed' economies and/or not current.[1]

This work is informed by specific requests for related insight, information and guidance made by policymakers at the annual global symposium on ICT use in education in Korea, and as a result of lessons and experiences shared by policymakers at the event. It is also an attempt to distill some of the key lessons and findings from related advisory work (supported by the World Bank and other groups) in which the authors have been engaged over the past 15 years. It explicitly draws on a set of new case studies (which follow in subsequent chapters) profiling experiences from a set of countries which, taken together, are more or less representative of the different contexts, approaches and histories of national educational technology agencies from different parts of the world:

Through an examination of some of the common backgrounds and contexts that inform the creation of such institutions and the environment in which they often operate, this report attempts to identify some of the common functions performed by such institutions, and the common organizational models that such institutions typically assume. It examines issues related to the governance of such institutions, and identifies some common stages of development that many such institutions exhibit over time. A number of general observations about such institutions are discussed, as well as related key lessons that have emerged over the past two decades about what has worked, and what hasn't.

[1] *The informal knowledge exchange of the Global Exchange of Networks in Education, or GENIE, in the first decade of the 21st century was one notable and important effort to share information of this sort among like-minded groups and their leaders in developed countries. The useful set of 'Schoolnet Toolkits' sponsored by UNESCO Bangkok (in Asia) and the Commonwealth of Learning and IDRC (in Africa) date from roughly the same period of time.*

b. Background and Context

Why should we care about national educational technology agencies?

Given their critical, integral, and in many ways outsized importance in the implementation of national policies and initiatives related to the use of ICTs in education in many countries, especially at large scale, there has been surprisingly little international attention paid to how national ICT/education agencies are organized, what they do, how they have changed over time, and what lessons have emerged from such experiences. ICT-related investments in the education sector around the world are becoming increasingly large, strategic and complex, and yet little is thought to be known at a global level about how such investments are implemented and managed, especially where related responsibilities are shouldered by a single institution established for this purpose.

In reality, *a lot* actually *is known* about these topics, but this knowledge has largely remained *within the country in which such an institution exists*, known primarily only to policymakers, practitioners and partner organizations there. Related lessons and institutional practices have, for the most part, not been documented, disseminated and made accessible to key decision makers responsible for the management and oversight of such institutions in other places – especially in middle and low income countries in the early stages of planning for, or evolving, their own national ICT/education agencies. This knowledge gap can greatly complicate efforts to inform key decisions and planning about the nature and role of such institutions going forward. Given the amounts of money being invested in educational technology products, services and activities around the world today, and the strategic importance that ICTs are assuming in the official education policies and practices in many countries, this knowledge gap could have very practical – and expensive! – consequences.

Whether it is in (1) low or middle income countries that are currently considering or embarking on large scale ICT/education initiatives and considering how to organize themselves to translate the often lofty rhetoric of related policy documents into implementable action 'on the ground'; or (2) countries that are transitioning away from a hardware-centric, approach to ICT-related investments in the education sector focused primarily on infrastructure to more varied and holistic considerations of how the use of various information and communication technologies can make the achievement of a variety of education sector goals more likely; the 'success' or 'failure' of national ICT/education agencies is often critical to the success of such efforts.

A caveat: This publication is deliberately ***not*** concerned with issues related to whether technology should be used in the education sector, how it should be used, and/or what the impact of such use might or might not be. These larger, and more fundamental, sorts of questions are beyond the scope of this particular study. (Those looking for discussions of those topics can benefit from a rich related literature available from the World Bank and other sources.[2]) Instead, this publication attempts, in a modest way, to begin to help fill in a small but critical gap in our collective knowledgebase about how countries organize themselves, deliberately or organically, in response to however it is that they seek to answer such questions. (A cynic might re-phrase this last sentence to read, "about how countries organize themselves to do things instead of attempting to answer such questions" – but that is perhaps the topic for another paper.) However one feels about large investments in ICTs in the education sector,

[2] *For a list of World Bank publications on the topic, please visit the World Bank's web site devoted to ICT/education issues, http://www.worldbank.org/en/topic/edutech.*

there is no denying that they are occurring with increasing frequency and at increasingly large scale, in rich and poor countries alike, in East Asia and beyond. A national ICT/education agency often plays a critical role in this process. Generally speaking, this study on national ICT/education agencies seeks to provide some insights that may help answer two lead questions:

1. What do we know about the form, functions and characteristics of such organizations?
2. What are some key considerations and lessons related to their establishment, operation, and oversight?

It is hoped that, by attempting to document and highlight various ways some such institutions have acted, been organized, and evolved over time, policymakers may gain some insight into useful, practical approaches to implement their country's vision for the use of ICTs in education.

What exactly* is *a national educational technology agency?

Despite often highly varied local contexts, in most countries a *single institution is core to the implementation of ICT/education initiatives*.

For the purposes of this study, this institution is labeled a 'national educational technology agency' (or, more commonly, 'national ICT/education agency') as a matter of convenience. It is acknowledged that such a designation in some cases may not be technically accurate: In most cases this institution is not actually an 'agency' (and even where it is, it may not include the word 'agency' in its official title). In some cases, the institution is not national, but rather regional (or even municipal) in focus or activity and in others, a combination of two or three institutions may effectively, and collectively, perform the function(s) of an 'agency' of this sort. 'National ICT/education agency' is therefore deployed here as convenient shorthand to designate groups or institutions around the world that perform similar functions, but which may take many different legal and organizational forms in practice.

c. Key Themes

Around the world, the use of the ICTs is often seen to play an increasingly important and strategic role in the way that education services are delivered, and to be more integral to daily teaching and learning processes and activities. Structurally, education systems organize themselves in various ways to fund, implement and oversee ICT/education initiatives, which are typically quite expensive – and complex. Despite highly varied local contexts, in most countries, a single institution is core to the implementation of ICT/education initiatives. Experiences from around the world reveal that such institutions typically evolve, in ways incremental and radical, over time according to a common 'life cycle'.

What do we know about how such 'national ICT/education agencies' function, and what insights and lessons might exist for governments creating such institutions for the first time, supporting these sorts of agencies over time, and/or restructuring such organizations to meet future challenges?

Some key questions and themes related to the development of ICT/education agencies (and their functional equivalents, within the public, private and non-governmental sectors) are worth considering:

- How should an education system structure itself to meet new challenges and realize new opportunities that arise through the increased availability and utilization of ICTs, and what related roles and responsibilities could/should a dedicated ICT/education agency play?
- What do the experiences of national ICT/education agencies from around the world tell us?
- How have such organizations evolved over time, and what implications might there be for the future?

National ICT/education institutions take *various forms*. Most prominent in the global consciousness are probably the quasi-autonomous ICT/education agencies under the general direction or guidance of the ministry of education (prominent examples include KERIS in Korea, Becta in the UK, PUSTEKKOM in Indonesia, NCET in China). In other countries, foundations or NGOs serve some similar functions, in coordination with units at the ministry of education (examples include the Omar Dengo Foundation in Costa Rica and the Pilipinas School at FIT-ED in the Philippines). In yet other places, related responsibilities are assumed almost entirely by a special department or division of the MOE (as is currently the case in Malaysia); in still others, universities (as in the early days of Chile's Enlaces program) assume such roles.

A study of such institutional arrangements over time is complicated by the fact that formal place of such institutions can *change* within the structure of a country's education system. Examples of this mutability can be found in Thailand, where the MOE assumed the schoolnet-related functions originally performed by NECTEC, which operated under the general direction of the MoIT ; in Chile, where the Enlaces program began as a university-centric initiative and was later folded into the MOE; in Uganda, where the staff of the independent Schoolnet Uganda were absorbed into the MOE; and in Jordan, where the Jordan Education Initiative was spun out of its home in the MoIT to become a separate NGO.

In addition to taking various forms, such institutions can assume different formal and informal *functions* and responsibilities integral and vital to the success of ICT use in education. Most commonly, such institutions oversee the roll-out and maintenance of the technical infrastructure (hardware, software, networking) upon which ICT use in schools depends. *Most national agencies of this sort are created to deal oversee the roll-out of computer hardware and connectivity within a country's education system*; the National Center for Education Technology (NaCET) in Armenia is one notable example of a relatively new institution of this sort. Schoolnet Thailand performed similar roles a decade earlier, as part of an initiative led by an institution under the loose direction of the national IT ministry.

In addition to fundamental initial responsibilities around technical infrastructure (including procurement of equipment, installation, tech support, development of technical specifications, and maintenance of educational networks and portals, to name just a few) many institutions *slowly assume additional responsibilities over time* – sometimes by design, often by default. These responsibilities can include delivery of (or oversight of) the *training* of technical staff; technical training for students, administrators and/or teachers; the development of education content (digital learning resources); pedagogical training for teachers; research and development, including *piloting* of new approaches and practices; the management of *community* ICT resources and outreach; educational and/or ICT strategy or *policy* development; and monitoring and evaluation. In some cases, institutions are able to adapt and change successfully over time in response to new responsibilities assigned to them (KERIS in Korea is one good example of this), while in other cases organizations are not able to survive the new mandates and responsibilities thrust upon them (see, for example, the notable case of Becta in England).

Independent or quasi-independent institutions can have *complicated relationships with government* departments, which act (variously) as their key clients, overseers and/or, in some cases, even their 'competitors'. The *staffing* of such institutions can be challenging, especially as they may be populated by a mix of employees, civil servants, seconded staff from other organizations and (especially in very technical areas) private contractors. In some instances, organizations are established independent of existing government structures expressly to be able to employ people with certain skills not typically found within government agencies – and to pay these people salaries out of sync with existing government civil service guidelines. *Leaders* of such organizations can be drawn from various specialties, possessing a variety of skill sets.

Institutions can draw on a variety of *funding and financing* mechanisms, such as dedicated or discretionary government budgets or earmarks; contracts; user fees; special revolving funds (sometimes made possible by dedicated monies from universal service provisions); philanthropic donations; revenue-sharing arrangements with private companies; and subsidies from sponsoring or partner organizations.

Managing relationships with vendors can be an important – and difficult role – for such institutions. In some cases, such institutions are deliberately set up at arm's-length from existing government units or agencies to allow for a greater flexibility in dealing with the private sector (as in the case of NaCET in Armenia or Plan Ceibal in Uruguay); in others they are expressly established as a special public-private partnership (as in the case of EdNA in Australia), or to help enable such partnerships (as in the case of Malaysia).

Set up outside (but linked to) formal government ministries, national ICT/education agencies can explicitly serve as *mechanisms for experimentation and innovation*, introducing new processes and approaches (supported by the introduction of new ICT tools) into an education system that may have trouble innovating from within. Plan Ceibal in Uruguay, which was set up under the auspices of that countries national research laboratory is a good example in this regard; the Jordan Education Initiative is another.

The enabling legislation and governing regulations for the activities of such institutions vary by country, as do models for institutional oversight. Over time, such institutions typically evolve, sometimes quite dramatically, in form, function, size and legal identity. *A common challenge for many institutions occurs when their responsibilities shift from providing mainly technical support services related to ICT infrastructure to assume additional responsibilities related to pedagogical training, content development, R&D and impact evaluation.*

Not all countries where large scale initiatives utilizing ICTs in the education sector have a dedicated single agency or institution that leads or supports such activities. The Philippines

provides an interesting case how the model for organizing the prominent activities and actors implementing ICT-related initiatives in the education sector is, essentially, to have 'no model' . Examining the various functions and responsibilities common to national ICT/education agencies in the context of a country where no such institution exists can help highlight the potential utility – and limitations – of such institutions.

The organizational structures – and the staff and leadership who populate them – at the core of such institutions in the early years may be challenged to deliver, manage or plan for a broader range of such activities as the organizations grow over time. Institutions set up for other purposes (as in the case of PUSTEKKOM in Indonesia, which originally developed learning content for correspondence courses) can be reformed and restructured to help oversee an implement national ICT/education initiatives, but this process can be difficult. In addition, by slowly accreting a variety of new responsibilities over time (whether desired or not), such organizations can experience *existential challenges* when political leaders question the suitability of the institution to deliver on an expanded set of responsibilities (the public outcry in the UK in late 2009 about the role and fate of Becta – considered one of the model global agencies of this sort – is one such example of this phenomenon).

d. Origins: Why Establish a National Educational Technology Agency?

Why, and how, might a country decide to establish a single organization dedicated to the use of ICTs in education? It is worth noting up front that many countries don't do this, of course. Some simply assign tasks to a special department or division within the ministry of education (or, in some cases, the telecom regulator or ministry of communications, IT or ICT). For others, related responsibilities are diffused throughout the education system as a result of a series strategic decisions (as in the highly decentralized circumstance of the United States) or as the result of inattention or an inability to make related decisions (as in the case of the Philippines). In some countries, there simply hasn't been a need (yet), as few substantial investments have been made related to the use of ICTs in education. That said, where dedicated agencies exist, they are typically born as a result of one or more of the following factors:

1. A big investment in educational technologies is coming
Many national agencies were formed explicitly to help oversee and/or implement a large project in the education sector to help build out ICT infrastructure (connectivity, computer labs, laptop deployments) in schools. This is perhaps the 'classic' example of why an institution of this sort is created, from Korea to Thailand, from Malaysia to Armenia to Uruguay. In some cases, many investments may have been made already, but, as such investments grow in size, scope and complexity, value is seen in having a single institution with primary responsibility for such activities to serve as a mechanism for taking stock of what has occurred and to help better coordinate activities going forward. Indonesia's PUSTEKKOM and England's Becta are example of this.

2. A new policy has been developed -- or needs to be
It is not uncommon for the creation of an agency to be an important part of a country's ICT/education policy – especially where such a policy outlines a vision or imperative for large investments in educational technologies. As groups involved with the implementation of large scale ICT/education initiatives grow in competence and importance over time, they may come to assume a key role in helping to formulate a new policy (as was the case with EdNA in Australia).

3. Existing institutions are not well placed to assume different or new risks and/or to promote innovative practices and approaches
In many countries, ministries of education are considered to quite conservative, bureaucratic institutions, strongly invested in the status quo. As such, they can be seen as ill-equipped to introduce new innovations within the system quickly and efficiently – and across the world, technology use in education is almost always seen as something that is by its very nature to be 'innovative'. While government ministries, and especially the ministry of education, may be seen to be (if not explicitly designed to be) risk-averse, new institutions set up to help guide the roll out of new technologies in the sector can be explicitly conceived in order to take on such risk (as was the case with Plan Ceibal in Uruguay), as can new programs within existing institutions outside government (like what occurred with the creation of Schoolnet Thailand within NECTEC). These can be especially true, or important, related to the potential use of so-called ***public-private partnerships*** to help enable and guide a country's ICT/education-related investments and activities (the Jordan Education Initiative has been a prominent example in this regard). Existing procurement guidelines can complicate attempts for the government to learn from what is happening in the market, and to communicate with companies active in this area. An agency can help coordinate and direct activities of vendors and private groups at an arm's length from the formal activities of government in ways that may not be possible, or appropriate, where the government itself to attempt to perform such a

coordination function – one of the many ways that KERIS is useful to the Ministry of Education, Science and Technology in Korea.

Related to this:

4. The necessary technical and business skills don't exist within existing organizations (especially within government)
In many places, a number of the technical and business skills required by an ICT/education agency are not commonly found within existing government ministries. For a variety of reasons, it is thought that attracting people with such skills to work in government may be quite difficult. At a basic level, they may command higher salaries, and disrupt existing pay scales. Issues of 'cultural fit' can also arise. In addition, there may be caps on the hiring of civil servants that prevent the hiring of additional staff, even where the salary needs of technical staff can be accommodated. NaCET in Armenia, which initially included staff from other organizations with strong technical skills and ICT-related competencies, is one of many examples in this regard; KERIS in Korea is another.

5. A desire exists to ensure continuity over time
Large scale investments in technology use in education often serve very clear political purposes. Indeed, the unveiling of shiny new computer labs in schools, or the handing over of the latest laptops to students, can serve as strategic photo opportunities for politicians wishing to demonstrate that they both care about young people and are actively investing in their future. Is there a more potent symbol of the future, and of the fact that a politician is forward-looking, than investing in computers for schools? While the parties and individual politicians in power may come and go, investments in ICTs in education are typically seen to be long-term, and so assigning key related responsibilities to a dedicated organization that is not officially part of a government ministry (although it may well be linked to one or more ministries, closely or loosely) can be one way to ensure that such investments can be made and sustained over time. When a new party comes to power, it can then call on existing expertise and experience, and not have to start over from scratch. The Omar Dengo Foundation in Costa Rica is a good example of how an institution has served for a focal point for activity related to ICT use in education during periods of governmental change and transition.

6. There is a need for a focal point of, or hub for, activity related to ICT use in education
Where a lot of activity related to ICT use in education has already been underway for some time as a result of the activities of many different groups, both inside and outside of government, a dedicated agency can serve as a mechanism to help better coordinate the activities of these groups. In such cases, the agency can assume certain important roles to convene multiple actors, to amplify the individual voices of such groups when speaking with government, and to channel messages from government to stakeholder groups more efficiently. The Smart School program in Malaysia, Plan Ceibal in Uruguay and Becta in England are prominent international examples of how an institution – or an organization within a larger institution – can play this role.

7. A country wishes to share its national experiences and expertise related to technology use in education with countries and institutions abroad
A national ICT/education agency can serve as an important mechanism to showcase what a country has accomplished. By sponsoring research and outreach activities, an agency can be an important tool for a government to burnish its global 'brand' as an innovator in the use of technology and education, and to help guide a country's overseas development assistance in related areas. Plan Ceibal in Uruguay, for example, has served not only as the mechanism to provide free laptops to students in government schools, but has also organized workshops, conferences and study tours as a way to expose policymakers and practitioners in other countries to the innovative practices and programs that are being explored and implemented in that small South American country. The global symposium on ICT use in education, which

KERIS hosts every year on behalf of the Korean Ministry of Education, Science and Technology, in partnership with the World Bank, is another notable example of how a national ICT/education agency can play this role.

e. Functions: Common Responsibilities of National Educational Technology Agencies

While national ICT/education agencies may come in various shapes and sizes, there are core sets of responsibilities and functions that they often assume. ***Indeed, it is the fact that a single institution performs many or all of these functions that has led us to label it an 'ICT/education agency' for our purposes here, even if it is not technically an 'agency'.***

The reason(s) that informed the initial creation of a national ICT/education agency often help determine both the initial *functions* (or roles) that institution serves, as well as the *form* (or organizational model) it takes. Whatever the reasons that informed the establishment of such an institution, it is perhaps worth noting that *the rationale(s) that influenced the initial creation of a national ICT/education agency typically continue to define the roles and organizational structure of such an institution quite fundamentally over time, even when circumstances change*. How such an institution evolves in response to these external changes and pressures – and indeed, whether it can in fact evolve in the face of such change – presents a critical (and in some cases, existential question) to such agencies as time passes.

An analysis of national policy documents[3] related to the use of ICTs in education reveals a set of common thematic areas of policy guidance in most countries around the world:

- Vision and Planning
- ICT Infrastructure
- Teachers
- ICT Skills and competencies
- Digital learning resources
- Education management information systems (EMIS)
- Monitoring and evaluation, assessment, research and innovation
- Equity, inclusion and safety

Generally speaking, government ministries are typically responsible for formulating national educational technology policies, while national ICT/education agencies are charged with implementing (or coordinating the implementation of) these policies. In some circumstances, where the agency is officially part of a ministry, it may help lead related policy development. More commonly, it may serve as a convener of related policy discussions and outreach, helping bring together diverse sets of stakeholder groups and outside expertise to help inform the development of ICT-related educational policies.

Depending on the extent of ICT use across a country's education system, and the capabilities of related institutions, other common *functions* that national ICT/education agencies typically assume include:

1. Infrastructure

The prototypical, indeed the 'classic', reason a national ICT/education agency is created, and which therefore determines its fundamental role or function in its first years of operation, is to help implement a large scale roll-out of ICT-related hardware (computers, Internet connectivity) into schools. To make this happen, such agencies are often staffed with many people who have strong computer-related technical backgrounds to (a) to do the actual roll-out of hardware; (b) to perform related software installation and technical support, and the training of technical staff; (c) to manage or support external groups who perform these roles; (d) to draft

[3] *See A Conceptual Framework for Understanding ICT/Education Policies (World Bank, forthcoming).*

the technical specifications for such hardware; and/or (e) to oversee related procurement activities. KERIS in Korea, Schoolnet Thailand, NaCET in Armenia, Smart Schools in Malaysia are just a few of the many examples of how national organizations can play key roles related to infrastructure.

2. Training
Where an agency has primary responsibilities for rolling out and/or maintaining technical infrastructure, much of its early responsibilities related to training are often technical in nature. For example, it may offer or oversee ICT literacy courses for teachers and school administrators (as happened with NaCET in Armenia, Enlaces in Chile, and Schoolnet Thailand). It may conduct technical training or support ongoing professional development for technical staff on topics like networking and computer repair and maintenance. Because it has been involved in training and teacher professional development for teachers using technology, such organizations can over time assume responsibility for professional development activities for teachers where the use of technology is integral, but where the training itself is primarily pedagogical in nature. This shift in responsibilities can be gradual and subtle, but it often occurs. Where a single institution does not exist with explicit, government-mandated responsibilities in this area – as in the Philippines with FIT-ED – groups may spring up and evolve to help with this function.

3. Digital content
Many ICT/education agencies are responsible for the building and maintenance of online educational portals which serve as central hubs through which teachers and students can access educational materials, get the latest news about the education system, find official government directives and communiques, etc. In addition to the back-end support of the servers and content management tools that make the portals possible, agencies may also have responsibilities related to the content and services offered through the portal itself. This can include the development of educational content as well as the vetting of content developed by others but made available through the portal. PUSTEKKOM in Indonesia is one example of this, as was EdNA in Australia. In some cases (as with the Kenya Institute of Education, which is responsible for curriculum development), an existing institution can assume this responsibility in a similar way where a dedicated national ICT/education agency does not exist.

4. Advocacy
A national ICT/education agency sometimes assumes advocacy roles within and across government, with key stakeholder communities or broader society, related to the use of technology in education. It can also serve as a convener of advocacy and stakeholder groups. Such advocacy work is often informed by the results of research (item #6) and pilot projects (#7) in which the agency itself has taken a lead role. It can also build off on-going, regular working relationships with a variety of stakeholders and stakeholder groups. Plan Ceibal in Uruguay, Smart Schools in Malaysia and KERIS in Korea are examples in this regard.

5. Vendor relations
Where it is organized outside existing governmental structures (for example, as a free-standing agency, or as an NGO), an ICT/education agency can serve an important role vis-à-vis vendors and private sector partners. Where an agency exists at arm's-length from standard government processes and procedures, it may have greater freedom to interact and partner with private groups without running afoul of procurement regulations and guidelines that apply to civil servants. The Omar Dengo Foundation in Costa, and the JEI in Jordan, are two good examples of this.

6. Research
An ICT/education agency can serve important roles by supporting forward looking research that can inform upcoming government policies and by evaluating the impact of government, private sector, civil society and academic programs related to technology use. As part of this

process, it can support linkages with academic research communities and universities, connecting researchers with practitioners. EdNA in Australia, Enlaces in Chile, Becta in England and KERIS in Korea are prominent examples in this regard.

7. Risk
An ICT/education agency can assume responsibilities for new initiatives, piloting new, innovative practices and approaches in ways that may be difficult to do within existing government structures. In this regard, an agency can assume risks that government itself is unwilling or unable to take on itself. Where such initiatives are deemed to be successful, ongoing responsibility over time can be assumed by (e.g) a government ministry. When pilots 'fail', responsibility for that failure can remain with the agency itself, with the ministry of education insulated to some extent from potential fall-out. Plan Ceibal in Uruguay is an oft-cited example of an institution serving this function in this way.

8. International outreach
A national ICT/education agency can perform specific functions on behalf of a government, showcasing a country's experiences internationally via various means: through hosting and supporting study tours from other countries, through publications about projects and research meant for international audiences by organizing conferences and workshops, and/or by providing technical assistance on behalf of the country to similar organizations around the world. KERIS in Korea, Becta in England and Uruguay's Plan Ceibal are all examples in this regard. PUSTEKKOM has also served to help bring international exposure and attention to the ways that ICTs are being used in education in Indonesia.

9. Special initiatives
An ICT/education agency can assume responsibility for 'special' initiatives utilizing ICTs in some way outside of the scope of what is offered through traditional channels and educational programs. Examples include programs to support students with special educational needs through technology; extra-curricular activities and competitions related to things like robotics and programming; as well as targeted outreach to specific population groups related to technology use (girls, low income communities, linguistic or ethnic minority groups). Special programs of the Enlaces program in Chile reaching out to linguistic minorities; the Omar Dengo Foundation in Costa promoting the use of educational robotics; KERIS's support for open educational resources; and the efforts of Uruguay's Plan Ceibal in piloting English language training at a distance using ICTs; are examples of this sort.

10. Sustaining and expanding new programs
An ICT/education agency can assume critical responsibilities for sustaining pilot programs begun by other groups, expanding them to a level where they might be able to be absorbed into ongoing government programs. By recruiting people with different profiles and skill sets, especially younger people, it can also serve as a way to introduce cultural changes into an education system more quickly than is possible through formal government bureaucracies, as well as to and energize (or re-energize) longstanding existing initiatives. The example of KERIS in Korea is notable here, especially in its ability to attract and retain staff with technical competencies and academic backgrounds in educational technology use.

Functions without form in the Philippines

What happens in a country without a dedicated national educational technology agency but which is the site for many initiatives and experiments related to the use of ICTs in education?

The situation in the Philippines provides insight into how (very loosely organized groups of) institutions with complementary (and sometimes even competing) activities can help provide many of these ten functions, even in the absence of explicit direction from the ministry of education. That said, such a situation may not be ideal, as complications can arise related to planning, with individual groups acting largely in their own interests, and because there are not clear channels of collective communication between the private sector and civil society with related governmental bodies.

f. Forms: Common Models for National Educational Technology Agencies

Most national ICT/education agencies fall into one of six basic models. These models are typically an outgrowth of existing governmental, legal, cultural and academic contexts. In other words, they are typically evolutionary, based on what is considered possible and practical within a system, and do not stand in opposition to existing circumstances or institutions. In a number of notable cases, agencies have adopted different models over time, usually in response to new mandates and/or government policies.

1. Quasi-governmental agency
Perhaps the most well-known general model is that of, for lack of a better term, a quasi-governmental agency. Agencies of this organizational type often have strong links with an existing governmental body, and may be covered by a specific governing law or regulation. Staff of such agencies are typically *not* civil servants, although civil servants can be – and often are, particular in the early stages of the life of this sort of institution -- loaned or 'seconded' to such groups via a formal secondment process. Prominent examples of this model include KERIS in Korea, Becta in the UK, and NaCET in Armenia.

2. Government department or unit
In some cases, the functions and responsibilities of a national ICT/education are assumed by a dedicated group within the Ministry of Education. This is the case, for example in Malaysia. In some cases, as in Chile (with the Enlaces program), Uganda (with Schoolnet Uganda), and Schoolnet Thailand, programs that began elsewhere were incorporated into and absorbed by groups within the ministry of education, bringing functions and responsibilities that had previously been assumed and performed by outside groups into ministries of education.

3. Small foundation or NGO
Another option is to set up a small foundation or NGO to assume some of the key functions that are in other countries assumed by a national ICT/education agency. In this model, a group may take on a limited number of targeted responsibilities. The Jordan Education Initiative, which was originally a project housed within the Ministry of IT in Jordan, was reconstituted as an NGO under the patronage of the Queen, concentrating on testing and piloting new approaches and tools for using ICTs in education. The Foundation for Mobile Communications in Portugal is supported by telecom providers, and coordinates industry support of ICT/education programs under the direction of the ministries of education and IT. The Maine International Center for Digital learning (MICDL) is housed at the University of Southern Maine (USA) and performs research and outreach activities in support of the official governmental program to support the use of educational technologies in schools in that U.S. state, the Maine Learning Technology Initiative (MLTI).

4. Larger foundation
Another model is that of a large foundation, whose size can enable it to perform a wider variety of functions than a small NGO and foundation, and which is designed to last for a longer (or indeterminate) amount of time. The Omar Dengo Foundation in Costa Rica is an example of this model.

5. No institution
In some countries, there is not one 'model' at hand. The Philippines is an example of the model being, essentially, 'no model'. In such a case, it is possible for a diverse set of loosely coordinated stakeholders to evolve in a semi-organized way over time to assume responsibilities which are performed in other countries by a single ICT/education agency. Such a circumstance typically takes place out of necessity and rarely occurs by design. It could be seen as an organic response to the lack of such an agency in the face of sets of compelling

needs for implementation, organization, advocacy, implementation and oversight that are not being handled via systematic, 'official' means. Whether this is a desirable circumstance or not, or whether this 'model' is a pre-cursor to the establishment of a formal agency, depends on the local circumstance.

6. Other models: A company, a university

The final model observed is that of a group outside government housed within another existing institution, such as a university, or even as a private company. The early years of the Enlaces program in Chile, when the initiative existed as a research program within the Universidad de la Frontera, is one example of this arrangement. In some countries, a private company serves (some of) the functions of a national ICT/education agency (facilitated by a multi-year contract with a ministry of education). EdNA in Australia is an example of this sort of structural model.

Regional educational technology bodies

In Europe and in Africa, regional organizations have existed to support the sharing of information between national ICT/education agencies and institutions.

The ***European Schoolnet*** is a network of ministries of education from across the continent. On behalf of its members, it provides support for policy development, research and innovation activities; facilitates the exchange of inter-operable digital learning resources across the continent; and provides targeted services to select groups of schools related to ICT use.

The ***Schoolnet Africa*** NGO has encouraged the use of the internet in African schools through linking together national schoolnets across the continent and by hosting a pan-African portal of digital education materials.

g. Stages: The Development and Evolution of National Educational Technology Agencies Over Time

National ICT/education agencies have been observed to pass through a general 'life-cycle' over the course of their existence, with five semi-distinct stages of development. Each stage may bring with it a new set of functional responsibilities and mandates, different staffing (including leadership) and budgeting requirements, and entail varied levels of oversight and relationships with other groups, causing organizational structures to adapt, and be adapted, over time.

Stage 1. Starting ('birth')
When initially conceived, ICT/education agencies often have a narrow set of responsibilities, typically related to the roll-out of computers and/or Internet connectivity to schools. Alternatively, they may be set up to perform a specific function (e.g. research, overseeing pilot activities) for which an existing (typically governmental) structure is poorly positioned.

Some related *key considerations for policy makers to consider* during the first stage of life of a national ICT/education agency may include:

- What sort of key enabling legislation or policy may need to be enacted to given a national ICT/education agency its mandate – and to communicate this mandate with a larger community of stakeholder organizations active in the sector?
- How should such an organization be funded – and staffed? (a more complete set of considerations and questions can be found in an annex to this report)

Stage 2. Expanding ('childhood')
As an agency gets better at its work, and as its activities roll out at greater scale, it may increase both its budget and staff. It still does what it did before – it just does more of it.

Some related *key considerations for policy makers to consider* during this third stage of life of a national ICT/education agency may include:

- How can the processes and procedures introduced during the early activities of the agency be formalized, so that the institution can become increasingly cost-effective and impactful as it grows?
- How can an agency find – and retain – key personnel once the start-up phase of the institution has largely ended?

Stage 3. Evolving ('adolescence')
Over time, an ICT/education agency often assumes additional responsibilities beyond its original mandate. This occurs because its 'success' in achieving its original mandate naturally surfaces new needs (e.g. once all schools have computers, some group needs to make sure that there is educational content to run on them), because new opportunities arise and/or because existing responsibilities are absorbed into formal government programs and structures and, as a functioning existing institution, it is considered well placed to pursue other objectives.

Some related *key considerations for policy makers to consider* during this third stage of life of a national ICT/education agency may include:

- As an agency enters a new phase of its life, might new leadership be necessary to help direct its evolution?

- If an organization is outside of government, does it make sense to bring many of its key responsibilities and functions within government, now that an initial period of trial and error has largely ended? *Conversely:* If a program is housed within government, does it make sense that it be 'spun out' to another institution – or to be constituted as its own separate institution?
- If initial special funding sources and mechanisms have run out, how should such an agency be funded going forward?

Stage 4. Sustaining ('adulthood' and 'middle age')
Where an ICT/education agency becomes 'embedded' into the system and is seen as 'core' to the delivery of certain essential activities or services over time, with a (reasonably) secure medium- to long-term budget horizon, much of its activities and processes can become more bureaucratized and serve largely to sustain existing programs. Given the pace of technological change, it will continue to assume new responsibilities and mandates, but its structure and defining characteristics remain largely un-changed. KERIS in Korea is a very prominent example of an institution that is seen to have 'grown up' in this way; the Omar Dengo Foundation in Costa Rica is another.

Some related *key considerations for policy makers to consider* during this fourth stage of life of a national ICT/education agency may include:

- How can a national ICT/education agency remain a locus for innovation and experimentation, given that it is responsibility for a rather set of on-going, legacy activities?
- How can a national ICT/education agency develop deeper links with key stakeholder groups – and incubate new initiatives and processes that might one day be spun-out as separate programs or organizations on their own?
- To what extent can – or should – a national ICT/education agency play a more proactive role in helping to inform and influence policy decisions related to ICT use in education across the country?

Stage 5. Ending ('death')
Where the goals of an ICT/education agency have been thought to have been met, and/or where other organizations are thought to be able to more effectively and efficiently absorb an agency's responsibilities, it may be disbanded or shut down. Becta in the UK and EdNA in Australia are perhaps the two best known global examples of this occurring. Whether this is the result of a conscious process ('mission accomplished'), the 'failure' of an agency to accomplish its mandate, or simply changing circumstances, the end result is the same.

Some related *key considerations for policy makers to consider* may include:

- What are the agency's key assets, and how can they live on past the closing of a national ICT/education agency?
- What institutions can assume the key roles previously performed by a national ICT/education agency that are still deemed important?
- What are the key messages that they government wishes to convey related to the closing of the agency?

h. Observations: Key Issues for Policymakers Concerning National Educational Technology Agencies

National ICT/education agencies can vary greatly in their forms and functions, depending on a number of factors. In some cases, form and function may be unique to a particular country context or circumstance. That said, when the histories of many such agencies around the world are viewed collectively, it is possible to make a number of common observations about key issues that typically confront such institutions over the course of their institutional life, as well as some potentially important related questions for policy makers to consider, related to:

a. Legal frameworks and laws
b. Oversight
c. Autonomy and independence
d. Links to policy
e. Collaboration with key stakeholders
f. Leadership
g. Human resources
h. Selling services
i. Evolution
j. Decentralization

Each of these observations, and a short set of related questions for potential consideration by policymakers, will be examined briefly.

Observation #1: Legal frameworks and laws

In some countries, an ICT/education agency takes its mandate from a specific law passed to bring it into existence, to secure budgets, define related oversight and articulate core responsibilities and areas of activity. In such circumstances (as with the case of KERIS in Korea), the establishment of such an organization through a dedicated law can help to ensure long term funding for such an organization (especially when there is a change in government) and can be an important signal to other stakeholder groups about the importance and mandate of such an organization. In the UK, Becta received its annual mandates through a series of official letters from the department of education which, while not laws, had many of the same consequences in practice.

What role can specific laws or regulations play in establishing the mandate and legitimacy of an ICT/education agency? Some key related questions for policymakers to consider:

- To what extent might new legal mechanisms or frameworks be useful or necessary for an ICT/education agency to be created, funded and governed?
- Are there laws or regulations governing other institutions in the country, or from other countries, that may serve as useful models for a 'national ICT/education agency' law?

Observation #2: Oversight

As a new institution operating in an area where a government may not have much prior experience, government may have limited internal expertise to evaluate the effectiveness of such an institution. People and organizations with relevant skills and experience in this area may well have professional (and potentially even contracting) links to the agency.

How should the effectiveness and impact of the work of an ICT/education agency be measured? Some key related questions for policymakers to consider:

- Who articulates the vision and mission for a national ICT/education agency?
- Who will be responsibility for setting performance targets for an ICT/education agency – and for checking to see if these targets are met?
- How can the independence of the oversight (including the auditing function) of a national ICT/agency be ensured?

Observation #3: Autonomy and independence

A key rationale for establishing a dedicated national ICT/education agency *outside* existing governmental institutions is to help insulate it from daily political and bureaucratic pressures that may may impact the normal working of a government agency ministry. The extent to which an agency is autonomous or independent of current political leaders may help to ensure continuity when governments change. It can also enable more flexible human resources practices than those possible within government and allow more room for innovative and market-relevant procurement practices. To the extent that an ICT/education agency evaluates the impact of government initiatives related to ICT use in education, it may benefit from the extent to which it is independent of or autonomous from the ministry or agency whose work it may be evaluating.

How autonomous should an ICT/education agency be? Some key related questions for policymakers to consider:

- To what extent will an ICT/education agency need to recruit staff who do not fit the profiles of government employees and civil servants?
- Will an ICT/education agency be expected to assess or comment on the impact of government programs and initiatives?
- If/when government leaders change, how closely aligned might an agency be with a prior administration – and might its funding or existence be endangered as a result?

Observation #4: Links to policy

ICT/education agencies often play a key role in the implementation of policies related to ICT use in education, on behalf of the ministry of education, the ministry of IT (or equivalent) and other key government ministries. They may also be effectively utilized by governments to explore activities where no governing policies exist, in the hope that lessons from such activities may contribute to the formulation of future policies. Agencies can also serve and important convening role as part of policy formulation and dissemination processes, by bringing together key stakeholder groups to explore areas of common concern and communicating such concerns and related recommendations to government, and by communicating government policy decisions on to key stakeholder groups.

To what extent do ICT/education agencies serve to implement current policies, to contribute to the formulation of related policies, and/or to potentially to go beyond them? Some key related questions for policymakers to consider:

- Where an agency is meant to implement existing policies, are these largely the policies of one ministry, or of multiple institutions across government?
- Is the ICT/education agency meant to simply implement existing policies, or does it have a role in the process of policy formulation as well?

Observation #5: Collaboration with key stakeholders

Because its activities often cut across areas for which multiple government ministries (education, IT/communication, etc.) may have responsibility, a national ICT/education agency may operate in an environment where regular collaboration with multiple groups across government may be necessary. In addition, an agency may be called on to play key roles in coordinating with the private sector and civil society in the course of its operations – and as part of its mandate.

What is the role of an ICT/education agency vis-à-vis other stakeholders and key actors? Some key related questions for policymakers to consider:

- Who are the key stakeholder groups active in, or responsible for, ICT/education activities in the country, and what role should an ICT/education play in coordination with and between such groups?
- In the course of its activities, to what extent should an ICT/education present itself as acting independently, and to what extent should it be representing the interests of multiple stakeholder groups?
- What guidelines should be developed related to conflicts of interest, especially with regard to dealings and communication with vendors with whom the agency might be in close and regular contact, but who also may be selling goods and services to the agency itself and/or to other key stakeholder groups, including government ministries who have oversight of the ICT/education agency?

Observation #6: Leadership

ICT/education agencies often exist as hybrid institutions, attempting to confront challenges that cut across both the education and ICT sectors. Generally speaking, the heads of such agencies tend more often to come from IT, rather than education, backgrounds. As ICT/agencies evolve over time, the profile of the leader of an institution may need to change as new responsibilities are assumed and legacy activities are completed. Where such groups take on responsibilities beyond the management and support of technical infrastructure for schools, leaders of such institutions who feel technically competent in assessing the work of the institution they lead may be challenged to provide leadership and oversight of activities that are more typical of those assumed by ministries of education, as opposed to ministries of IT. In addition, where ICT/education agencies are called on to play increasingly central roles in the coordination of activities of many new stakeholder groups, especially groups outside the IT sector, and where agencies are expected not only to implement related government policies, but also to help inform the creation of such policies, different sets of skills, expertise and sensibilities may be required of the heads of such organizations.

Who should lead a national ICT/education agency? Some key questions for policymakers to consider:

- What is the required skill set and background for the head of an ICT/education agency?
- From what types of organizations can such leaders be recruited?
- Where the responsibilities and mandates of an ICT/education agency have changed, is a different sort of leader required?

Observation #7: Human resources

In some cases, ICT/education agencies explicitly are meant to serve as outsourced expertise, so that government ministries can benefit from skills, competencies and expertise that do not exist within government. Such expertise can include things related to computer networking and connectivity; computer hardware installation, maintenance and technical support; software development; digital content development; training in specific software applications; and IT project management. In some small, low income countries, an international NGO may serve

many of the functions of a national ICT/education agency, especially where local expertise or skills are not available.

What are some of the key competencies of staff at an ICT/education agency? Some key related questions for policymakers to consider:

- What are the standard profiles of agency staff, and how are these consistent with the activities and responsibilities of the agency?
- To what extent should technical expertise be found within an agency, and to what extent should it be outsourced?
- To what extent should civil servants be placed within an ICT/education agency?
- If a group from outside the country (e.g. an international NGO) or international expats (e.g. funded by international donors) perform key functions within an ICT/education agency, is there a plan for transferring knowledge and expertise from to local groups and people?

Observation #8: Selling services

Over time, as it develops and demonstrates specific expertise and competencies, an ICT/education agency may decide to set up a what is essentially a 'consulting' arm, offering services outside of its original mandate to other groups within a country (include parts of the formal education system, especially at a sub-national level), to international bodies, or to ICT/education agencies in other countries.

Once it has demonstrated functional expertise, to what extent should an ICT/education agency market and sell this expertise to other potential clients? Some key related questions for policymakers to consider:

- To what extent should an agency be seeking alternative funding sources, and what rules or guidelines should govern its pursuit of additional funding opportunities?
- Should a national ICT/education agency be allowed to market and sell its services on the open market to third parties?
- Where it is allowed to do market its products and services to third parties, what are the key rationales for allowing an ICT/education to do this, and what related guidelines and processes, checks and balances may need to be put into place?

Observation #9: Evolution

As it grows over time and as new technologies and political imperatives emerge, an ICT/education agency can be assigned many new responsibilities beyond the scope of their original mandate. In some cases, such new responsibilities may be internally generated, in response to perceived new opportunities or as a result of the successful completion of earlier mandates. In other cases, changes in technologies may compel such institutions to explore new areas of activities. Political and governmental leaders may be tempted by the flexibility of an external ICT/education agency – especially where it is free from many of the bureaucratic, legal and human resource constraints that limit or proscribe the activities of government ministries – and allocate new mandates to a national/ICT agency which is unprepared for them, and which may lose at least some focus on its core mission as a result. As an institution evolves, it might be worthwhile to consider whether or not its legal status may need to change to help it better meet new responsibilities or respond to new market or political circumstances.

How do ICT/education agencies assume new responsibilities over time – and does this usually happen by design or by default? Some key questions for policymakers to consider:

- Is there a vision or expectation for how an ICT/education may evolve over time?
- To what extent will it be useful to insulate an ICT/education from being assigned new tasks

and responsibilities not relevant to its core mission, or for which it is inadequately staff or funded?

- Is there a mechanism to periodically evaluate the responsibilities and mandates of an ICT/education agency – and, where possible or relevant, to benchmark its activities and performance against similar institutions, both within the country and abroad?
- Is there a specific point at which an ICT/education is expected to have fulfilled its mandate, and if so, what are the plans for the dissolution of the agency and the apportioning of its responsibilities to other groups (as necessary/appropriate)?

Observation #10: Decentralization

While this short paper has focused on 'national' ICT/education agencies, most of the lessons and experiences from such institutions apply to sub-national agencies at various levels. In some cases (as is the case with NCET in China) a national ICT/education agency sits atop a hierarchy of regional and sub-regional ICT/education institutions. In other cases, no national agency may exist, and so the form and functions of a national agency are assumed at a smaller scale at a more local level. As a practical matter, this may mean that a regional institution is just like a national one, only a bit smaller. Where regional institutions of this sort exist, the roles of a national agency may change, and focus more on coordination with local groups, communication of policy decisions, oversight of funding, and research activities which may be of general benefit across the system. Where no national agency exists, a provincial or state equivalent (especially in a large state or province) may function, and indeed appear, much like a national agency does.

How might the nature and role of an ICT/education agency change if it is part of a decentralized educational system? Some key related questions for policymakers to consider:

- What is the role of a national agency in a largely decentralized system?
- What are the forms and functions of local (provincial, municipal, district) ICT/education agencies or organizations, and how to these relate and connect to those of a national agency?

i. Key Lessons from Experiences of National Educational Technology Agencies

An analysis of commonly observed successes, failures and challenges experienced by national ICT/education agencies around the world yields a set of twelve key lessons of potential interest to policymakers and leaders with oversight and management responsibility for such institutions. While these lessons were developed with particular attention to the contexts and needs of national organizations in middle and low income countries in East Asia and the Pacific, it is hoped (and expected) that they may be of wider applicability and relevance. While they may not apply in every circumstance – and where they do apply they might have varying degrees of importance or relevance – these lessons highlight areas of strategic interest and importance across multiple countries:

a. Leadership is important – critically important
b. Enabling legislation can make life much easier
c. Especially in the early years, 'getting the little things right' helps to build credibility
d. Funding and financial autonomy need to be ensured
e. Managing transitions successfully is key if ICT/education agencies are to remain relevant and useful
f. Tensions between building capacity versus creating dependence should not be underestimated
g. Remaining flexible and innovative becomes increasingly challenging over time
h. To ensure their relevance, agencies should evolve to become focal points for communication, consultation and cooperation
i. Where they are most successful, ICT/education agencies are one constituent part of a larger holistic vision related to education, technology – and the intersection of the two
j. Organizational structures may change, even if core functions do not
k. Focus on supporting and meeting the needs of teachers
l. Learning from experience is a vital ingredient for success

Each of these lessons will be considered briefly in turn.

Lesson #1: Leadership is important – critically important

A key theme that emerges from an examination of the development of national ICT/education agencies relates to the central importance of ***leadership***. Operating at the place where the education and ICT sectors meet, national ICT/education agencies have to navigate between two different worlds. Education ministries are often viewed as very traditional, quite bureaucratic institutions that have evolved very slowly over time. The IT sector, in contrast, is seen as dynamic, fast-changing and innovative. The leader of a national ICT/education agency needs to have feet in both worlds, and often has an important role in serving as a 'translator' of sorts between them. At the same time, s/he presides over an institution that is often quite new, and growing or evolving quite quickly. Links to universities can be important, especially where the mandate of an ICT/education includes research responsibilities. In addition, the leader of a national ICT/education agency may serve as a convener or stakeholders across the public, private and civil society sectors, and as a key advisor to government on upcoming policies related to ICT, education, and the combination of the two. Not many people have backgrounds and expertise in all of these areas – especially in many middle and low income countries.

Lesson #2: Enabling legislation can make life much easier

Many national ICT/education agencies have benefitted greatly from the existence of ***enabling legislation*** and official government directives. Where such institutions have been around for a

long time (such as in the case of KERIS in Korea and the Omar Dengo Foundation in Costa Rica), the fact that their existence has been enshrined in law has been cited by their leaders as critical to their institutional identity, ability to attract sufficient funding, and longevity. In addition, the existence of related laws provides powerful signals to other groups and actors – within government, in the private sector and in civil society – about the mandate of the institution, its centrality with regard to various ICT/education initiatives, and the fact that it has official government support.

Lesson #3: Especially in the early years, 'getting the little things right' helps to build credibility

National ICT/education agencies often operate in environments characterized by much uncertainty and change. Where they are engaged in activities that are new, and thus for which they have no demonstrated track record of success, they may encounter skepticism from both partner organizations and beneficiary groups (schools, teachers, principals, students) about their ability to successfully, efficiently and expediently do whatever it is they aim to do. This is especially true when the activities of ICT/education agencies are be disruptive to traditional ways of doing things. Taking the time to 'get the little things right' especially in the early years, can help to build credibility and support for their activities among key stakeholder groups. Quickly responding to and solving problems related to technical support is often a way for an ICT/education agency to demonstrate both competence and reliability. Establishing competence and reliability early – even for seemingly minor things – can serve as an important foundation on which an ICT/education agency can pursue more complicated projects and objectives.

Lesson #4: Funding and financial autonomy need to be ensured

Not surprisingly, issues related to ***funding and financial autonomy*** emerge as key to both the day-to-day operations of national ICT/education agencies, as well as to how such organizations develop and evolve over time. The ability to ensure budget allocations beyond the traditional, and sometimes highly variable, annual budgeting cycle of government is seen as important – especially where an ICT/education agency is involved in large scale, multi-year roll outs of infrastructure and activities. Where multi-year budget commitments are not possible, uncertainty can negatively impact contracting of certain vital services from third parties (the case of PUSTEKKOM in Indonesia may be instructive here, where needs to procure Internet connectivity on a yearly basis, coinciding with annual budget allocations from government, can greatly complicate long term planning). In some countries, ICT/education agencies and schools benefit from the regular and predictable allocation of monies from *Universal Service Funds*, in which telecom countries are required to dedicate a portion of their revenues to benefit various social objectives (including the provision of connectivity to communities that can not afford it). Some of the national ICT/education agencies that have existed for many years have been able to tap multiple funding streams as a way to diversify their funding risks; grants from foundations and international donors, as well as the selling of services, are two mechanisms that ICT/education agencies have utilized to this end.

Lesson #5: Managing transitions successfully is key if ICT/education agencies are to remain relevant and useful

While the contexts and functions of individual ICT/education agencies may be different in different places, one common theme that emerges from an examination of the histories of such institutions is that 'change is inevitable – and so it needs to be anticipated and planned for'. Success in ***managing transitions*** of various sorts – including the political changes that accompany changes in government to the impact of new technologies, from the emergence of new actors and stakeholder groups to changes in funding mechanisms and institutional structures – can be of critical importance in ensuring the effectiveness and relevance of national ICT/education agencies. Where such transitions are poorly navigated, the existence of the institution itself may be called into question.

Lesson #6: Tensions between *building capacity* versus *creating dependence* should not be underestimated

A tension common to the activities and priorities of many ICT/education agencies relates to the need to build internal capacity within the institution and the desire not to create undue dependencies by other groups on the capabilities of the ICT/education agency. How to resolve this ***tension between building capacity and creating dependence*** may differ according to a country's specific individual context, and/or by the stage of an ICT/education agency according to the general life cycle of national ICT/education agencies. Given the increasingly important and various ways that ICTs are being used in, and are relevant to, education systems, few national ICT/education agencies have the resources and capabilities to 'go it alone' – even where they have a clear mandate from government that would enable them to do so. Building and maintaining partnerships with key stakeholder groups, whether within or across government, as well as with the private companies whose activities and knowledge are typically key to the activities and functions of such agencies.

Lesson #7: Remaining flexible and innovative becomes increasingly challenging over time

Another key tension experienced by many national ICT/education agencies over time relates to trade-offs between desires for an institution to ***remain flexible and innovative***, while at the same time institutionalizing the role of the institution vis-à-vis government and other key stakeholders. It is out of a need for an organization that can be flexible, and operate in innovative ways or in areas being quickly disrupted as a result of various (typically technology-enabled) innovations that many national ICT/education agencies are born, or survive after their initial mandates have been met. As an ICT/education agency ages, the need for support for legacy activities in which it has been involved can inhibit its ability to identify and respond to new opportunities and challenges in ways that are quick and efficient. Over time such institutions may have to resist forces that may conspire to make them more risk averse – especially where they have been conceived in part as a way to accept and embrace risks that other existing institutions were not equipped or able to handle.

Lesson #8: To ensure their relevance, agencies should evolve to become focal points for communication, consultation and cooperation

In their early years of operation, national ICT/education agencies may largely be concerned with implementing existing government policy related to the large scale roll out of computing infrastructure in a country's schools. As it develops internal competencies and expertise in this regard, and interacts with a variety of important stakeholder groups, it can serve important roles related to ***communication, consultation and cooperation*** between these groups, both as it aims to help realize governmental policies and vision related to technology use in education, as well as serving as a mechanism for surfacing and aggregating information, knowledge and opinions from these stakeholder groups, which can then be used to help inform the development of government policies going forward. In this way it can play an important role in promoting and sustaining *public-private partnerships* of various sorts.

Lesson #9: Where they are most successful, ICT/education agencies are one constituent part of a larger holistic vision related to education, technology – and the intersection of the two

Where national ICT/education agencies primarily serve as an implementation mechanism for existing policies related to ICT use in education, they may benefit from the strength and relevance of such policies. The existence of good policies strengthens the ability of a national ICT/education agency to implement such policy. 'Good' policies are often a consequence not only of a narrow vision for technology use in education, but rather are part of a larger ***holistic vision*** for education, for ICT, *and* for ICT use in education that is fundamentally cross-sectoral

in nature. That said, it is perhaps worth noting that it is sometimes the absence of related government policies in this area that actually enables the growth of such agencies. (The emergence of Schoolnet Thailand has been attributed in part to this phenomenon.)

Lesson #10: Organizational structures may change, even if core functions do not

Organizational structures are a means to an end – they may need to change, even where/if core functions do not. Where core functions *do* change, a change in organizational structure may be required. Whether a national ICT/education agency is part of the ministry of education (or another government ministry), a quasi-governmental agency, an NGO, or assumes some other form, it is the core functions and roles that it serves, and not the particular legal form that it embodies, that is most important. As agencies age, they would do well not to lose sight of this distinction.

Lesson #11: Focus on supporting and meeting the needs of teachers

Teachers are fundamental to the learning process. Introducing and sustaining technology use in schools is not easy – and teachers play a central role in this effort. ***Focusing on supporting and meeting the needs of teachers*** – related to technical training needs and equipment support, opportunities for peer networking, support for introducing new pedagogical approaches – will increase the likelihood that the activities of national ICT/education agencies may be successful. ICT/education agencies should be while cognizant of the fact that a variety of factors may conspire to restrict the ability of teachers to act as an agent of technology-enabled change at the point of learning in classrooms. Where agencies can help to ensure that new technology initiatives are not a further burden in the lives of teachers, but rather help and support them in ways that are practical and tangible, they should do so. Where teachers are seen as part of the 'problem', a 'barrier' to introducing technology successfully in education, they may turn out to be so. Whether they are considered part of the 'solution', teachers can be critical allies for ICT/education agencies, serving as agents of change within schools.

Lesson #12: Learning from experience is a vital ingredient for success

The history of the introduction and use of new technologies in education is littered with mistakes, and indeed includes more than a few spectacular failures. As a key institution integral to the implementation and oversight of large scale ICT/education initiatives, a national ICT/education agency typically experiences its fair share of setbacks and challenges. Given that it is often leading new initiatives and piloting new approaches and technologies in an environment characterized by change and complexity, a national ICT/education is in part often 'learning-by-doing'. An ***ability, commitment, and willingness to learn*** – and learn quickly, recognizing mistakes when they occur and changing course as a result, *piloting* and iterating its approaches and procedures until it finds one that 'works' – is seen by many leaders of such agencies as key to success, not matter what stage of the typical life cycle of national ICT/education agencies an institution may find itself. When and where possible, opportunities to learn from the failures and successes of similar organizations in other countries, can be an important part of this process.

Annex:
Ten discussion questions for policymakers seeking to create or restructure a national educational technology agency

Based on interviews and discussions with government policymakers around the world, a set of ten short, general 'discussion questions' has been developed to help catalyze targeted discussions during the initial stages of high level planning exercises related to the activities and responsibilities of national ICT/education agencies. These questions are meant to highlight areas of potential critical importance, based on the experiences of national ICT/education agencies in many places, and can serve as entry points into deeper, more fundamental discussions, linking recognition of specific needs related to the implementation of ICT/education activities in a particular country with practical experiences of institutions in other countries which exist to help meet similar needs.

1. **Goals:** Why are you doing this? What is the purpose, and why can't you do it through existing structures, organizations or mechanisms?

2. **Needs:** Is the desire to create a national ICT/education agency a response to a short term need ... or part of a long term vision?

3. **Change:** Is this about reinforcing or extending existing educational practices, or changing/reforming them? How does this fit in with existing policies, strategies and visions?

4. **Partners:** What are the key stakeholder groups whose support will be critical if the agency is to meet its responsibilities? Are you seeking to extend control from the top, or to engage a stakeholder community from below?

5. **Models:** Do you want to do this inside or outside of government? Is there a particular organizational model you wish to adopt, based on the experiences of a similar type of institution?

6. **Learning from the past:** Has something similar been tried before in your country, and if so, what lessons were learned from this experience?

7. **Evaluation:** What would success look like (over five years, over ten years) and how will you know if you have 'succeeded' or not?

8. **Funding:** How are you going to pay for this?

9. **Legal:** What legal measures or environment is required?

10. **Opportunities:** What new opportunities to you see arising in coming years related to the potential for ICT use in education, and how can you plan for them?

Sources

Bannayan, H.; Guaqueta, J.; Obeidat, O.; Patrinos, H. & Porta, E. (2012). *The Jordan Education Initiative: A multi-stakeholder partnership model to support education reform.* Policy Research Working Paper Series 6079. Washington, DC: The World Bank.

Haddad, W. et al. (2007). *ICT in Education Toolkit.* Washington, DC: infoDev/The World Bank; Bangkok: UNESCO.

Marquard, S. (2005). *African Schoolnet Toolkit.* Vancouver, Canada: Commonwealth of Learning; Johannesburg, South Africa: Schoolnet Africa.

Trucano, M. (2005). *Knowledge Maps: ICT in Education.* Washington, DC: infoDev/The World Bank.

UNESCO. (2011). *Transforming Education: The Power of ICT Policies.* Paris, France: UNESCO.

UNESCO. (2007). *Initiating and Managing SchoolNets (ICT Lessons Learned Series Volume III).* Bangkok: UNESCO Bangkok.

UNESCO. (2005). *School Networking: lessons learned (ICT Lessons Learned Series Volume II).* Bangkok: UNESCO Bangkok.

UNESCO. (2005). *Integrating ICTs into Education: lessons learned. A Collective Case Study of Six Asian Countries (ICT Lessons Learned Series Volume I).* Bangkok: UNESCO Bangkok.

UNESCO and the Commonwealth of Learning. (2004). *Schoolnet Toolkit.* Bangkok: UNESCO Bangkok; Vancouver: Commonwealth of Learning.

World Bank. "Global symposium on ICT and education." (web site, accessed via http://www.worldbank.org/en/topic/edutech/brief/global-symposium-on-ict-use-in-education)

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

2

Lessons from Korea (KERIS)

Youngsun Kwon and Sanghyun Jang

in this chapter …

Executive summary

Information and communications technologies (ICTs) are developing fast and triggering fundamental changes in education system. This case study focuses on institution building, which can manage such a fundamental transition in education system on a national scale. Following a short introduction, a theoretical framework is discussed. The birth, major tasks, and growth of the Korea Education and Research Information Service (KERIS) are explored, and the roles of KERIS in planning and implementing the Cyber Home Learning System (CHLS) policy in cooperation with the Ministry of Education, Science and Technology (MEST) and regional offices of education are explored. The case study concludes by highlighting useful implications derived from this case study on KERIS.

From this organizational ecology perspective, this case study attempts to investigate the birth and growth of KERIS and explores the role of KERIS in planning and implementing one quite prominent strategic initiative to introduce innovative practices within the Korean education system—the CHLS. The objective of this case study is to find out key factors that the government needs to consider for successful institution building and those that determines the accomplishments of the missions assigned to KERIS. Using the CHLS policy case, in addition, we explore how KERIS implemented the CHLS policy in cooperation with regional offices of education, which are autonomous and in charge of education policy in each region in Korea. This case study, we believe, will provide rich experiences that policy makers can refer to when they plan to build a similar institution or restructure an existing one.

a. Introduction: Background and Context

Many people in Korea feel that information and communication technologies (ICTs) will trigger a fundamental transformation of the traditional education system, which in Korea has been teacher and lecture-centric. Like that of many other industrialized societies, the traditional Korean education system has been one of 'mass education,' providing standardized instruction and knowledge to students at a classroom during the same class hour, regardless of their differences in abilities and eagerness to learn. Today, however, the changes and opportunities being brought about by a variety of new technologies— from the abundant knowledge on the Internet that can be accessed and shared quickly to the increasingly ubiquitous network connections available at affordable costs that offer instantaneous channels of communication— are enabling a variety of new, innovative practices in the Korean education system, and many hope that a more student-oriented, needs-based approach to lifelong learning will be realized in the near future in Korea.

The role of government is seen as critical in introducing ICT-assisted innovations in the Korean education system, given that the country's traditional education practices have been so deeply ingrained in its culture, economy, and politics. In Korea, establishing and supporting a new institution to draw up and implement new education policies in changing environments is seen as a key first step in realizing innovation in education. KERIS was established as such an institution in Korea in 1999.

As recognition in Korea grew about the potential strategic importance of ICTs, the government considered whether to create a new bureau inside the Ministry of Education to oversee the roll-out of new technologies within the education system, or establishes an external public institution outside the ministry, or does both. In Korea as elsewhere, whether to establish an internal bureau or to create an external public institution depends on many factors, such as the level of expertise required to perform tasks, the degree of client homogeneity, transaction cost, accountability, coordination efficiency, etc. (Garnett, 1984; Thomas, 1993). According to organizational ecology theory, an institution, once built, adapts to changing environments by reorganizing its structure, redefining its mission, lobbying stakeholders, and acquiring other institution as living organisms often do. The case of KERIS illustrates such an organizational evolution.

b. KERIS: Its Birth and Management

Building a Quasi-Public Institution in Korea

In Korea, when the government needs to implement new projects that it has never experienced before, it first collects information and data by examining the experiences of advanced countries. In the past, Korean government officials typically would refer to experiences and lessons from advanced countries such as the U.A., European countries, and Japan. In addition, because officials in Korean ministries usually are hard pressed by routine work obligations and have little time to develop long-term plans, government often establishes working groups to mobilize external experts in formulating new projects. Sometimes government officials directly lead such working groups; other times they just attend their meetings as observers. The participation of government officials in such working groups is important in Korea because this allows them to learn from experts in the field and to communicate their ministries' interests and concerns to the working group, while at the same time not being obliged to report a completed project plan prematurely to their bosses. This arrangements allows ministry staff to advise ministers and director generals on new projects with confidence because they themselves participated in conceiving the new projects. In addition, ministry staff participation improves efficiency in developing new projects and increases the probability of successful implementation of the projects because they are the ones who obtain budget and allocate it to public projects.

While making a new project plan, a working group typically considers a system to guide project implementation. In the case of the potential wide scale use of ICTs in the education system in Korea, two alternatives were considered: a new bureau inside a ministry or a new external, quasi-public institution, funded and supervised by government but largely autonomous in how it manages its day-to-day activities. If a new initiative is not a 'one-off' endeavor, but rather is something where external expertise is continuously needed over time, government often decides to establish an external, quasi-public agency. Examples of such quasi-public agencies of relevance to the education system in Korea include the Korea Educational Development Institute (KEDI); KERIS, which is responsible for ICT/education related initiatives; and the Korea Development Institute (KDI), which was built to assist government ministries in developing long-term, innovative plans. If it is decided that a new project is a largely 'one-off' task, or if it is felt that a bureaucratic organization can better manage the related activities, the ministry can create a bureau or a task force inside a ministry to oversee the new project.

Even though the necessity of creating an external quasi-public institution may be widely acknowledged, it can actually take a long time to launch it because of two important political processes: making a special act *or* revising an existing act to include a clause for establishing the institution and acquiring budget for running it. Ministries in Korea play their functions, commissioned by laws, and they can propose revision of acts within their purview of task. Therefore, a ministry can, if need be, initiate creating a quasi-public institution by creating a new act or revising an existing act.[1] In Korea, if an institution is established by a law, then budget naturally follows it because of the system of cost estimate on the bills. The process for budgeting and allocating funds is thereby institutionalized, which helps ensure that the National Assembly or line ministries do not enacting laws imprudently by forcing them to check if budget can be secured for the tasks stated in laws. In other words, the system secures the successful establishment of an institution by guaranteeing budget for the institution. Therefore, providing a sound legal foundation for an institution is critically important. A firm legal foundation also determines the life time of the institution because an organization, once built, develops its own 'survival instinct,' and committee members of the National Assembly, overseeing a ministry to

[1] *All acts are made by the National Assembly (NA) in Korea, so ministries can only propose making new acts or revisions of existing acts to the NA.*

which the institution belongs to, have an incentive to protect the institution in order not to lose their political power. Once it is established, the growth and survival of a quasi-public institution depends on many factors, such as its leadership, organizational efficiency, effectiveness in fulfilling clients' needs, and the capacity of its staff.

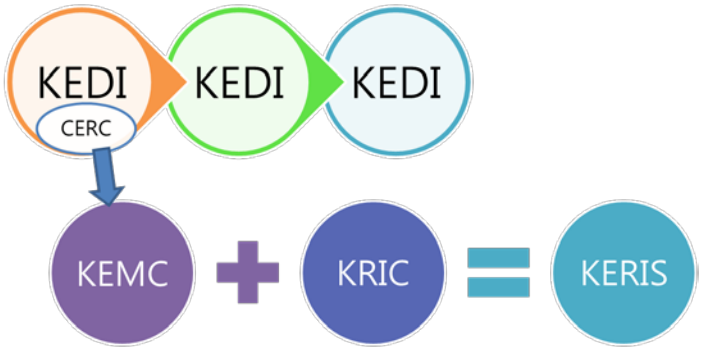
Birth of KERIS

The Korea government established two important quasi-public research institutions in the early 1970s: KDI and KEDI. KDI has supported the Economic Planning Board in drawing up Five-Year Economic Development Plans and various macroeconomic policies, while KEDI has assisted the ministry of education in modernizing Korean education system. KEDI, for example, implemented the first project that used computers and networks for distance learning in cooperation with Korea Telecom (KERIS, 2010a). This project, which ran for two years, developed a new process for creating educational content and a prototype for online distance learning. KEDI also carried out many pilot projects for informatization of educational services, such as computerization of education administration, library networking, building educational content database, and standardization of computer education facilities. Those early experiences paved the way for the nationwide implementation of informatization policies in the mid-1990s.

In Korea, even though national level informatization plan was conceived as early as 1992, it kicked into high gear in 1995 when the Ministry of Information and Communication (MIC) was established (MIC, 1996). As the MIC led national level informatization projects, the MEST also drew up the first Master Plan for informatization of educational services in 1996. The first Master Plan was effective for five years (1996-2000) and focused on building educational information infrastructure. It announced a number of very clear, measurable goals, such as one PC per teacher; one PC per five students; and one PC and Internet connectivity for each classroom. In order to accomplish these objectives, the MEST established two specialized institutions: the Korea Multimedia Education Center (KMEC) and the Korea Research Information Center (KRIC) in 1996[2]. KMEC inherited the tasks of the Computer Education Research center (CERC), part of KEDI which studied and developed education informatization policies and ran EDUNET, an online education content service for elementary and secondary schools. KRIC was established to digitalize existing research and education information, construct a national research information database, and provide an information retrieval service. KRIC launched the first version of this research information service system in 1998.

[2] *The KRIC was initially part of the National Research Foundation of Korea before being an independent organization in 1996.*

The MEST established KERIS in April, 1999 by merging KMEC and KRIC after KERIS Act was enacted in January 1999 in order to facilitate informatization of educational service more comprehensively and actively on a national scale. KERIS functions both as a think tank, helping the MEST in its planning processes, as well as an organization carrying out education informatization projects under the MEST.



Initially, KEDI, the research institution for general education policy, housed CERC, which was soon separated as an independent institution. Innovations in education driven by ICTs can be disruptive and are often in conflict with, and indeed can undermine, existing education system processes and policies. Put differently, it was felt that the mission of CERC was likely to be in conflict with that of KEDI, especially in the long run, and thus the separation of CERC from KEDI was a necessary step.

KEDI and KERIS are quasi-public institutions in cooperation with the MEST: KEDI is more pedagogical research–oriented, while KERIS is more oriented toward the development and implementation of education informatization policies. KEDI assists the Policy Planning Bureau of the MEST, while KERIS assists the ministry's Education Information and Statistics Bureau, although in theory and practice any bureau of the MEST can request assistance from either institution. The minister of the MEST appoints the presidents of the two institutions and the MEST controls the budget and the number of staff of the two institutions. The successful survival and growth of these two quasi-public institutions thus heavily depend on the degree to which they assist, and are useful to, the MEST.

Master Plans for Education Informatization and Key Projects Implemented by KERIS

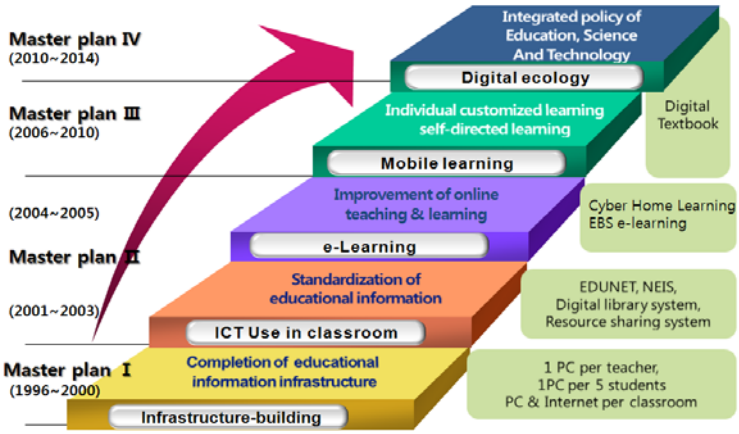
The mission of the KERIS is to enhance education and research competitiveness of Korea by innovating traditional education and knowledge sharing system using ICT. The major tasks of KERIS have included:

1. operation of a cyber-home learning support system through the EDUNET,
2. building ecosystem for digital text books,
3. management of the National Education Information System (NEIS),
4. establishment and operation of administration and finance system of regional offices of education,
5. supporting informatization of school libraries,
6. operating research information sharing system,

7. standardizing and certifying digital content and managing copyrights for digital content,

8. operating education cyber security center.

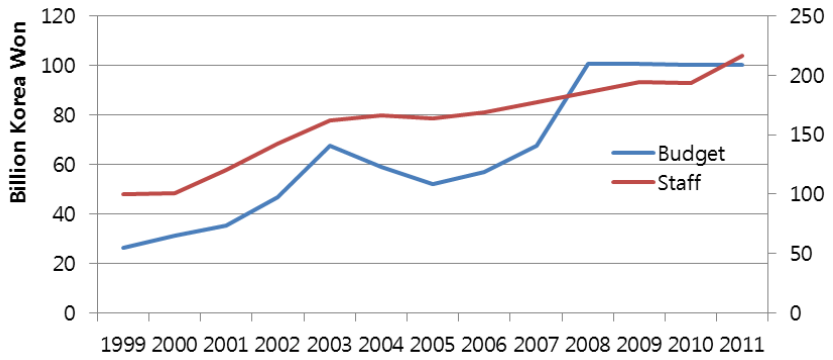
Since its inception in 1999, in close cooperation with the MEST, KERIS has drawn up three master plans for education informatization as shown in Figure 3. These master plans reflect the dynamic development of the use of ICTs within the Korean education system and tried to utilize better ICTs for innovation in education. KERIS completed the first master plan by networking schools and universities, supplying PCs to teachers and students, and providing Internet connection to classrooms by 2000. KERIS drew up the second master plan in 2000 and implementation began one year later. The plan targeted strengthening computer education in schools, standardizing multimedia content for education, building digital library system, facilitating online learning at home by providing multimedia contents created by the Korean Education Broadcasting System (EBS) through the Internet, and boosting teachers' capability to use ICT for education. In addition, KERIS launched the National Education Information System (NEIS) in 2002 to integrate and help manage the education information created by elementary and secondary schools. This project enabled the public, the MEST, and researchers to know students' and schools' performance at national level promptly and reduced administrative burdens of teachers and parents greatly.



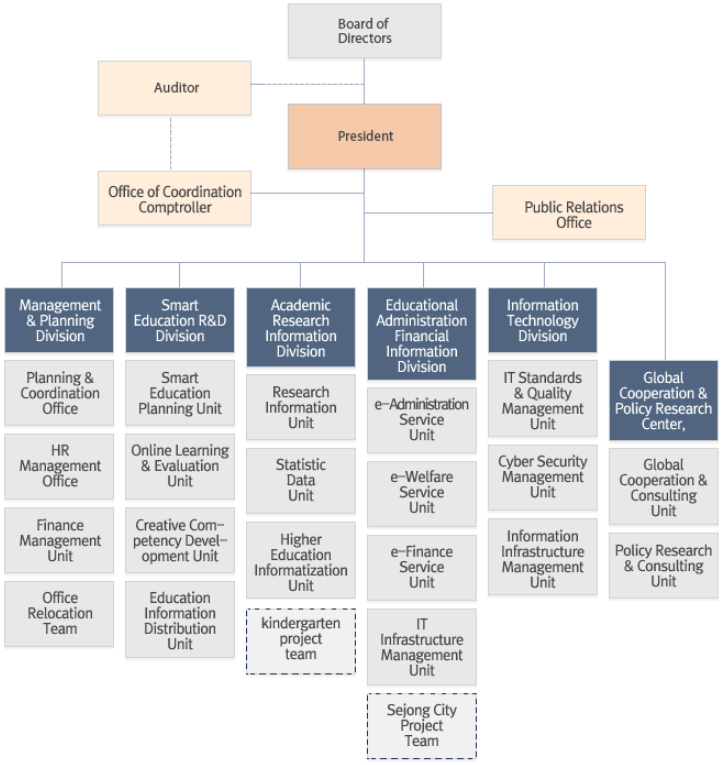
The third master plan tried to upgrade education informatization policy by introducing mobile ICTs to e-learning. In addition, KERIS built a 'self-learning' management system that evaluates students' knowledge level on-line, proposes customized learning paths to students, and keeps students' record of studying. Today KERIS is focusing on implementing the Smart Education Plan (SEP) announced in 2011, which coexists with the fourth master plan promulgated in 2010. As the SEP rolls out, Korean students will be able to choose the learning paths which best suit their individual needs, and teachers will play roles not as knowledge transferors but as facilitators or mentors who will evaluate individual student's needs, give advice, and suggest alternative learning paths.

Growth of KERIS

KERIS and the MEST first focused on building infrastructure and creating digital content for the informatization of education, and later began to support innovating teaching and learning processes to realize more individualized learning. This transition in the focus of education informatization policy has been directly reflected in the leadership appointment of the KERIS. Since the inception of the KERIS in 1999, seven presidents (including the present incumbent) were appointed. Among seven presidents, four presidents majored in computer science, two in management, and one in pedagogy. Appointing ICT experts who knew the ICT 'ecology' in Korea to lead KERIS enabled the organization to manage education informatization projects effectively. Reflecting changes in its mission, the sixth president, appointed at the end of 2009, was the first president who majored in pedagogy.



As informatization of education has progressed, the number of staff and the size of budget have grown considerably over the decade as shown in Figure 4 (right y-axis count the number of staff). For the past decade, the budget of KERIS has grown about five times (1,000 Won equals approximately one U.S. dollar) and the number of staff has doubled.

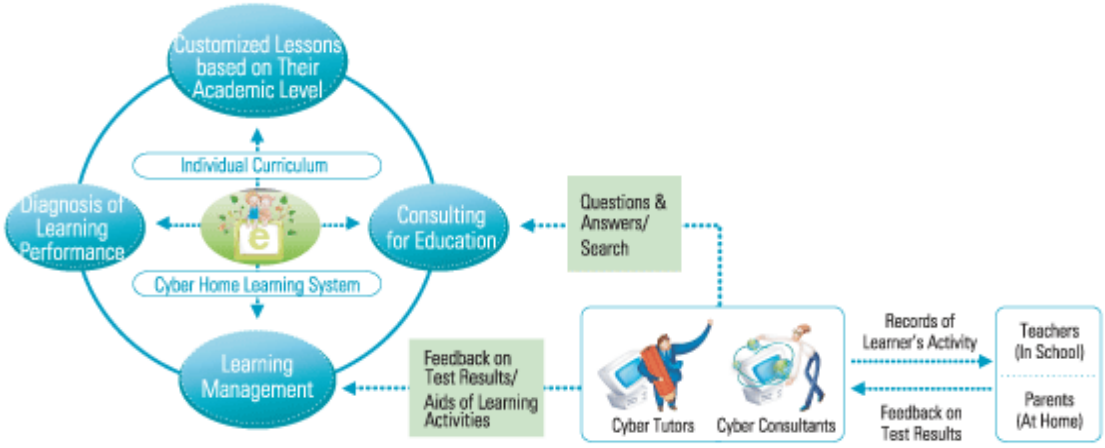


c. Planning and Implementing the Cyber Home Learning System

An examination of the role of KERIS in planning and implementing the Cyber Home Learning System (CHLS) provides insight into how KERIS functions in practice.

Planning the CHLS

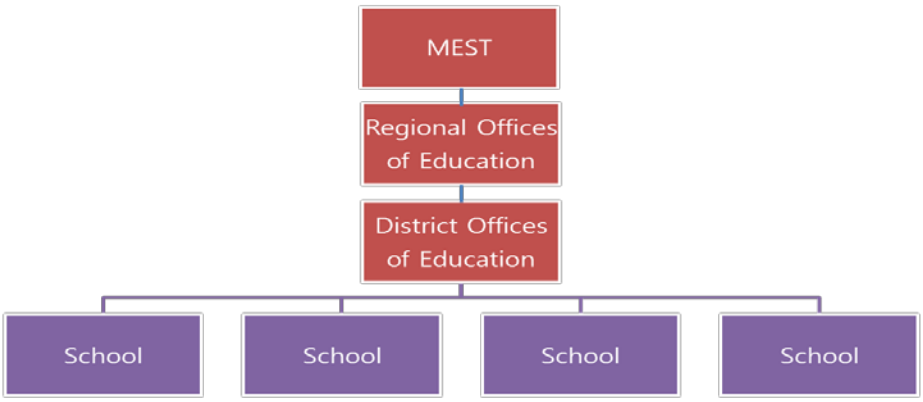
Household Internet subscription rate in Korea rose to 85.7% in 2004 (OECD, 2010), the digitalization of educational content has progressed, and students have got accustomed to using computer and the Internet. Recognizing these realities, the MEST implemented a pilot project to build the Cyber Home Learning System (CHLS) on a national level in cooperation with KERIS and 16 regional offices of education to facilitate e-learning at home in Korea. Two main reasons of facilitating e-learning at home in Korea were to reduce household expenditure on private education (Korean families traditionally spend large sums on private tutoring for their children)



and to reduce the educational achievement gap among provinces (KERIS, 2004).

The schema of the CHLS illustrates the logical structure of the CHLS. The CHLS has four modules: Diagnosing module to evaluate students' needs, consulting module to advise on students' learning paths, learning module for students' learning, and learning management module to keep students' learning records. Students can capitalize on cyber tutors to get more detailed explanation on a specific problem and cyber consultants to get information on learning paths as well as future career paths. Teachers and parents can also monitor students' learning activities and their progress in learning and communicate with cyber consultants.

In the hierarchy of Korea education administration (Figure 6), the MEST formulates nationwide educational policy in cooperation with KEDI and KERIS, and then, 16 regional offices of education, supervising district offices of education, make detailed implementation plan of the national policy and district offices of education actually implement the policy (KERIS, 2010b). In Korea, 16 regional offices are autonomous offices, so they do not have to accept the MEST policy even though the MEST can induce them to follow its policy by offering subsidy. Therefore, when KERIS was formulating the CHLS policy with the MEST, it assisted the MEST and when it was implementing the policy, it had to assist also regional offices of education.



Implementing the CHLS

When building the CHLS on a nationwide scale, KERIS assisted the regional offices of education to develop a learning management system (LMS), set standards for content development, and developed the service reference model to provide the cyber home learning service to students. The MEST simultaneously offered funds to regional offices of education to induce them to participate in the national project. The 16 regional offices of education across Korea have been running the CHLS, supported by KERIS.

Even though the implementation process went smoothly, it was not without its difficulties. One major challenge was to coordinate different preferences of 16 regional offices of education with regard to developing LMS. Some regional offices of education, which were relatively superior to others in personnel capacity and available funds, preferred building their own CHLS to using a standardized one developed by KERIS; other regional offices preferred the opposite approach. In the end, KERIS allowed regional offices to develop their own LMS individually because each region, it was argued, had different educational needs. Even though regional offices disagreed on developing a unified LMS, they agreed that each regional office would create educational content for different subjects and for different grades in a coordinated way in order to prevent duplication of efforts.

After the CHLS service started in 2005, KERIS and the regional offices of education realized the necessity of tighter coordination in managing learning management systems and creating educational content. If learning management systems of regional offices were the same, content development could become more cost effective. In 2008, the regional offices of education agreed to develop an advanced, standardized LMS and in 2009, they also agreed on assigning the development of educational content to KERIS. Even though 16 regional offices are still running their CHLS with their unique features at their websites, compatibility of LMS and educational content across Korea has been much improved since 2010.

Outcome of the CHLS

The Cyber Home Learning System is considered a flagship initiative of KERIS and is widely considered to be a success, both within Korea and abroad (KERIS, together with the MEST, won the first UNESCO-King Hamad Bin Isa Al-Khalifa prize for ICT in education in 2007, and the CHLS was cited as a primary reason for this honor). The number of users of the CHLS has grown rapidly for the past six years, from about 0.8 million in 2005 to 4.2 million 2011. In addition, students' level of satisfaction has grown gradually, from 69% to 75% point on a 100 point scale (Figure 7). Elementary school students evaluated the CHLS most highly; the level of satisfaction declines as grade goes up, with high school student satisfaction levels the lowest. The low

satisfaction of high school students is attributed to the fact that high school education in Korea has been focused on the nationwide university entrance examination, and the CHLS is not designed specifically to prepare students for such tests. As a result, since 2010 the CHLS service has begun to target elementary and middle school students.

According to KERIS' s 2011 survey, about 86% of students who had used the CHLS evaluated positively the CHLS. After beginning to use the CHLS, 12.7% of respondents could improve their academic achievement, 18.2% of them could improve self-learning habit, 11.9% could gain more confidence in learning subjects, 24% could become to like learning subjects more, and 19.2% mentioned other benefits.

The CHLS is evolving continuously to satisfy students better and accommodate fast improving ICTs. Since 2011, KERIS has been innovating its centralized and supplier-oriented content development process. Teachers are those who have field experience and know best students' needs, and so it has been determined that they should lead the educational content development process. Acknowledging this, KERIS started pilot projects with three regional offices of education in 2011 to allow teachers to create, edit, and modify learning content.

d. Conclusion

The MEST established KERIS in 1999 in order to accelerate the informatization of Korean education more comprehensively and aggressively on a national scale than had occurred previously. Even though the MEST has had KEDI as its right arm to develop pedagogical education policy since 1972, it established KERIS as its left arm to develop and implement innovative education policy for the 'future education of the information age'. Since its inception, KERIS has led the implementation of various policies to build ICT infrastructure in schools, connect them via the Internet, create online learning content, develop learning management and education administration system, and train teachers to be able to use computer, the Internet, and educational software. The Cyber Home Learning System is a notable successful KERIS-led initiative.

Innovating educational practices in Korea through the use of ICTs would have not been feasible if household broadband penetration rate were not high. According to OECD (2010), Korea has been the first among OECD countries in terms of household broadband Internet penetration rate. Notwithstanding that unique favorable feature of Korea, several useful implications can be drawn from this case study. These are:

1. **When establishing an institution for facilitating ICT use in education, the government should lay a firm legal foundation for the institution.**
   In drawing up master plans for innovation in education, government officials of ministries can utilize experts of academics and industries and have to attend all working group meetings. Their attendance improves communication between working group and ministries, and enhances the possibility of successful implementation of new plans.

2. **It is better to build new institution rather than to use an existing institution for innovation in education using ICTs.**
   The MEST built KERIS even though it already had KEDI because the KEDI was built as an institution to assist the MEST in modernizing education in industrial society. The use of ICTs can challenge and even undermine an educational system tailored for mass education of industrial society, which means that, in the Korean context, they have the potential to undermine the foundation of KEDI. In other words, it was felt that KERIS, with its clear, focused mission to innovate mass education system using ICTs, would be better placed than KEDI, which had a stronger stake in the traditional education system, in devising and implementing innovative policies utilizing ICTs.

3. **ICT infrastructure building for education should be implemented together with content development, computer supply, and teacher training for ICT use.**
   It is better to implement four policies together on a regional scale rather than one policy on a national scale if budget is limited.

4. **When regional offices of education are autonomous, it is not easy to implement innovation in education using ICTs on a national scale because of coordination problems.**
   Some regional offices of education in Korea insisted on building their own LMS and the MEST finally accepted that approach. However, three years later, all regional offices of education acknowledged the efficiency and necessity of building LMS and creating content on a national scale. This centralized approach was needed, especially at the initial stage of building e-learning system on a national scale, to save costs and overcome differences in readiness and willingness to use ICTs among regional offices. Once basic infrastructure for ICT use in education is set up, the government can induce regional offices or teachers to add or modify content for localization and customization.

5. **Leadership of an institution is a key factor that determines successful growth of the institution.**
   KERIS had been run by the presidents who majored in computer science or were ICT experts, not by those who majored pedagogy, for about a decade since its inception. Especially in the early stage of ICT infrastructure building for education, those who understand ICT ecology should lead the institution for innovation in education by using ICTs.

When building an institution for innovation, the government should see the whole picture of ecology surrounding the institution and assign clear mission to the institution. Then, institutions without regard to differences in surrounding environment try to survive and grow by adapting to changing environment or modifying it.

Annex
KERIS: Timeline of Key Events

1996 Korea's first comprehensive educational information service, “EDUNET”, was launched.

1998 Nation's first service for enhancing national research competitiveness, the “Research Information Service System (RISS)”, was launched.

1999 The Korea Education and Research Information Service Act was enacted. KMEC and KRIC were consolidated into the KERIS. First president appointed.

2000 KERIS set education guidelines for elementary and secondary schools on the use of ICT.

2001 The KERIS designated as “National Education and Research Information Center” by the Ministry of Information and Communication. Second president appointed.

2002 The KERIS designated as the national operation center for the “National Education Information System (NEIS)” by the Ministry of Education and Human Resources Development. EDUNET subscribers reached 5 million. “National Educational Resource Sharing System” launched by the KERIS. “National Digital Library Support System” launched by the KERIS.

2003 100% of all universities and research institutes in Korea joined the RISS.

2004 Third president appointed.

2005 16 regional offices of education launched the Cyber Home Learning System.

2007 Opening of the u-Class. Fourth president appointed.

2008 Opening of the Education Cyber Security Center (ECSC). Fifth president was appointed.

2009 Sixth president appointed.

2010 Established a next-generation education administration information system.

2011 Announced and started the Smart Education Plan. Seventh president appointed.

Sources

Carlton, D.W., & Perloff, J.M. (1999). *Modern industrial organization*. New York: Addison-Wesley.

Garnett, J. L. (1984). Why State Executive Reorganization Occur: Competing and Complementary Theoretical Perspective. *Problems in Administrative Reform*, 197-221.

KERIS. (2004). *Adapting education to the information age: a white paper*. Seoul, Korea.

KERIS. (2010a). *KERIS: Ten years of history*(Korean). Seoul, Korea.

KERIS. (2010b). *Adapting education to the information age: a white paper*. Seoul, Korea.

KERIS. (2012). *The 2011 KERIS annual report*. Seoul, Korea.

McAuley, J., Duberley, J., & Johnson, P. (2007). *Organization theory: Challenges and perspectives*. Pearson Education.

MIC. (1996). *MIC Annual Report 1995*.

OECD (2010). *OECD Broadband statistics*.

Thomas, C. W. (1993). Reorganizing public organizations: Alternatives, objectives, and evidence. *Journal of Public Administration Research and Theory*, *3*(4), 457-486.

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

3

Lessons from Malaysia (Smart Schools Initiative)

Molly N.N. Lee and Soon Seng Thah

in this chapter …

Executive summary

Malaysia, like many countries in the region, has invested heavily in the use of ICT in schools since 1999. Unlike many other countries, Malaysia does not rely on a single specialized agency or a particular division of the Ministry of Education to implement its ICT in education programmes. Instead, the Malaysian government rolled out a nation-wide initiative known as the 'Smart School Initiative', which is based on strategic public-private partnerships involving various stakeholders including ministry, industry, and community.

This case study examines how the *Malaysian Smart School Initiative* (MSSI) was developed and implemented in its initial years. The study demonstrates that the MSSI was the result of a deliberate, holistic approach to incorporate the use of ICT in Malaysian schools. The MSSI involved not only the use of ICT in the teaching and learning process, but also in the management and administration of schools. The MSSI paid particular attention to the capacity development of teachers, administrators and technicians in using ICT effectively in their daily practices.

The introduction of ICT into Malaysian schools was done cautiously and deliberately, stage-by-stage. The Malaysian experience highlights the need for continual support, monitoring and evaluation as an integral part of the implementation process. At each stage, reviews and evaluation were undertaken to collect feedback and information to fine tune policies, to fill in gaps and to re-allocate resources. A set of performance indicators to measure the utilization of ICT in schools, the *Smart School Qualification Standards* (SSQS), are examined. The paper concludes by offering eight key lessons from the Malaysian experience for policymakers in other countries.

a. Introduction: Background and context

In the past decade, with the advancement of information and communication technology (ICT), many governments have invested huge sums of public funds to build ICT infrastructure and enable various kinds of services in the public sector as part of initiatives to promote activities related to 'e-government', 'e-health', and 'e-learning'. Since most of the related ICT technologies are new, there has been a great deal of experimentation in the utilization of these technologies to improve the efficiency and quality of public services. This has been particularly so in the field of education, where ICT is often used to enhance the efficiency of school management and administration, to improve the quality of teaching and learning, and to widen the access to education through alternative delivery systems (such as distance learning). Some governments have established ICT/education agencies or institutions such as KERIS in South Korea, Becta in the UK, and NCET in China to be responsible for the development and application of ICT in the field of education. In other countries, such functions are carried out by foundations and NGOs such as the Omar Dengo Foundation in Costa Rica and the Pilipinas Schoolnet at FIT-ED in the Philippines. There are still other countries which assigned such roles to a special division of the Ministry of Education, or to universities.

Beginning in the late 1990s, Malaysia rolled out a nation-wide initiative to introduce the use of ICT in both primary and secondary schools. Instead of relying on a single specialized agency or a particular division of the Ministry of Education (MOE), the *Malaysian Smart School Initiative* (MSSI) was based on strategic public-private partnerships involving various stakeholders, including government ministries, industry actors, and local communities. This paper briefly examines how the initiative was organized, funded and implemented in its initial years. It addresses the following key research questions:

- What are the key contextual factors of relevance to the development of the Malaysian Smart School Initiative (MSSI)?
- How has the MSSI developed and been implemented over the years?
- What were the monitoring and evaluating mechanisms put in place to inform and sustain the initiative?
- What are some of the impacts of, and future directions for, the initiative?
- What are the key lessons learned from the Malaysian experience of potential relevance to policymakers in other countries?

The particular focus of this paper is on the monitoring and evaluation of the initiative, highlighting the shortfalls, gaps and challenges of its overall implementation. Monitoring and evaluation is a crucial component of any new programme in Malaysia of the size and scope of the MSSI, because policy makers need to collect regular feedback for policy enhancement, allocation of resources and to assess its cost-effectiveness. The tool used to monitor the utilization of ICT in schools in Malaysia consisted of a set of indicators to measure ICT integration in school administration, teaching and learning in the classrooms. This monitoring tool, which is known as the *Smart School Qualification Standards* (SSQS), may represent a useful model of relevance policymakers looking for a set of standards to measure the use of ICT in schools in their own countries. An analysis of the Malaysian experience under the MSSI also provides some useful lessons to policy makers in other countries more generally.

Since the early 1970s, the Malaysian government has introduced various initiatives to capitalize on the use of information and communication technology (ICT) in every sector, including

education. The Malaysian Smart School Initiative (MSSI) is one of the seven flagship applications of the *Multimedia Super Corridor* (MSC) undertaken by the Malaysian government to strive towards becoming a knowledge-based economy. The MSC,[1] which was launched in 1996, is a key component of Malaysia's strategy to harness the potential of ICT and multimedia technologies to create high-value jobs and to improve national productivity and competitiveness in the global economy. The broad goals of MSC are to develop human capital, bridge digital gap and nurture development of local multimedia small-medium enterprises. The seven flagship 'applications' under the MSC are Smart Schools; Multi-purpose Card; Tele-health; Electronic Government; Technopreneur Development; R&D Clusters; and Electronic Transactions.[2]

The MSSI was officially launched in July 1997 in 88 pilot schools, with the aim of using ICT as a tool to enhance learning and improves the efficiency and effectiveness of school administration. The Ministry of Education's main policy goals for ICT in Education are:

- ICT for all;
- ICT as a teaching and learning tool, as part of a subject or as a subject on its own;
- Using ICT to increase productivity, efficiency and effectiveness of the management system.[3]

By definition, the Malaysian Smart School is "a learning institution that has been systematically reinvented in terms of teaching and learning as well as the improvement of the school management process in order to help students cope and leverage on the Information Age".[4] The pilot and post-pilot phase of the Malaysian Smart School Initiative ended in 2005, after which time the initiative was extended to all schools in Malaysia via the "Making all schools smart" programme. This programme is an on-going process of the Smart School endeavour, under which the MOE:

- provided the ICT infrastructure;
- provided broadband and local area network facilities;
- facilitated training to enhance teachers' competency in integrating ICT in education;
- made the 88 Smart Schools the benchmark;
- incorporated ICT elements into the curriculum;
- introduced ICT programmes at the school level;
- provided various courseware, educational TV programmes and other resources for teaching and learning; and
- established collaboration programmes to expedite the process of making schools smart.

Since 1999, the MSSI has evolved in a number of ways. Developments in each phase of the initiative were based on feedback and information on the implementation of the previous phase

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[1] MSC is a government-designated zone in Malaysia which covers an area approximately 15km x 50km (i.e. 750km^2), stretching from Petronas Twin Towers to Kuala Lumpur International Airport. It aims to attract companies with temporary tax breaks and facilities such as high-speed internet access and proximity to the Kuala Lumpur International Airport.

[2] NITC, National IT Council. (2012). Multimedia Super Corridor Malaysia. http://www.nitc.my/index.cfm?&menuid=28.

[3] Ministry of Education. (2008). Malaysia ICT in Education: Cutting Edge Practice. Kuala Lumpur: Ministry of Education.

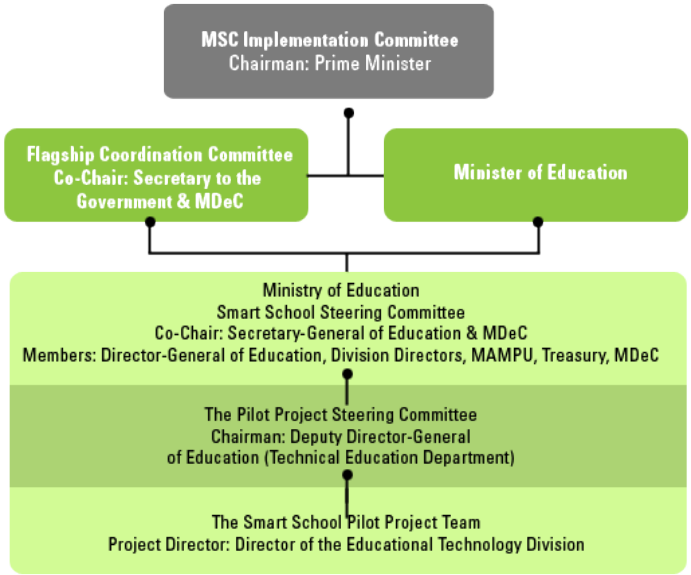
[4] Ministry of Education. (2009). Smart School Qualification Standards (SSQS). Second Edition. Kuala Lumpur: Ministry of Education.

as well as on the advancement of ICT technologies. It is important to note that the initiative was first piloted in 88 schools before it was rolled out to all Malaysian schools.

b. The Organization and Development of MSSI

At its start, the MSSI had six main components. They included: (a) teaching-learning processes; (b) management and administration; (c) human resources, skills and responsibilities; (d) processes; (e) technology; and (f) policies.[5] The teaching and learning processes relating to curriculum, pedagogy, assessments, and teaching and learning materials were redesigned to enable students to practice self-accessed and self-directed learning at their own pace. The management and administration of the Smart School was computerized so as to help school heads to manage more efficiently and effectively the resources and processes required to support the teaching-learning process. Multiple stakeholders, including parents, the community and the private sector, were involved in the Smart School initiative. The MSSI was continuously studied and reviewed to ensure it was producing the desired outcomes. Such reviews were undertaken both internally, by the Educational Technology Division, School Inspectorate and the Curriculum Development Division, and externally, by Frost & Sullivan[6] and a number of local universities. Technology was used as an enabler of Smart School practices in teaching and learning, management and communication with external constituencies. To ensure the successful implementation of the MSSI, policies and regulations were constantly reviewed and changed, based on feedback from monitoring and evaluation processes.

The implementation of MSSI was directed by a high level Implementation Council chaired by the Prime Minister. This high level committee planned drove all of the various flagship initiatives. Directly under this Committee was the Flagship Coordination Committee (FCC), to whom the MSSI reported progress, identified issues and suggested necessary next steps. At the Ministry of Education (MOE), MSSI was under the Smart School Steering Committee and the Pilot Project Steering Committee, which guided and supervised the Smart School Pilot Project Team. The Pilot Project Team was responsible for all planning, development and implementation of the Smart School; this team resided within the Educational Technology Division in the MOE.



The MOE formed smart partnerships with leading industry and community players to accelerate the use of ICT in schools. The partners included corporate companies, parent-teacher

[5] *MDec, Multimedia Development Corporation. (2009). Malaysian Smart School Roadmap 2005-2020. Kuala Lumpur: Multimedia Development Corporation Sdn. Bhd.*
[6] *Frost & Sullivan (2004). Benchmarking of the Smart School Integrated Solution. Kuala Lumpur: Ministry of Education.*

associations, teachers' unions, alumni and educational associations. Collaboration with key players such as Microsoft Malaysia, Intel Malaysia, TIME Engineering Berhad (TIME), Telekom Malaysia, and MDeC enhanced the professional development of teachers through the integration of pedagogy with ICT.[7] Over time, smart collaborations were extended to include many other corporations, such as ELMO Japan, Oracle, CyberSafe Security, Maxis and Digi. Different partnerships brought with them advantages and challenges to the MOE. Companies such as TIME, Telekom Malaysia and MDeC were government-linked corporations, and they were commissioned by the MoE to carry out specific tasks, such as to train practicing teachers to use ICT in schools, to develop digital curriculum materials for teachers, to develop information management system for schools, etc. This kind of outsourcing strategy was adopted by the MOE to overcome the shortage of qualified personnel for these specialized tasks. Partnerships with key players such as Microsoft Malaysia and Intel Malaysia were one mechanism to keep up with the rapid change of technologies in the IT industry. Collaboration with teachers' unions and educational associations in organizing training workshops helped to smoothen the process of adoption of ICT usage by teachers. Donations from parent-teacher associations and school alumni helped to equip schools with computer equipment and facilities. On the other hand, it was very challenging to coordinate among the various divisions in the MOE which had different roles and responsibilities for the Smart School Initiative, as well as the different partnerships established with external partners.

As mentioned earlier, MSSI represented a *continual process* of integrating ICT in schools. It evolved over 15 years as a result of changing contexts and technologies. The key Smart School Milestones occurred in four waves:

Wave 1 – The Pilot (1999-2002)

Wave 2 – The Post Pilot (2002-2005)

Wave 3 – Making All Schools Smart (2005-2010)

Wave 4 – Consolidate and Stabilize (2010-2020)

The original implementation plan of MSSI comprised two phases: a pilot phase; and a broad roll-out phase. Eighty-eight (88) schools were selected at the pilot phase to be Smart Schools. These 88 Smart Schools tested three models of technology[8]: a computer laboratory model (Level B); a limited classroom model (Level B+); and a full classroom model (Level A). The pilot project also tested the *Smart School Integrated Solution* (SSIS) by providing these schools with courseware in four subjects (Malay language, English, Science and Mathematics); a computerized Smart School Management System (SSMS); a Local Area Network (LAN); and a Help Desk; as well as providing training for teachers, school heads and appointing an ICT Coordinator in each of the pilot schools.[9]

Following the pilot phase, the government undertook a massive computerization programme by constructing computer laboratories in all 10,000 Malaysian schools and providing broadband and Internet access to these schools. To help bridge the digital gap, rural schools were provided with School Access Centres (SACs) -- cyber cafes for students to source materials, select

[7] *Ministry of Education. (2008). Malaysia ICT in Education: Cutting Edge Practice. Kuala Lumpur: Ministry of Education.*

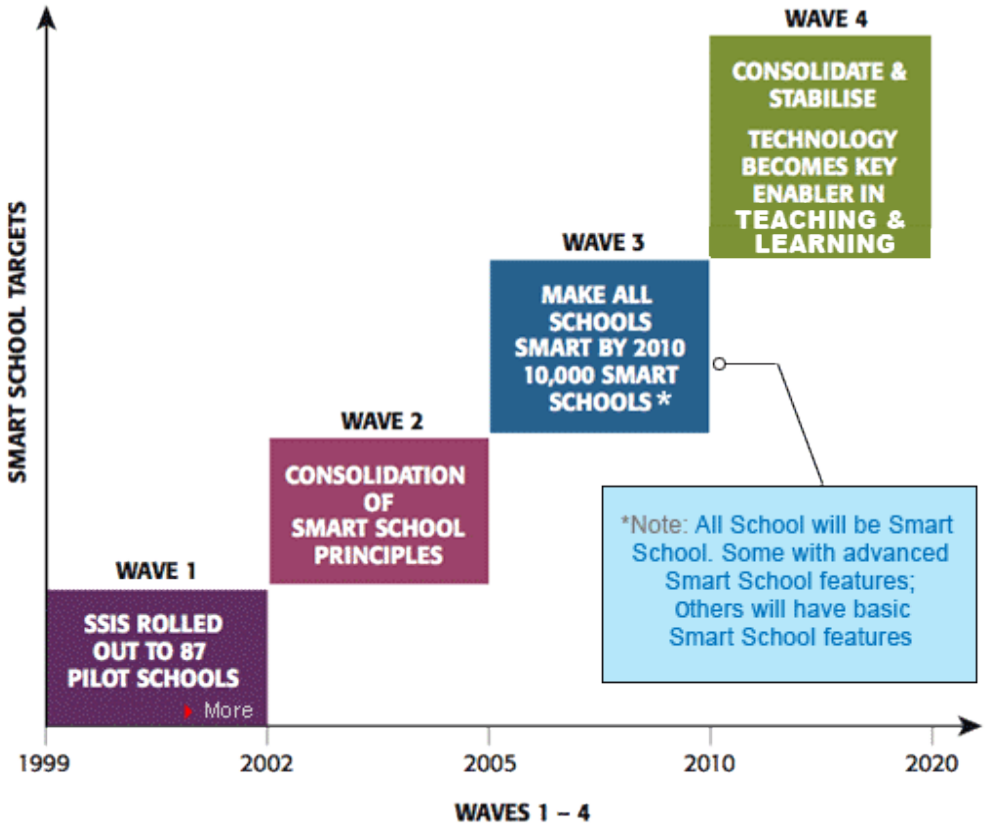
[8] *The three models of technology are three ways of providing ICT infrastructure to the smart schools: (i) a computer laboratory model (Level B) consisting of 37 computers, 2 notebooks, 3 servers, 4 printers and a leased line of (128/64kbps) to a school; (ii) a limited classroom model (Level B+) consisting of 81 computers, 2 notebooks, 3 servers, 8 printers and a leased line of (128/64kbps); and (iii) a full classroom model (Level A) consisting of 520 computers, 5 notebooks, 6 servers, video conference equipment, leased line of (512/256kbps). Out of the 88 Smart Schools, 6 are at Level A, 2 at Level B+ and 80 at Level B.*

[9] *Ministry of Education. (2009). Smart School Qualification Standards (SSQS). Second Edition. Kuala Lumpur: Ministry of Education.*

information and monitor their own learning progress. In 2003, the *Teaching and Learning of Science and Mathematics in English* programme was introduced. To ensure the success of this programme, schools were provided with laptops, LCD projectors and screens, television sets and printers. Teaching and learning courseware were developed to facilitate the teaching of Science and Mathematics in English.

At the post-pilot phase, the focus was on providing supervision and support as well as coordinating parallel efforts of integrating ICT in schools. The aim was to monitor the implementation and to take corrective actions in the implementation of MSSI. *Making All Schools Smart* (MASS) was a process to roll-out the Smart School concept to all Malaysian schools by leveraging on all of the MOE's various ICT initiatives. This was an on-going process to improve the effectiveness of school management and the quality of teaching and learning.[10] It was considered 'on-going' because the full incorporation of ICT in a particular school was seen to depend on a variety of factors, including its ICT infrastructure, the competency of its teachers and the leadership of school heads.

Monitoring and evaluation is a crucial component of any new programme because policy makers need to collect feedback for policy enhancement, allocation of resources and to assess its cost-effectiveness. The following section provides an analysis of the various types of support given to schools and teachers under MSSI, how the project was developed based on feedback from several reviews, and some of the outcomes of the initiative.



[10] *Ministry of Education. (2011). Hearts and Minds Towards Making All Schools Smart. Kuala Lumpur: Educational Technology Division, Ministry of Education.*

c. Monitoring and Evaluating Mechanisms

The Pilot Phase (1999-2002) of the MSSI was closely monitored.[11] Although there were no major difficulties identified, it was evident from the start that the 80 schools provided with Level B ICT infrastructure found it difficult to share the computer laboratory facilities among all the classes in these schools. A study found the teachers used the computer laboratories for teaching and learning four to eight times a month on the average.[12] Maintenance of hardware was problematic and breakdowns were frequent. It was reported in several reviews that the Smart School Management System (SSMS) and the Smart School (SS) courseware were found to be under-utilized. The utilization of SSMS was reported at 40-50%, largely because there were other school management systems introduced by other divisions and departments in the MOE; schools found these demands overwhelming. Teachers were not keen on using the SS courseware, as they found usage of materials directly related to examination preparation saved precious teaching time. The lack of monitoring and support made teachers less inclined to use the SS courseware. It was reported that the MOE help desk faced problems in addressing queries within a stipulated timeframe.[13]

In addition, the training of teachers on ICT competencies and ICT-pedagogy integration was found to be inadequate. A review reported that a sum of MYR 288 million (USD96million) was allocated for the training of teachers in Smart Schools. A 14-week, in-service training course implemented in the beginning period (1998-2000) was reduced to a 12-week course in 2001-2003, and later to an 8-week course in 2004–2005.[14] Since 2007, the length of ICT in-service teacher training course was further reduced to 4 weeks. All the reviews pointed to the fact that the ICT in-service teacher training was not sufficient enough in helping teachers to use the SSI courseware.

In brief, the issues and challenges from the Pilot Phase can be summarized as: infrastructure readiness; connectivity; change management; parallel ICT initiatives; training of teachers and administrators; technology obsolescence; and policies.[15]

To overcome the issues and challenges that emerged during the pilot phase, and in line with the move to make all schools 'smart', a monitoring tool known as the *Smart School Qualification Standards* (SSQS) based on the *Star Rating* was introduced in 2006. The SSQS was a set of indicators to monitor, evaluate and categorize schools in the usage and impact of the technologies. These indicators were developed to monitor the types of ICT resources available, the extent and nature of professional development efforts, and changes in teaching/learning practices.[16] The key objectives of the SQSS were:

- to increase utilization of ICT in schools;
- to develop a set of indicators to measure ICT integration in administration, teaching and learning;
- to provide a basis for policy planning and programme improvements.[17]

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[11] The parties concerned were MOE, MDeC, Telekom Smart School (TSS). When the Pilot Project concluded in 2002, a number of formal reviews were carried out by MoE and MDeC, MoE and TSS, and local academics. (MDeC, 2009).
[12] KPM, Kementerian Pendidikan Malaysia. (2002). Pemantauan Kolaboratif Pelaksanaan Projek Rintis Sekolah Bestari. Kuala Lumpur: Bahagian Sekolah, Kementerian Pendidikan Malaysia.
[13] MDeC, 2009
[14] Shaharuddin, B. & Abbidin, N.Z. (2009). "Reviewing the Implementation of the Smart Schools and the Training of Bestari Teachers in Malaysia", Uluslararası Sosyal Arastirmalar Dergisi / The Journal of International Social Research, Volume 2/6 Winter 2009.
[15] MDeC, 2009
[16] MOE, 2009
[17] Ibid.

The SQSS evaluated schools by performance indicators across four focus areas[18], as follows:

- *Utilization* (40%): monitored the extent to which the school makes use of ICT in its operation, management, teaching and learning activities; examples of related indicators include: student-to-PC contact hours; courseware/ICT-based content integration by teachers for core subjects; School Management System updating; Education TV content and Learning Management System (LMS) usage; and student completion of self-learning materials.

- *Human Capital* (40%): referred to the competency of end-users in integrating ICT in teaching, learning and/or administration; examples of related indicators include: ICT Coordinator's competency; core-subject teachers' ICT competency; use of ICT in dissemination of information; smart partnerships; use of multimedia in teaching; and students' competency and awareness of the availability of educational courseware.

- *Applications* (10%): referred to the various applications provided by the MOE and others adopted by schools; examples of related indicators include: at least 5 modules used for school management; LMS and MoE courseware are used for teaching; and website presence and maintenance.

- *Technology Infrastructure* (10%): a comprehensive audit of the infrastructure was provided by the MOE, inclusive of maintenance and support within the schools; examples of related indicators include: PC-to-class ratio; PC accessibility; LAN & WAN; and technology downtime.

All schools are required to periodically participate in this self-assessment exercise[19] to determine their achievement according to the indicators. The SSQS rated the achievement of schools from one (1) to five (5) stars. This Star Rating was awarded based on a unified score from the indicators to:

- Serve as a device for monitoring;

- Provide information for specific actions to uplift the integration of ICT in schools;

- Facilitate decision and policy making towards making all schools smart.

The Star Ratings[20] were:

Basic *(1 Star)*: Schools with merely basic conditions across all indicators;

Basic Plus *(2 Stars)*: Star rating for schools with basic features, with slight additions but falling below the average conditions of for all indicators;

Median *(3 Stars)*: Star rating awarded to Smart Schools with fair or average conditions of all the indicators;

Advanced *(4 Stars)*: A seal of approval awarded to Smart Schools with good or advanced conditions for most indicators;

Advanced Plus *(5 Stars)*: The highest approval rating, awarded to Smart Schools with advanced conditions for most indicators.

Schools achieving one (1) or two (2) stars had not achieved the desired level according to the indicators, while schools with a three (3) star rating and above had achieved 'Smart School

[18] *Ibid.*
[19] *The SSQS on-line system for assessment is accessed via http://ssqs.moe.edu.my.*
[20] *MOE, 2009*

status'. A number of schools that attained high rating levels were selected as 'Champion Schools' under the *1Bestarinet* initiative, which was being rolled out to all schools in the country. The 1Bestarinet initiative provided increased broadband connectivity of up to 10 Mbps and the use of the Frog Virtual Learning Environment (VLE). For schools that attained low ratings, catalyst schools (those categorized with 5-star ratings) were assigned to nurture them to attain higher star ratings in future.

The SSQS was used to monitor the number of Malaysian schools that achieved smart school status. The monitoring results for the last three years in this period are shown in *Table 1*. The results show that the percentage of schools that have achieved smart school status increased from 89.60% in 2009 to 94.76% in 2011, leaving a small percentage (5.24%) of Malaysian schools that had not achieved smart school status.

Table 1. Achievement of Smart School Status (2009 -2011)

Year	No. of Schools	SSQS benchmarking					No. of Schools with Smart School Status	No. of Schools yet to achieve Smart School Status
		5 Stars	4 Stars	3 Stars	2 Stars	1 Star		
2009	8 454	96	2 412	5 067	662	217	7 575 (89.6%)	879 (11.60%)
2010	8 955	271	3 440	4 436	621	187	8 147 (90.98%)	808 (9.92%)
2011	9 662	627	4 552	3 977	399	107	9 156 (94.76%)	506 (5.24%)

source: Bahagian Teknologi Pendidikan (BTP), MOE, 2012

Besides monitoring the usage of ICT in schools, a couple of studies were undertaken to investigate the impact of ICT on students' learning achievement. A quasi-experimental study (Soon, 2003) was carried out to compare students' achievement in science between smart schools and non-smart schools. The study shows that students in smart schools performed significantly better than those in non-smart schools in the pre-test, post-test and gain scores. Another impact assessment study on the SSI undertaken in 2006 (Frost and Sullivan, 2006) shows that:

- 90% of students demonstrated sufficient ICT literacy for learning;
- less than 50% of students were unable to conduct independent/self-learning due to limitations in access to facilities and content;
- 82.5% of teachers felt that their ICT competencies had been positively impacted by SSIS;
- 90% of teachers were using the computer laboratories for lessons and preparations of materials;
- 73% of teachers noted their productivity has improved using ICT;
- 90% of information technology coordinators (ITCs) were technically competent;
- 70% of ITCs felt their efficiency was impacted due to late response from Help Desk;
- the Smart School Management System (SSMS) helped general administrators in managing school resources and planning; and
- the productivity of general administrators was impacted by poor equipment reliability.

On the whole, the monitoring and evaluation mechanisms put in place helped to monitor the implementation of MSSI nationwide and evaluate its impact at the school, teacher and student level. It provided useful information for responding to emerging challenges and for policy refinement, which the eventual goal of making all Malaysian schools ‘smart’ by the year 2020.

d. Moving forward

The SSQS rating for 2011 showed that only a small percentage (6.49%) of all the Malaysian schools achieved a 5-Star rating. One of MOE's key strategies to ensure that schools would achieve Smart School status was the *Catalyst Schools* programme.[21] This strategy was designed to generate a 'multiplier effect' to speed up the process of achieving a 5-Star rating. Catalyst Schools – those schools which had received a 5-star rating -- were required to mentor, guide and support schools within their cluster and help them to improve the usage of ICT in their schools. By design, each Catalyst School were responsible for guiding between four to five schools in their 'cluster' to achieve a 5-Star rating. In 2010, 100 Catalyst Schools were appointed to coach a total of 400 schools. Of the 400 schools, 271 successfully attained 5-Star rating. In 2011, these 271 schools were appointed to coach 1,394 schools. Of the 1,394 schools, 627 attained 5-Star rating. In 2013, these 627 schools were designated to coach 2,500 schools.

When the monitoring tool SSQS was introduced, schools were required to carry out a self-assessment survey, which was conducted once a year through an online monitoring system, to input the data against the indicators specified in SSQS. Very often the data collected were not valid or reliable, because teachers misunderstood the indicators and input incorrect data. As a result, it was quite common that a particular school was rated higher in the star rating than it should have been. To overcome this problem, on-site monitoring was undertaken by the Malaysian School Inspectorate, working closely with the Educational Technology Division (ETD), starting in 2012.

Although Malaysia developed the Smart School Qualification Standards (SSQS) to rate schools in the utilization and impact of ICT in their schools, what was lacking was a national ICT Competency Standard for teachers. Although the SSQS had some indicators on teachers' ICT competencies, such as the number of ICT-related courses attended by teachers in the last three years, the number of ICT knowledge-sharing activities conducted by teachers, and frequency of ICT-related information dissemination by teachers, these indicators were considered insufficient when measuring the actual ICT competencies possessed by the teachers. The Educational Technology Division (ETD) in the MOE obtained input from international and local consultants and completed the draft of a national ICT Competency Standard for teachers, with reference to the standards developed by ISTE. The draft national standards were pilot tested in early 2012, and an actual study was conducted in a number of schools throughout the country upon its completion. With a national ICT Competency Standard for Teachers in place, the Teacher Education Division and teacher training institutions were in a better position to design and deliver relevant in-service and pre-service ICT teacher training courses. In addition, the ICT competencies for students were also developed to provide indicators for curriculum planning undertaken by the Curriculum Development Division.

The courseware for all subjects was developed and disseminated to schools by ETD, with the expectation that it would help facilitate teachers' ICT-based teaching and students' self-directed learning. However, it was found that the courseware was hardly being put into use by the teachers, because either the courseware was not relevant to the local context or that it did not meet the diverse learning needs. ETD initially focused on the development and provision of the CD-ROM based courseware, while online support to teachers was limited to downloading of syllabus and instructional materials. Subsequent future developments under MSSI included the development of more e-materials, the introduction of the VLE (virtual learning environment), the upgrading of connectivity through 1BestariNet, and promoting the use of EduWebTV.[22]

[21] *MOE, 2011*

[22] *EduWebTV is a video-based educational portal designed to help teaching and learning within and outside the classroom.*

e. Conclusion

The Malaysian case of the MSSI shows that the wide scale implementation of ICT in education across an education system need not be the sole responsibility of a Ministry of Education, but rather that it can instead involve multiple stakeholders from the ministry, industry, community and educational associations. The Malaysian government drew expertise and resources from both the public and private sector through smart partnerships in implementing the Malaysian Smart School Initiative. Furthermore, the implementation of ICT in education in Malaysia remains an on-going and evolving process, given organizational and technological changes that are taking place over time. For Malaysia, it was crucial that monitoring and evaluation was an integral part of the implementation process of MSSI, as it helped policymakers to refine or reformulate policies, re-allocate resources and set new targets.

The Malaysian model of involving multiple actors in its Smart School Initiative has had its advantages and disadvantages. The fact that the Implementation Committee of the Multimedia Super Corridor (MSC) was chaired by the Prime Minister and that the Smart School Initiative was one of the seven flagships under MSC sends a clear signal that it is one of the top priorities in the Malaysian government's agenda. The Smart School Steering Committee consists of representatives from multiple stakeholders, from both the public and private sector. The effective functioning of this steering committee is of utmost importance, because this is where major policies are formulated and coordination among the different actors is put in place. The organization chart of MSSI (see *figure 1*) identifies five levels of management in the planning, development and implementation of this initiative. The flow of information and channels of communication among these different management levels, as well as between management and implementers in the field, were crucial to the roll-out of MSSI.

The involvement of the private sector in this model brought with it the practice of corporate management and the elements of competitiveness, all of which contributed to the efficiency and quality of the deliverables. Under the MSSI, private companies had to bid for contracts with the Smart School Steering Committee for specific tasks and deliverables related to the MSSI, such as training of teachers, development of curriculum materials, and the supply of computers to schools. Meeting targets and deadlines with quality deliverables were critical to the functioning of the numerous public-private partnerships established under MSSI. This kind of 'privatization' is often used in various public sectors in Malaysia to overcome the slowness and inefficiency of public management. This model also brings with it the nimbleness and speed in responding to the rapid technological change in the IT industry. However, this sort of model can contribute to a lack of continuity and institutional memory, because specialists and consultants come and go depending on the length of each contract. In addition, the remoteness of schools located in the interior regions of Sabah and Sarawak brought about many challenges to the private sector's involvement in these projects.

As mentioned earlier, the coordination among the different actors in this initiative was essential to the success of its implementation. More often than not, one division of the Ministry of Education may not be aware of what is being done by other divisions. Similarly, one private company may not know what other companies are doing under the MSSI. As a result, schools and teachers may receive conflicting messages from these various actors and at times there are competing demands from different authorities. This has been observed under the MSSI. For example, a number of reviews have shown that many Smart Schools are not using the Smart School Management System (SSMS) because there are other management systems introduced and supported by other divisions in the MOE.

Although it was necessary to implement the MSSI phase-by-phase and to pilot test educational innovations in a small number of selected schools, there was the tendency to channel most of

the limited resources to these pilot schools so as to showcase them, both nationally and internationally. This strategy raised the issue of educational equality among the general public in Malaysia. During the pilot phase of MSSI, many parents questioned why only certain schools were selected to become Smart Schools. Although there were plans to roll out MSSI to all Malaysian schools, there were still many schools, especially those in the rural areas, which lacked computer facilities and teachers with ICT competencies.

The development of the Malaysian Smart School Initiative can provide some useful lessons to policy makers from other countries. These include:

1. **It is important to adopt a holistic approach to incorporate the use of ICT in schools right from the onset.** The MSSI involved the use of ICT in the teaching-learning process as well as in the management and administration of schools. It also entailed the capacity development of teachers, administrators and technicians in using ICT effectively in their daily practices.

2. **Effective public-private partnerships can be a useful strategy to mobilize resources and expertise in the implementation of ICT in education.** The Ministry of Education in Malaysia formed partnerships with key players in the industry and community to implement the MSSI.

3. **Since large sum of money is involved and the fact that the application of ICT in the field of education is relatively new to many people, it is essential that this educational innovation is piloted before it is being up-scale.** The MSSI was piloted in 88 schools before being rolled out to all Malaysian schools.

4. **Research and development, monitoring and evaluation are essential components of the implementation process.** The MSSI developed and adopted a monitoring tool (SSQS) to measure the utilization of ICT in schools. However, it was not adequate to rate schools in Malaysia only the utilization and impact of ICT on learning outcomes; it was also necessary to assess teachers on their ICT competencies.

5. **Teachers need adequate training, continual supervision, professional and technical support before they become more inclined to use ICT in their daily work.** The case study shows that these essentials were lacking during the initial part of MSSI, resulting in under-utilization of the ICT facilities by teachers in the smart schools.

6. **The maintenance of hardware and the provision of software and courseware are indispensable if educational personnel were to make effective use of ICT in education.** The case study shows that timely maintenance service was missing in some of the smart schools in Malaysia.

7. **Any ICT initiative on a large scale requires managing change effectively.** In Malaysia, introducing a massive ICT initiative required teachers and school administrators to adopt change readily and implement the project with creativity and innovativeness.

8. **The success of any ICT initiative must be complemented by robust broadband connectivity to the internet.** Based on the Malaysian experience, failure to do this will result in teachers not wanting to use the web-based resources available and ultimately results in low adoption rates.

The implementation of ICT in education in Malaysia is an on-going process with contributions required from various stakeholders so that teachers and students can benefit from the use of

ICT in teaching-learning, management and administration. The Ministry of Education seeks to continue to monitor and evaluate the MSSI so that it can ensure better returns on the huge investments related to ICT in education as part of the MSSI.

Sources

Frost & Sullivan (2004). *Benchmarking of the Smart School Integrated Solution*. Kuala Lumpur: Ministry of Education.

KPM, Kementerian Pendidikan Malaysia. (2002). *Pemantauan Kolaboratif Pelaksanaan Projek Rintis Sekolah Bestari*. Kuala Lumpur: Bahagian Sekolah, Kementerian Pendidikan Malaysia.

Ministry of Education. (2008). *Malaysia ICT in Education: Cutting Edge Practice*. Kuala Lumpur: Ministry of Education.

Ministry of Education. (2009). *Smart School Qualification Standards (SSQS). Second Edition.* Kuala Lumpur: Ministry of Education.

Ministry of Education. (2011). *Hearts and Minds Towards Making All Schools Smart.* Kuala Lumpur: Educational Technology Division, Ministry of Education.

MDec, Multimedia Development Corporation. (2009). *Malaysian Smart School Roadmap 2005-2020*. Kuala Lumpur: Multimedia Development Corporation Sdn. Bhd.

NITC, National IT Council. (2012). *Multimedia Super Corridor Malaysia*. http://www.nitc.my/index.cfm?&menuid=28.

Shaharuddin, B. & Abbidin, N.Z. (2009). "Reviewing the Implementation of the Smart Schools and the Training of Bestari Teachers in Malaysia", *Uluslararası Sosyal Arastirmalar Dergisi / The Journal of International Social Research*, Volume 2/6 Winter 2009.

Soon, S.T. (2003). *Indicators That Contribute Towards The Achievement Of Science In Smart Schools. Paper presented at the 10th National Research Seminar, 29 September - 2 October 2003.*

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

4

Lessons from England (Becta)

Gavin Dykes

in this chapter …

Executive summary

The British Educational Communications and Technology Agency (Becta) was established in 1998 and finally closed in 2011. The government in England set out Becta's priorities in annual remit letters, and the agency's changing role is traced through the content of these letters. Becta primarily addressed school-based and technical and vocational education and it acted as the key agency in taking forward England's e-learning strategy, Harnessing Technology.

In Becta's lifetime, technology changed dramatically and the agency played an important role in building the capacity of schools and colleges to support their work and the learning of students through technology. Becta played an important role in conducting research and gathering evidence in use of technology for learning and in developing education leadership and teacher capacity to use technology across the school curriculum.

Becta's role was undoubtedly challenging. The comments and conclusions reflect stakeholder views of specific challenges and what might have been done differently and perhaps better. While every national context is different, some of the experience associated with Becta's existence may provide a starting point for reflection on the development of similarly focused ICT in Education agencies.

a. Becta's establishment and initial remit

The British Educational Communications and Technology Agency (Becta) was established in 1998 by the English[1] government's Department for Education and Employment[2], to provide the advice and support needed to meet the government's objectives of:

- "ensuring that technology supports efforts to drive up standards in core curriculum subjects, teaching of key skills, improvement of school effectiveness and the development of lifelong learning
- ensuring that young people leave school and college with the information and communications technology skills that they will need for the 21st Century
- ensuring that the needs of people with special educational needs are addressed"[3]

Notably, Becta was set up as a registered charity, with its trustees tasked with overseeing and steering the organization such that its work reflected government policy. In its first official remit letter of 1998, the government called on the new body to work closely with government ICT initiatives. Becta was also charged with developing the National Grid for Learning alongside the Department for Education and Employment. This work included developing connectivity to schools, developing infrastructure with appropriate managed service provision and developing a content structure for the Grid. Becta also was given a role in supporting and simplifying provision of support and guidance to schools, teachers and teacher-trainers, assisting Government Agencies so that they make best used of NGfL and assisting the Department in monitoring and encouraging schools' progress.

Further roles were identified in these early stages including:

- Monitoring and informing the Department of the potential for education of developments in new technologies and, where necessary, to undertake or commission innovative and independent evaluations
- Supporting the effective use of ICT in primary and secondary curriculum subjects, in school management and special educational needs
- Working in consultation with the Qualifications and Curriculum Agency[4], the major schools subject associations (for example the Association for Science Education, the Maths Association and the Association for Language Learning and the Association for Physical Education) and "others including the commercial supply industry and with the organization established to support the work of Curriculum IT Support Groups.

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[1] *In 1999 Scotland, Wales and Northern Ireland were granted devolved powers from the UK Government to administer their domestic affairs, although they retain representation in the UK Parliament at Westminster. "Domestic affairs" include education. Becta's focus was therefore education in England, although it also built collaborative links with similar organizations in Scotland, Northern Ireland and Wales.*

[2] *English government departments responsible for education went through a series of name changes during Becta's lifetime. For schools, the Department of Education and Employment became the Department for Education and Skills then the Department of Children, Schools and Families. It is now the Department for Education.*

[3] *Department for Education and Employment letter to Chair of the National Council for Educational Technology dated 16 January 1998.*

[4] *The Qualifications and Curriculum Agency was set up under the Education Act 1997 to develop and regulate the national curriculum, assessments in schools and qualifications. In 2007 the government decided to set up an independent exams regulator, Ofqual, which took on most of QCA's regulatory functions. QCA's remaining work was carried on by QCDA until 2010.*

b. The evolution of Becta

A remit or priorities letter, an official directive from government which details the priorities and targets for an organization, is a mechanism used in the United Kingdom to help provide direction and guidance for groups which are technically outside, but closely linked to, government. In the case of Becta, the remit letters served not only to help guide actions by Becta, but, because they are public documents, also helped to inform Becta partners and stakeholder groups of what was expected of Becta, and served as an important mechanism for coordination of ICT/education activities across England.

One notable feature of Becta is that, over its short life, its roles and duties were often changed or expanded, with additional responsibilities and mandates added, as detailed by the annual official remit letters. Highlights of this evolution, as detailed in the remit letters, include:

1998: Becta was required to work closely with the government's Department for Education and Employment. The government department was seen as the policy making body and also held the reins of strategy development. Becta provided expert advice, research support and worked on implementation. Becta was required to work with many different bodies including agencies, teacher organizations, and private sector organizations.

2003: Following a significant review, Becta's role was strengthened, made more strategic, moving towards policy-making and away from implementation.[5]

2007: Becta was required to step yet closer to policy- making, working very closely with the department, and in some cases undertaking roles (such as providing informing policy development and responding quickly to policy issues as they arose) that were previously held within the government department. Becta also was given clear leadership of the implementation of the e-learning strategy across all sectors of education. To achieve all of this Becta was again exhorted to liaise closely with a wide range of additional organizations.

2008: Becta was tasked with contributing to delivery of a wide variety of priorities for the government's Department of Children, Schools and Families (DCSF) and the Department for Innovation, Universities and Skills (DIUS). Becta's priorities for action included: establishing a national professional development program with regional support for workforce and leaders in the effective use of technology (including supporting a network of business leaders as advocates of flexible and online delivery); supporting equity and social cohesion; raising the quality of technology products and services through a system wide National Digital Infrastructure and aggregation of procurement leading to better value for money; considering how the effective use of technology was best embedded in any revision to the inspection process; and identifying professional workforce standards for the skills required by practitioners in the effective use of technology in teaching and learning and in business systems.

[5] *Charles Clarke, then Secretary of State for Education and Skills, stated, "ICT can make a significant contribution to teaching and learning across all areas of the curriculum, and in the teaching that takes place there. As the lead agency for ICT in schools and the learning and skills sector, Becta has a critical role to play in ensuring that ICT is a key element in education in these areas".*

Harnessing Technology – Transforming Learning and Children's Services

Published in 2005, Harnessing Technology – Transforming Learning and Children's Services set out England's e-learning strategy for all sectors of education. It built on Becta's 2005 review which provided a synthesis of schools and post-16 education, noting the "variations in the use of ICT within and between institutions" and how these "lead to inconsistent and widely differing experiences for learners". It noted, "we have little in the way of agreed specifications and standards for issues such as learning platforms; institutions are wasting time and effort on routine procurement administration; and we continue to miss opportunities for aggregating demand to achieve the best deals." The Harnessing Technology Strategy built significantly on Becta research and evaluation of the use of technology in education. It identified a significant number of actions which were allocated to identified partners "with deliverable goals and milestones", stating that "Becta and the Joint Information Systems Committee (JISC) ... provide a powerful focus for using ICT to modernize education and could potentially, in the longer term, contribute to the effective use of IT in children's services."[6]

Roles for Becta are further described in the Harnessing Technology Statement, "The development and implementation of the e-strategy entail responsibilities at four different levels: strategic direction, policy development, coordinating the delivery strategy and delivery itself. We are clear that the first two responsibilities should lie with the DfES[7] itself, advised by Becta and JISC, the Department's lead strategic partners. Responsibility for coordinating the delivery strategy will lie with Becta and JISC[8]. Responsibility for delivery itself will lie with a wider range of partners, including Becta and JISC for specific elements."

Reflection on the change between 2005 and 2007 suggests that in 2005, at the time of publication of the Harnessing Technology e-learning strategy, Becta was perceived as body that would implement government policy and strategy. In 2007 Becta was expected to contribute more significantly to policy and strategy development.

Reference to DIUS developments suggests also further expansion of Becta's role in the skills area. This could be expected to include the work of further education colleges, lifelong learning and training and vocational education. Becta's role as a lead partner in implementation of the Harnessing Technology Strategy pointed also to a greater requirement for developing relationships and working with a wide range of organizations. Those mentioned in the strategy are listed in Annex A.

2009: Becta's close links and alignment in working with the Government departments are reinforced; to some observers this suggested that more effort was needed to work on these relationships; for others this was seen as a simple reminder. Noting Becta's steady progress in the Harnessing Technology Strategy including capacity building brought about through continued use of ICT self-improvement tools[9] by local government and schools, the successful negotiation with regards to school licensing of Microsoft products, and progress with regard to the Home Access Project[10], Becta's work priorities were set out to include the effective delivery and roll out of the Home Access Program; practical solutions to ensure that best practice in e-

[6] *https://www.education.gov.uk/publications/eOrderingDownload/1296-2005PDF-EN-01.pdf*
[7] *DfES was the government's Department for Education and Skills.*
[8] *JISC's primary responsibilities were associated with Higher Education.*
[9] *Self improvement tools included Becta's self review framework which provided a model for schools and their stakeholders to self assess their position and progress in adoption of technology for learning, to prioritize and plan future development and also provided a route to assessment and public recognition of ICT capability through the ICT Mark.*
[10] *The Home Access Program aimed to bring access to technology and connectivity within the reach of disadvantaged children and families.*

learning is available and accessible across the system; and best practice for 14-19 partnerships and consortia of providers based on a clear vision on the use of ICT to support objectives for young people. The need for Becta to develop robust processes which provide assurances of effective delivery of its remit were emphasized as well as the need for Becta to share its knowledge of the system and its ICT expertise with the Department and the group of organizations with which the Department was working.

Becta funding

Becta was a government funded agency. A guide to the level of Becta's budget is set out in Becta's remit letter date 19 March 2009[11].

The letter states, under the heading "Funding, Efficiency, Reducing Burdens and Sustainable Development":

> "To deliver the priorities set out in this letter, Becta's baseline budget for 2009-10 is £108,785,000 which comprises £62,585,00 program and running costs, £6,300,000 capital and £39, 900,000 capital for Home Access. See Annex A attached for reference.
>
> Included in the £62,585,000 is £396,905 we expect Becta to make in efficiency savings in 2009-10. Becta must ensure that these agreed efficiency savings are recycled into front-line activities.
>
> We expect Becta to play a prominent role in policy discussions about the role of technology in addressing challenges within the current economic climate. In particular we would like Becta to play a lead role in developing propositions to achieve future efficiencies through new approaches to technology systems and infrastructure in the different sectors of education and training."

As noted above the Remit Letter's Annex A provides further budget details and which can be found at the web address given below.

Becta's closure

A new government was elected in May 2010 and later that month it was announced that Becta was to be closed. Becta was finally closed in March 2011, at which time some of Becta's functions were taken over by other organizations:

- Policy development, liaison and support function – *transferred to Government Department for Education*
- Research and analysis function – *transferred to Government Department for Education and the Institute of Education*
- Development of relationships with private and public sector suppliers – *transferred initially to the Department for Education*
- Information regarding Becta led work continued to be made available through a range of websites. These included the ICT services framework, self-review framework and the information management strategy framework.

[11] http://www.teachfind.com/becta/about-becta-becta-remit-becta

c. Post-Becta analysis

Many views[12] have been expressed on Becta's closure. Some reflect views of those who supported or had particularly benefited from Becta's work. Other views are from those did not agree, at least in part, with some of the positions taken by Becta and the way in which the organization operated.

The following observations arise from conversations and interviews that reflected on the organization's strengths and weaknesses, and what might be learned from Becta's experience.

Becta's role and relationship with government and policy

Becta was an institution that was initially designed to enable an education world that knew little about technology to make sensible decisions about its adoption. To fulfill this role, Becta became involved in: developing research and evidence; developing procurement and purchasing systems and strategies; and leading opinion. Becta's remit letters over the years demonstrate that, over time, Becta was drawn closer to government policy making. While its role in policy making and policy implementation brought Becta close to its sponsoring government department, its role in other areas such as regulation and the development and management of procurement demanded independence. ***The tension between the need for independence and closeness to government created challenges for Becta.*** Some believe that Becta could have been better positioned if greater priority had been given to communicating good practice, stimulating communities to encourage those communications, and providing advice on government policy.

Changing remit

Becta's remit sometimes appeared unclear and complex, not least when that remit changed annually. Simplification might have been achieved through making it a five year remit with an annual review of priorities. Managing the remit in this way could have improved focus and ensured that more projects and programs were seen through to completion. Some commentators reflected that Becta's remit was not always clearly linked to government priorities. Clearer lines between government priorities and Becta's remit could have helped relationships between government agencies; provided their roles were made clear and their joint aim for education was self-evident.

Risk taking

Becta's organization and behaviors were perceived to be close to those of a government department with similar approaches risk. Some suggest that greater independence from government would have encouraged a more risk taking and an entrepreneurial approach within Becta, and that approach might have been beneficial. Constraints such as those associated with the auditing of public finance expenditure meant that established and agreed measures had to be used in assessment. *One example*: When Becta sought to identify recipients of computers associated with their Home Access Program, assessment of deserving cases had to be auditable. As a result, existing measures of relative wealth, such as an individual's qualification for free school meals, had be used to identify qualifying children or families, while other measures, such as the lack of access to connectivity and computing, lack of access to learning, and actual wealth were not acceptable.

[12] *During the preparation of this case study, interviews were conducted with a range of stakeholders and interested parties including teachers, former senior staff in other agencies and in Becta, former Ministers, industry representatives and education commentators.*

Becta prescription and regulation

Becta had roles both in terms of implementation of policy and in regulation of education technology industry. ***This mixed role was difficult to achieve.*** Regulation took the form of procurement frameworks. Commercial IT companies had to comply with, then apply to be accepted on to procurement frameworks, for example, for Learning Platform providers; schools or Local Authorities would then select their suppliers from the framework.

The frameworks received a mixed response, particularly from the ICT industry. One criticism was that once a product or organization was accepted on to the framework, there was little assessment of continuing suitability and whether the product or organization continued to meet the standards required by the framework. A further observation regarding the frameworks was that they could work against innovation. Some participating organizations would be inclined to work to the minimum standards required by the frameworks. With a more open approach greater effort might have been put into development and maintenance of good working relationships between the supplier and their client.

ICT policy, implementation and accountability

Becta, in the judgment of some observers, was at its best when its work was closely aligned with government policy priorities. An example of good alignment was in development of the Home Access program. The policy sought to give access to technology and connectivity to families that were otherwise excluded and the program worked directly to provide that access. As a result of the close alignment between policy and Becta's implementation, the program was widely understood and supported. ***Becta programs were not as well understood and supported when they were not commissioned as part of broader government change programs.*** There is a fine balance between being perceived as an honest broker and in an independent and expert role, and being viewed as interfering as when setting standards and constructing frameworks with which other parties must comply.

Becta's approach to evidence and research

Some consider Becta's research to be its most important contribution to the development of technology in support of education, both domestically and internationally. However, ***concern has been expressed about the Becta's role*** **both** ***as developer of an agenda for ICT in education*** **and** ***as a commissioner of research***. Some consider Becta was over reliant on its own research rather than drawing on that of other groups. At the same time, there is a counter view that Becta was at the forefront of the development of technology supported learning and as such, had to conduct its own research. It was suggested also that Becta could have undertaken more by way of international benchmarking and also drawn more on research from around the world.

Relationships

Becta was perceived by many educationalists in the sector as an 'honest broker' which, while taking forward government policies, did so in a fair and independent way, drawing on its specialist expertise. Becta had strong relationships with Local Authorities leading to influencing mechanisms that were reasonably effective and could help to drive real change in classroom education. However, some feel that Becta could have done more to position itself well with stakeholders. Its relationship with industry was perhaps particularly challenging. "Representing the interests of education to industry" seems a reasonable role, perhaps only if industry's roles in innovation and its interest in developing and improving its products are acknowledged. ***The combination of representing the interests of education to industry can be particularly challenging when it is combined with quasi-regulatory roles.***

d. Conclusions and recommendations

Becta was established in 1998 and closed in 2011. Initially much of its focus was on building a National Grid for Learning. While Becta existed, it worked closely with government, its agencies, with Local Education Authorities, schools, teachers and pupils to develop the use of technology to support learning in schools. In that period also, use of technology changed from something that was considered to be the domain of computing teachers, to something that affected every teacher. Some of its work was particularly successful and had significant positive impact, some less so. Its ImpaCT2 studies demonstrated learning gains that were possible through technology supported learning.

Becta's experience may offer those who study it evidence of successful organizational arrangements, policies and implementations of the use of technology to support education, and how to achieve similar success in a range circumstances. It may also offer an indication of approaches that were less successful and therefore to be avoided.

The **remit letter** was an important tool used to help provide strategic direction for Becta. An examination of the various remit letters which helped define Becta's strategic objectives and priorities over time suggests the following key lessons:

- *If an agency is set up to address technology in education*, it is important that the government consults that agency. Consultation is likely to help the agency develop its expertise and is likely also to add weight to perception of the agency.

- *If the overarching purpose of the agency is to change culture within education with respect to the adoption and adaptation of technology for education*, then differing periods of cycles should be recognized. Political cycles may be 2-5 years or more, depending on the political systems within countries. Academic cycles are typically one year. The cycle of cultural change is generally viewed as much longer. So the structure and remit of the agency should be such that life of the agency is long enough to meet its overarching purpose.

- *The model of a multi-year remit letter, with potential to adjust priorities within the letter at shorter notice may be one way to provide stability, confidence and appropriate flexibility rather than in making major changes annually*. While allowing change in the agency's overall remit is a good idea, it is important for the confidence of the education community and the success in education of students that projects are completed or ended appropriately before moving on to new priorities.

- *A clear remit that can be related directly to government policy in education could help to add weight and strength to the agency's work*. The ICT agency's remit could for example associate its success to progress in development of access to learning, in child literacy or in the costs of teaching if these are parts of government policy. Such wider, but specific aims could improve the perception of the agency by government departments and their officers, and also in aligning the work of the ICT agency with other education bodies and agencies.

Based on the Becta experience, some additional conclusions can be drawn of potential relevance to similar institutions in other countries:

Leadership and staffing should reflect the major focus of the organization. Care should be taken with the focus of the agency: Is its focus technology, or should the greater focus be on pedagogy for use of technology, or some other application of technology?

Roles of different players within the structure should be clearly defined. These players include sponsoring government department, the board of the agency, and the executive of the agency.

Attention should be paid to the expected role of the agency. If it is intended that the agency act as an arm of government and to take on the behaviors of officers of government then this should be explicit. If, however, it is intended that the agency use its arms-length role to be more entrepreneurial and willing to take risks then that should be made clear. In each case, leadership and staffing should reflect the role and expected behaviors within the organization.

Development of good working and influencing relationships is likely to be critical to success of an ICT in Education Agency. If it is agreed that development of good working and influencing relationships is critical, then the roles of the agency and its leadership and staffing should be appointed with that in mind. For a long standing agency, relationship building and development should be considered as part of the professional development undertaken by agency staff.

Care should be taken with combinations of standard setting and regulation responsibilities with influencing and supporting. In England many agencies divided responsibilities between different bodies such as the Qualifications and Curriculum Development Agency which passed its regulatory responsibilities to Ofqual. Splitting in this way reduces the risks of conflict between regulatory and other roles.

Those developing the strategy for an ICT in Education agency should consider whether its aim is to build dependency or to build capacity. If expertise and knowledge is held within the agency then dependency of schools and other organizations may also be sustained. However, a capacity building approach may be more successful in developing a rapidly improving system in which the improvements are sustainable because of well-developed ownership and understanding of the school community. Tools such as Becta's *Self Review Framework* can help to build that capacity within the system and can make a contribution to developing networks and communities of practice that in turn contribute to sustainability.

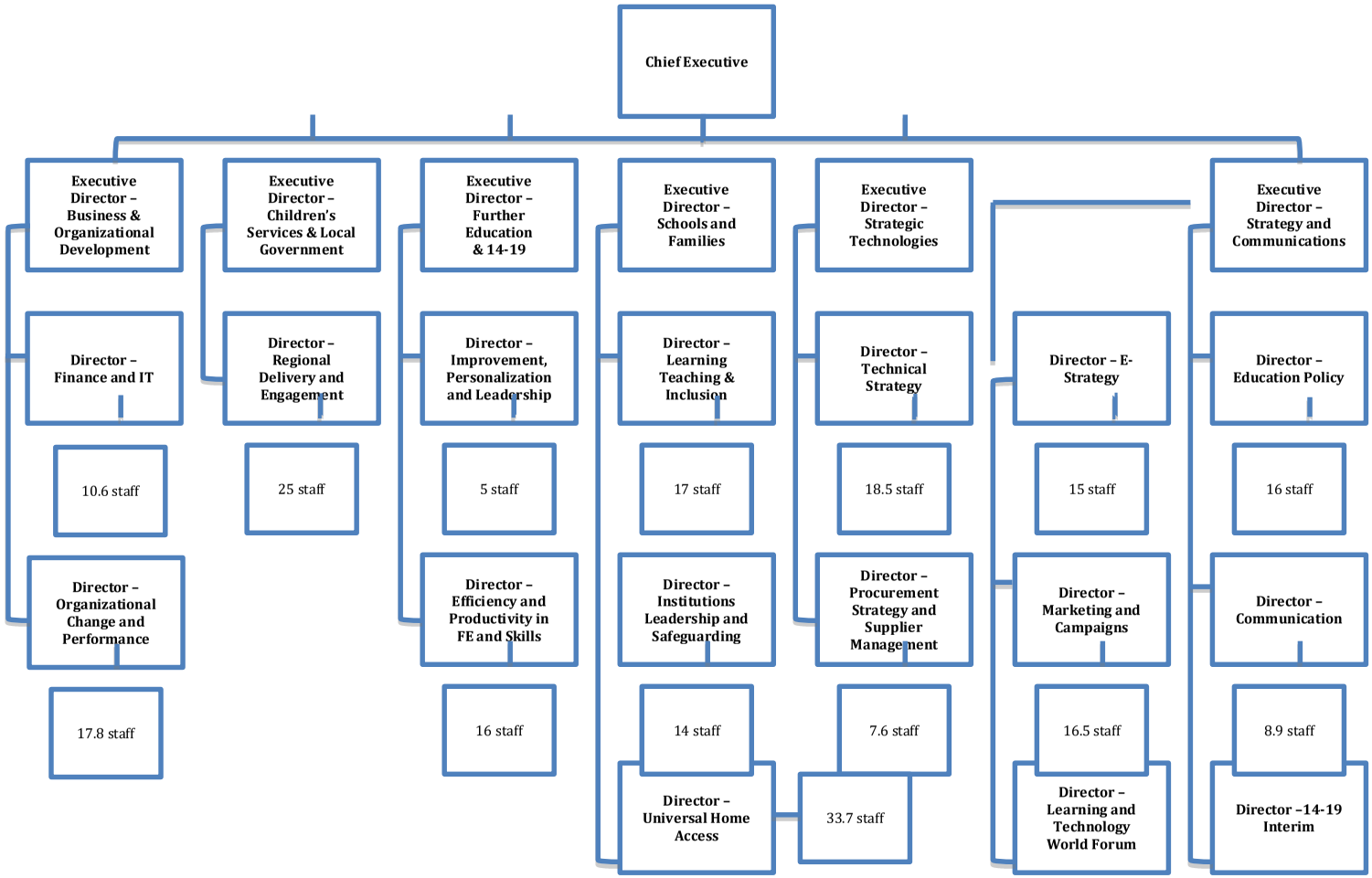
Care should be taken to avoid the risks of developing research to justify predetermined policy -- evidence based policy making would seem to be a better approach. The initial objectives were to have Becta promote good and valuable uses of technology at a time when a small number of schools were IT literate and IT interested. When developing research, it is suggested existing sources domestically and internationally should be recognized, and new research commissioned to fill particular gaps and to explore particular areas of special interest.

Becta's closure following the introduction of a new government in 2010 may lead some readers to the conclusion that this is a cautionary tale, given a sense of loss given all that was invested through Becta in developing the use of information and communications technology in schools in England. It certainly is a cautionary tale if you have a similar agency and you want that agency to continue its work.

However, Becta's rise and fall can be viewed in another light. Becta's research provided important and persuasive evidence of what worked when it comes to technology and education, its tools helped build capacity and community around the use of technology for learning, it contributed to the development of strategic leadership of ICT. It sought to develop procurement practices that would bring best value for public investment in technology for learning and it acted as a point of aggregation of demand for companies working in education technology.

Becta's existence helped to provide access to technology and to change attitudes to technology for learning, attitudes that will help form the foundations of future development. Perhaps the important thing is that such organizations do not need to last forever, but that their influence should last beyond their own lifetime.

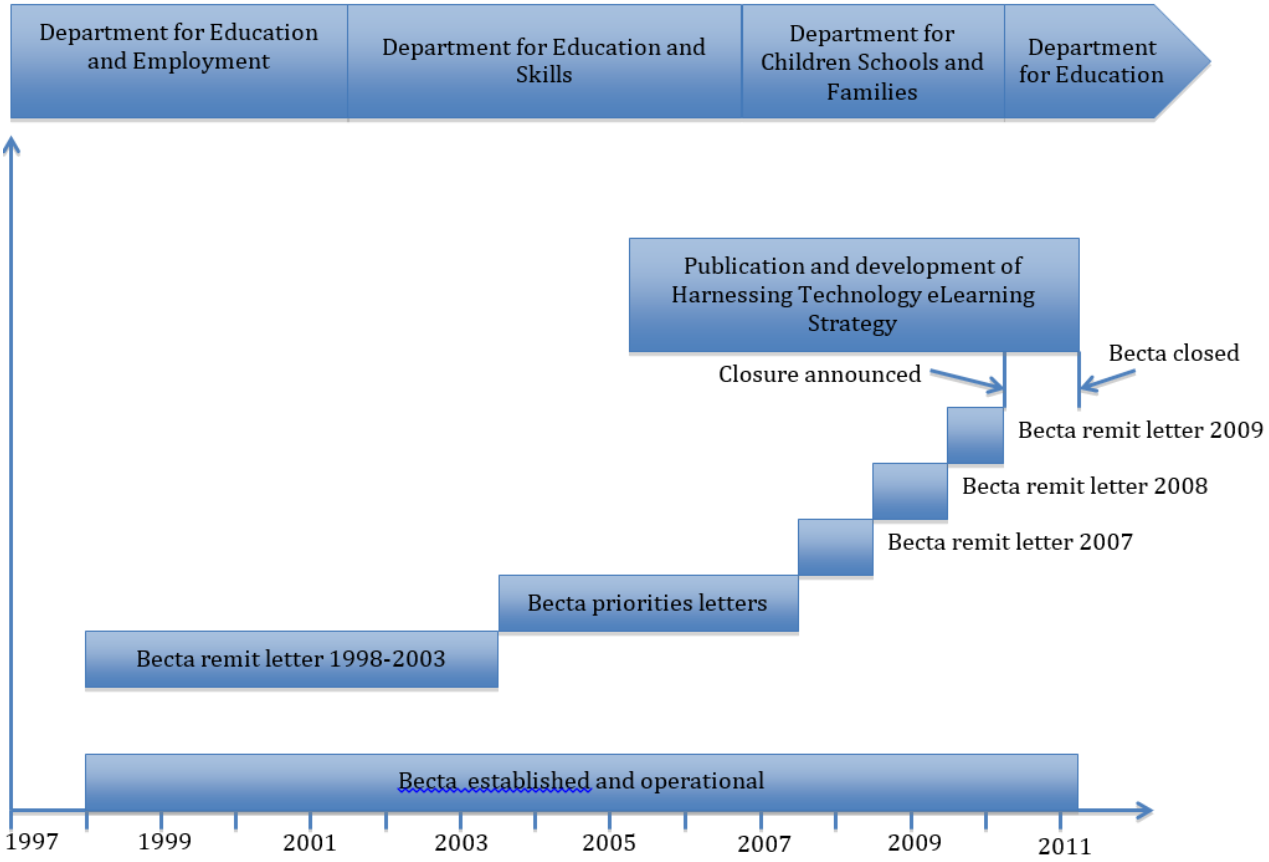
Annex A: Becta organogram (October 2010)[1]



[1] Note: Where figures such as 17.8 staff are quoted in the organogram above, they represent the full-time equivalent Becta staff working in the area concerned and reporting to the relevant directors or executive directors. The figures are calculated from the Becta organogram at http://media.education.gov.uk/assets/files/pdf/b/becta%20organisation%20chart%20as%20of%2030%20june%202010.pdf published at 30 June 2010.

Annex:
Becta: Timeline

Becta: Sponsoring government department



Annex:
Becta: Key governing documents

Remit letter 1998-2003: Development of National Grid for Learning including schools' connectivity, technical infrastructure, service provision and content structure working closely with Department for Education and Employment

Priorities letter 2003: Following review Becta's role strengthened and began to move closer to policy making

Harnessing Technology E-learning Strategy: Becta took on playing the lead role in developing and implementing the Harnessing Technology eLearning Strategy

Remit letter 2007: Becta encouraged to work yet more closely with the Department for Children Schools and Families and encouraged to liaise closely with a range of additional education focused organizations

Remit letter 2008: Becta encouraged to develop a national professional development program for effective use of technology; to raise quality of technology products and services through aggregation of procurement and identifying professional workforce standards

Remit letter 2009: Becta directly supporting Departmental priorities such as the Home Access program providing computers and connectivity for disadvantaged groups

Sources

This paper was informed by conversations regarding Becta held with a range of stakeholders. Among these interviews (via email or face to face) were conversations with the following parties:

- Charles Clarke, former Secretary of State of Education and Skills
- Dawn Hallybone, primary school teacher and expert technology practitioner
- Bob Harrison, education advisor to Toshiba and former consultant to Becta
- Professor Rose Luckin, London Knowledge Lab and former Becta Board Member
- Niel McLean, former Executive Director, Becta
- Steve Moss, former Director, Partnerships for Schools
- Dr Vanessa Pittard, former Director of Research and Evidence, Becta
- Dominic Savage, Director General, British Education Suppliers Association, former Becta Board member
- Tony Richardson, former Executive Director of Strategy, Becta
- Lord Knight of Weymouth, former Minister of State for Schools and Learners

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

5

Lessons from Chile (Enlaces)

Eugenio Severin

in this chapter …

Executive summary

The *Enlaces* program has been responsible for the implementation of projects exploring the use of new technologies in education in Chile for over two decades. Born in 1992 as a small pilot project, Enlaces grew and evolved over time to become part of the permanent structure of the country's Ministry of Education. Its implementation strategy can be characterized as one 'from the periphery to the center', both in its territorial deployment and in the manner in which it was gradually institutionalized.

The main focus of Enlaces has been to support the computerization of schools and to support teachers to incorporate the technology into their teaching practices. For most of its history, Enlaces has enjoyed committed political and financial support from Chile's national education authorities. From its inception, Enlaces has been built on strategic alliances with regional universities, schools, and the private sector, each of which has played a leading role in the development and success of Enlaces. The program's commitment to follow a 'logical path', by supporting traditional structures and actors within the education sector, resulted in a slower implementation of new technologies in schools than in many comparator countries, and over time the program struggled to demonstrate significant impacts on educational outcomes, as traditional educational practices did not change significantly. As its program became institutionalized within the Ministry of Education, Enlaces became more embedded within, and dependent on, official bureaucratic structures and education policies, constraining the ability to innovate and remain flexible which characterized its early years.

a. Setting the stage for Enlaces: Context

In the early 1990s, the Chilean government initiated a transition to democracy under President Patricio Aylwin. Sustained spending growth on education – at a level above growth in GDP – had characterized the Chilean economy for over 90 years. Aylwin sought to redefine the role of education in achieving solidarity and a more just society, as well as to redefine the status of the teaching profession – something that challenged some of the statutory provisions which had traditionally provided various protections for teachers.

With quality and equity the dual educational priorities for the new democratic government, a new project, "Programs Improving Equity and Educational Quality" (MECE), was introduced with support from the World Bank.[1] Global movements and trends to explore the uses of emerging information and communication technologies (ICTs) to help meet developmental objectives resonated with key figures on the technical staffs of agencies in the new government. In this context of political and social change and high expectations related to the potential utility of ICTs in education, a small pilot project began at School E-209 in Santiago to explore potential uses of computers in education. The project was led by a multidisciplinary group of researchers from the Catholic University of Chile, consisting of engineers, teachers and psychologists, in partnership with the Ministry of Education. This general model, where professionals from different disciplines led a small pilot project before proceeding with an activity at a larger scale, informed the evolution of educational technology efforts in Chile in subsequent years.

As part of the negotiations with the World Bank to fund the MECE – the first major intervention of the new democratic government in the education sector – national authorities expressed an explicit desire to integrate educational computing within the larger package of new measures and initiatives aimed at ensuring quality and equity in education in Chile.

The development of Chile's national program to introduce new technologies in education – *Enlaces* ("links") – can be divided into three stages: from its origins to 1995; between 1996 and 2005; and after 2005. This paper will consider each of these stages in turn.

[1] *Cox, C. (ed.) (2003). Políticas educacionales en el cambio de siglo: La reforma del sistema escolar de Chile. Santiago: Editorial Universaitaria.*

b. From a public policy experiment to a national program (pre-1995)

The Enlaces program was officially created by the Ministry of Education in 1992 during negotiations with the World Bank related to MECE. The founding mission of Enlaces was to improve the quality of education by integrating educational computing across the school system, according to the needs of the emerging 'information society' and to promote the development of a 'digital culture". Specifically, a national educational network comprising all government-subsidized schools utilizing ICTs was to be established.

The vision of Enlaces was typical of its young team, mainly drawn from the world of academia, which advocated for a *gradual* appropriation of new technologies by Chilean teachers as the approach most likely to succeed. One of the foundational decisions was to focus initial activities outside of the capital city of Santiago and to associate closely with a university. As a result, Enlaces began in 21 schools in 1993 in Chile's ninth region of Araucanía, one of the poorest regions of the country which had a high rural population, including many people who belonged to the majority indigenous population of Chile, the Mapuche. The project was led by a group of professionals who, two years later, would create the Institute of Computer Education at the University of La Frontera. "If it worked in Temuco, then it could work anywhere in Chile",[2] recalled one of the project's early leaders, and the variety of challenges confronting the project in this region were seen to be broadly relevant to a representative of many related key challenges across the country.

In support of the MECE project, Enlaces deployed necessary network infrastructure, ICT equipment, software and corresponding digital learning resources. The implementation strategy focused on promoting teaching with the use of technology, training teachers, providing workshops for students, providing digital educational resources and infrastructure to enrich the curriculum, and providing teachers with new teaching tools. According to Pedro Hepp, the first director of Enlaces, an important decision guiding the program in its first stage was that computers would be *a means, and not an end*, so that the goal would be to *learn with* computers. The integration of urban schools in the cities of Temuco and Santiago into Enlaces occurred alongside the expansion of the project into smaller cities and rural schools, including (in 1996) to some of the country's most remote regions.[3] This expansion was enabled by linkages to regional support networks centered around local universities. As the program grew to encompass 183 schools and became more connected with multiple regions and universities, the largely unstructured institutional relationships between organizations which characterized the early days of Enlaces slowly solidified and were formalized. This introduced some restrictions and rigidities into the project, constraining somewhat the great deal of management autonomy with which Enlaces operated in its early years.

Beginning in 1995, preparations began for national expansion of the program. The program was meant to grow 29 times larger in a period of five years to encompass over half of the schools in the country -- even including schools in remote regions like Easter Island and Antarctica.

[2] *Entrevista a Pedro Hepp, Director de Enlaces 1992 - 2000 [Santiago, 24/8/2007].- en Enlaces, "El Libro abierto de la Informática Educativa", Centro de Educación y Tecnología del Ministerio de Educación, 2010.*
[3] *Enlaces. (2004). Proyecto Enlaces Expandido. Santiago: Ministerio de Educación de Chile.*

c. Expanding Access (1996-2005)

Chile's new government, led by Eduardo Frei Ruiz-Tagle (1994-2000), initiated major changes in Chile's education system as part of a new educational reform process. New government programs presented a new set of operational challenges for Enlaces, especially related to *scale*. New strategic and operational partnerships with both academia and, increasingly, private companies, were developed. Large tenders for the purchase of hardware and educational software began. Telefónica CTC Chile offered free Internet access to schools beginning in 1998, and in 2001 Fundación Chile supported the development of an online educational portal.

The Ministry of Education assumed that computers and information networks were increasingly present in all areas of human activity, and a redesign of the curriculum to reflect this reality was initiated. Enlaces became a much more visible presence in schools with the inclusion of computer education in the curriculum of secondary education. Critically important to the growth of Enlaces in this period was strong support from the Ministry of Education and in the Treasury, which meant that the program was largely sheltered from the effects of the global economic downturn that began in 1997.

In 1996, the Technical Assistance Network Enlaces (RATE) was born. RATE, a partnership between the Ministry of Education and a group of universities, was new and unprecedented within the history of Chilean education. Six universities were designated as “zonal centers” and in turn coordinated with 18 other universities, which served as executing units within Enlaces. RATE provided technical and pedagogical training for teachers, enlisting trainers specialized in educational computing in primary and secondary schools. The fact that Enlaces utilized such specialized teachers proved to be very motivating for teachers, as it enabled a regular dialogue with professionals who had received the same training. Additionally, the program distributed educational resources, applications, software and educational sites -- all selected for their educational value to support teaching -- on CD-ROMs every year to all schools in the network.

Growth meant that Enlaces had to place a higher priority on its management structure. The large increase in the number of teachers and schools involved in the program, and the large tenders for procuring hardware and software, made the undertaking increasingly complex. While national coordination of the program remained headquartered in a regional university (Universidad de la Frontera), the increased budget and increasing visibility of the project required closer coordination and support from the Ministry of Education. Videoconferencing links were established to facilitate more regular dialogue between the management team in Temuco with the Ministry, other state agencies and the private sector based in Santiago.[4] The core teams in Temuco and Santiago grew in number and complexity.

In 2000, under the new government of Ricardo Lagos Escobar (2000-2006), the Enlaces team moved to Santiago and decision making was centralized. At this point, Enlaces had a presence in all urban schools, and focus increased on expanding the program to the remaining rural schools not yet participating in the program.

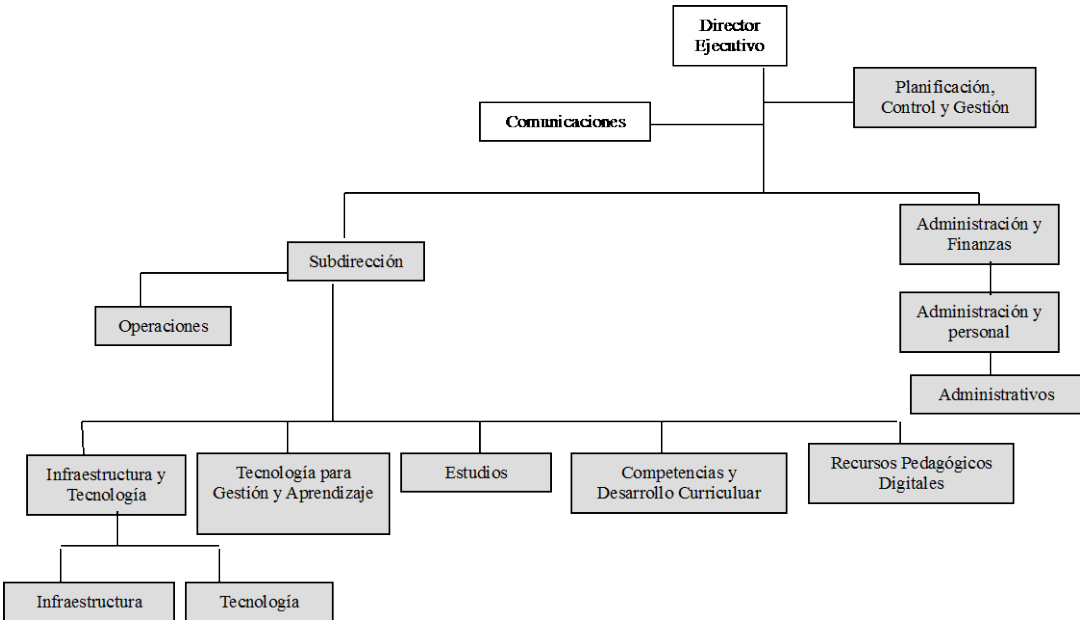
The partnership with Fundación Chile that began in 2001 enabled the creation of national educational portal (Educarchile), merging many separate educational sites into an autonomous portal, in collaboration with public, private and philanthropic partners. This relationship allowed access to new financial resources and alliances with third parties, as Fundación Chile had a large amount of institutional flexibility and was not tied to the rigidities

[4] *Hepp, P. (2003). “Enlaces, el programa de informática educativa de la reforma educacional chilena en políticas educacionales en el cambio de siglo”, in: Ed.Universitaria. Santiago de Chile 2003: Mineduc.*

of the public system. That said, tensions associated with growth brought with it new challenges related to how the Ministry of Education, the Enlaces program and Fundación Chile were publicly recognized for their work.

The challenges of Enlaces leading up to 2006 focused primarily on completing the program's coverage in all rural areas, including both hardware and software distribution as well as the training of teachers, with a major emphasis on the provision of digital educational resources.

***figure 1*. Enlaces organizational structure (2007)**



d. Integration into teaching and learning — and the demand for impact (post-2006)

For its first dozen years, Enlaces functioned as an educational technology project embedded within a larger national strategy in Chile to improve equity and the quality of education. Beginning in 2006, the program was transformed into the 'Education and Technology Center of Chile -- Enlaces', with its functions and structure strengthened and centralized under the Ministry of Education. The stated objectives of this 'new' Enlaces were to provide "support to schools to make classes more effective, develop new ways of learning, and develop digital skills in teachers and students". Enlaces was to play a leadership role coordinating public policy related to educational computing and to play an active role in promoting digital literacy of Chilean citizens. As a practical matter, this meant that there was now a greater emphasis on educational and learning practices than on the distribution of ICT equipment, and the management of Enlaces had greater autonomy over its own activities. At the same time, favorable economic conditions associated with high international copper prices – Chile has long been the world's highest producer of copper – helped accelerate a great expansion in Enlaces between 2007 and 2010. With the expansion of the activities of Enlaces came new tensions, especially as there were now greater pressures for Enlaces to demonstrate that its work was resulting in better learning outcomes.[5]

While Enlaces is credited with helping to bring about more favorable social attitudes related to the use of new technologies in schools, within Chile itself, concerns grew about the potential negative impact of such technologies across Chilean society. Questions were raised about whether the rapid growth in the availability of new technologies was actually helping to raise the quality of life for Chilean citizens. While Enlaces was lauded for its efforts to expand access to computers and the Internet within schools, it was also noted that this increased access did not bring about corresponding growth in achievements on international examinations such as TIMSS.[6] Was ICT use in schools contributing to higher quality learning? Researchers were not sure.

At the same time, a growing movement of discontent with the quality of education in Chile was emerging, expressed in mass protests and the increasingly mainstream perception across the country that, despite the investments that had been made, students -- especially those in public publicly-subsidized schools that educate 90% of all Chileans -- had serious difficulties in achieving satisfactory results in national and international tests. This meant that education policies were increasingly focused on other areas (institutional reforms, targeted programs, better working conditions for teachers, changes in higher education), which resulting in a diminished visibility and political priority for educational technology initiatives like Enlaces, even if such programs still accounted for a high percentage of investments in the education sector.

Changes in project leadership teams, changing institutions, increased expectations for student achievement, and an increase in funding for Enlaces meant that the program was going to face significant new challenges in the coming years. In 2008, a new national plan, "Technologies for Quality Education" (TEC), aimed to increase the educational use of technology in schools, especially at the classroom level. A 'new deal' was established

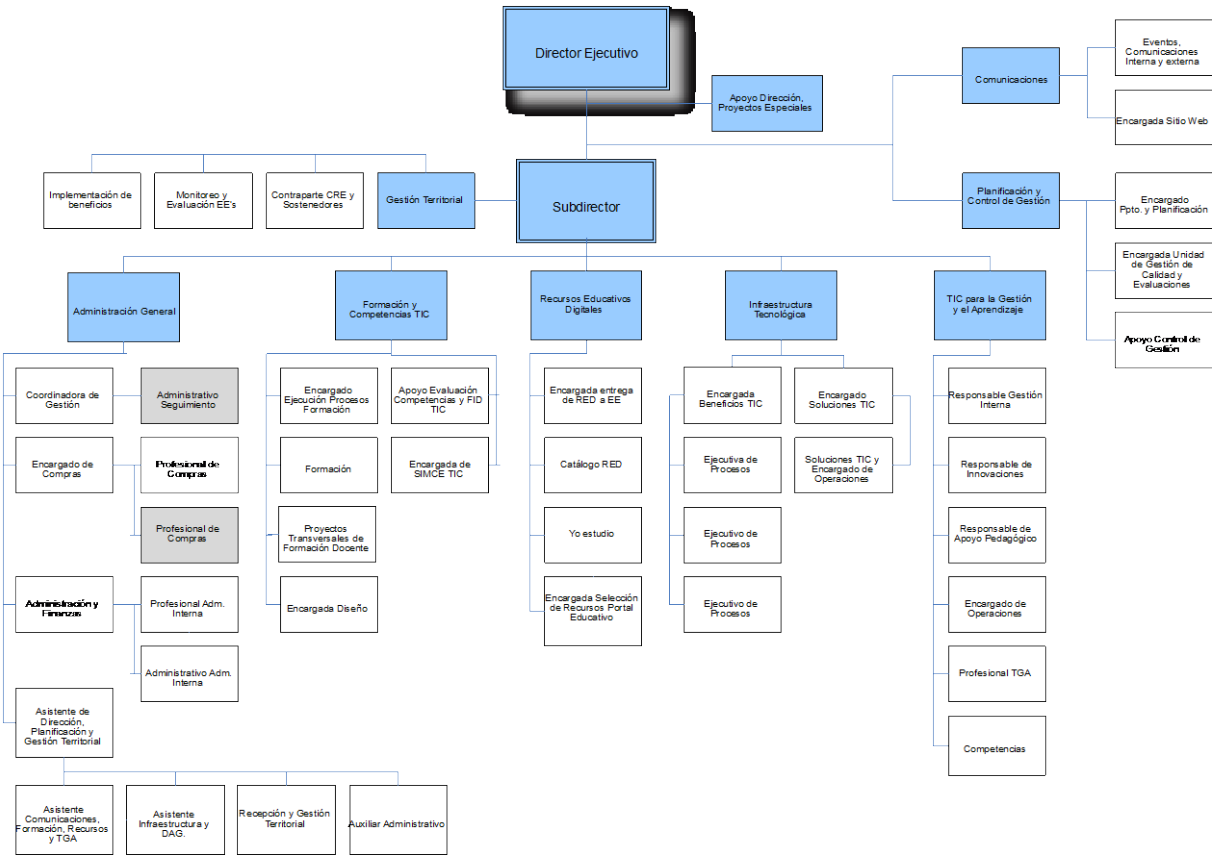
[5] *Rosas, R., Cox, C., & Saragoni, C. (2002). Evaluación de la Apropiación y Uso de Recursos Tecnológicos del Proyecto Enlaces por parte de las Unidades Educativas. Santiago: Pontificia Universidad Católica de Chile, Escuela de Psicología.*

[6] *Programa de las Naciones Unidas para el Desarrollo (PNUD). (2006). Informe sobre desarrollo humano 2006: más allá de la escasez: poder, pobreza y la crisis mundial del agua. Madrid: Mundi-Prensa Libros; Cancino, V & Donoso, S. (2004). "The educational computer program Chilean educational reform: A critical analysis", Revista Iberoamericana in Education, No. 36, 2004.*

between the Ministry and participants and stakeholders in the Enlaces program, whereby the Ministry committed to provide technical computing facilities while other groups became responsible for their installation and maintenance. In 2009, the Digital Educational Resource Catalog (RED) web site offered schools and colleges a tool to understand and select digital resources to support the implementation of their own educational plans. A pilot Mobile Computer Laboratory (CML) project introduced '1-to-1' computing for students via the introduction of mobile pushcarts that could be shared between classrooms in 1500 municipal establishments.

In early 2010, a massive earthquake rocked Chile. As a result, the first priority of much of the education sector focused on reconstruction. Building on earlier investments under Enlaces, an online training program (www.yoestudio.cl) functioned during this period to help reach teachers and students in affected zones and functioned in many ways as an online or 'virtual' school. In November 2011, a new ICT-related assessment was added to the national SIMCE examination scheme, further demonstration of how ICTs were being integrated within the Chilean education system. That said, around the same time a new wave of student protests began, and Enlaces began to feature less prominently in Chile's overall educational policies.

***Ffigure 2*. Enlaces organizational structure (2011)**



e. Conclusions and moving forward

The original objectives of Enlaces were met: Almost all Chilean schools had access to computers and the Internet; teachers, students and families did as well; and many digital educational resources became widely available. The program was especially successful in promoting equal access to students in poorer and more remote communities.

The most significant achievements of Enlaces include:

- *Reducing the digital divide among teachers.* By 2012, it was estimated that Enlaces had managed to train almost all Chilean teachers in the basic use of ICT. That said, important challenges remain related to supporting the ongoing of teachers over time, and, more importantly, the development of skills related to the use of ICTs within existing specific learning contexts.
- *Reducing the digital divide among students*. A survey in 2004 noted that 85% of students went to schools where computers and the Internet were in use, regardless of the quality or nature of the school or the socioeconomic status of its students.[7] The figure grew to 96% in the 2006 survey, and 99% in the 2009 census.
- *Reducing the digital divide in families*. Enlaces helped introduce the tools of the digital age to parts of the Chilean population which were not -- largely because of socio-economic factors -- participating in the expanding and increasing dynamic markets for ICT products and services.
- *Improving perceptions related to the use of ICTs in education*. Today there is a high demand for ICT use throughout the Chilean education system, which suggests that circumstances are potentially favorable for the introduction of new education policies that can take advantage of these technologies.

Enlaces began as a small team of dedicated and highly motivated professionals who operated at the margins of the Ministry of Education, and in close collaboration with academia. In its early years, program enjoyed broad levels of autonomy to innovate, and its leaders took advantage of this freedom and flexibility to innovate. As Enlaces developed, it became more 'institutionalized', a phenomenon that brought with it enormous advantages related to funding; coordination across government ministries; greater access to high level education decision makers; a larger geographic footprint across the country; and greater legitimacy with individual school leaders. At the same time, this had some drawbacks as well, as reflected in a growing difficulty to develop bold and innovative strategies; an increased bureaucracy; a slowness in the development of design processes and the implementation of projects; and more dependence on larger government policy cycles and priorities.

Going forward, the program today faces two key challenges if it is to stay relevant and important within the country's larger educational context and policies:

1. *Greater emphasis on aligning educational computing policies and practices with national educational policies to achieve better learning outcomes.*

The challenge of access within schools to ICTs is largely considered to have been 'solved' in Chile. Chilean teachers today have a generally positive view regarding the use of technology; students and families consider that technologies are an important part of the training process in schools. Challenges remain, however, in utilizing new technologies to help change traditional teaching and learning practices in ways that are positive and impactful. In most Chilean schools, available technologies are used far less than might be

[7] *Data courtesy of the Education and Technology Center of Chile – Enlaces (2005)*

expected, given their relative abundance. Where they are being utilized, such use largely supports traditional educational practices, rather than encouraging and enabling innovation.

2. *A more flexible and lightweight organizational structure, better connected to sources of innovation and international experience.*

While its incorporation within the Ministry of Education allowed Enlaces to grow in size and legitimacy, it also took the program away from the flexibility and innovation that characterized its activities in its early years, when it was closely linked with local universities and efforts within individual regions.

What is the 'best' organization model for Enlaces going forward? Is it possible to regain some of the early momentum that characterized Enlaces in its 'start up', phase, embracing and promoting the development of pilots and evaluations, as well as possibly exploring the potential relevance of ICT use to emerging alternative educational models, while at the same time maintain the high level political support, organizational linkages and funding necessary so that it can have an impact at scale across the education system? As the worlds of education and technology continue to evolve, so to must the structure and activities of Enlaces evolve to help meet them.

Annex: Data

***table 1*: Enlaces: Student-computer ratio**

***table 2*: Enlaces: School connectivity**

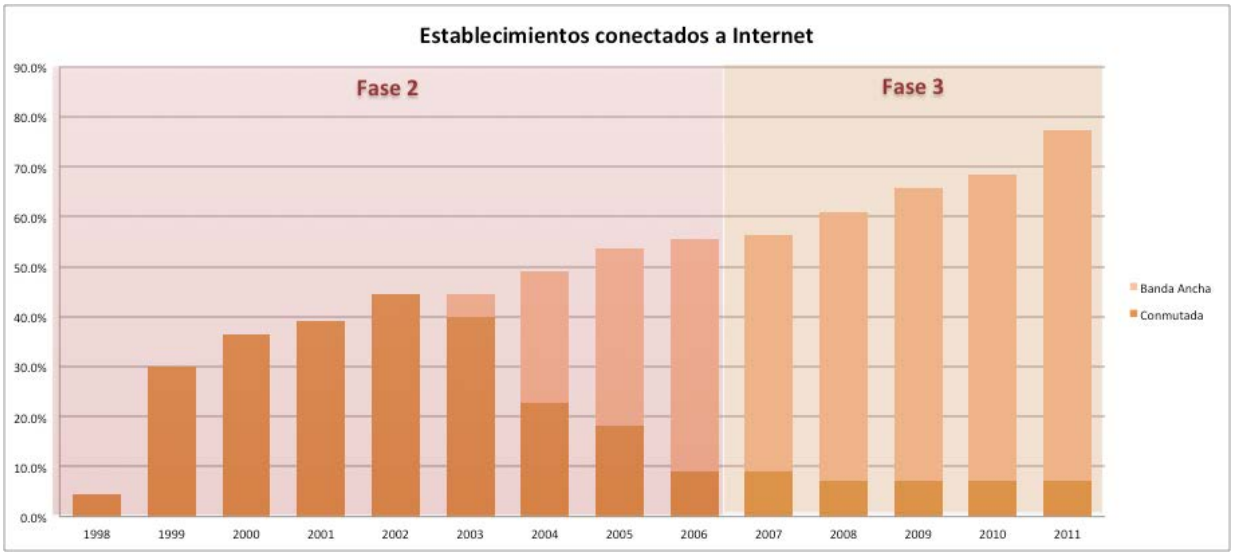


***table 3*. Enlaces: Budget**

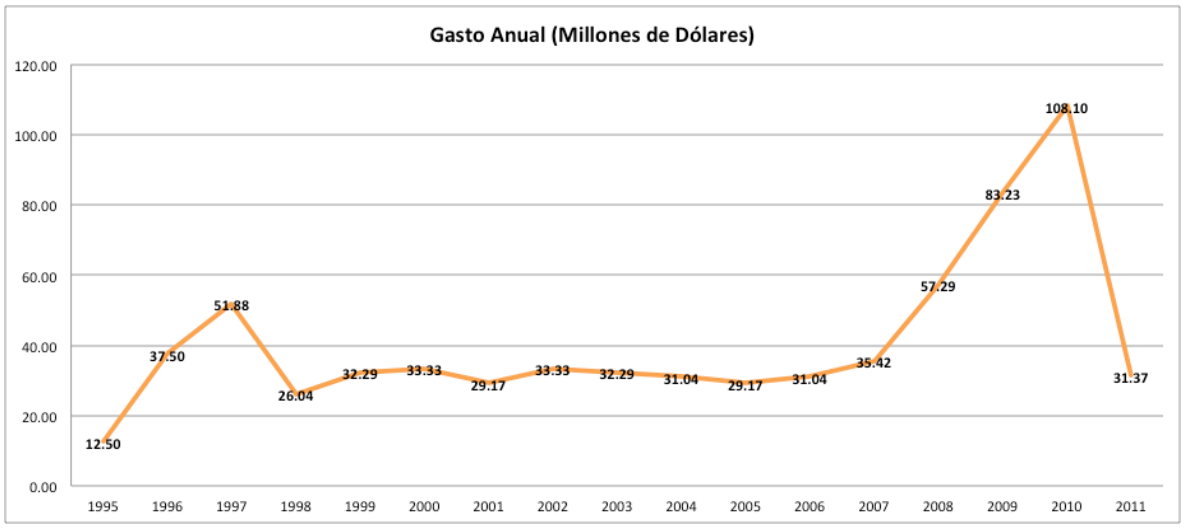


***table 4*: Enlaces: Coverage**

Sources

Cox, C. (ed.) (2003). *Políticas educacionales en el cambio de siglo: La reforma del sistema escolar de Chile*. Santiago: Editorial Universaitaria.

Cancino, V & Donoso, S. (2004). "The educational computer program Chilean educational reform: A critical analysis", *Revista Iberoamericana in Education*, No. 36, 2004.

Delors, J., Amagi, I., Carneiro, R., Chung, F., Geremek, B., Gorham, W., & Stavenhagen, R. (1997). *La educación encierra un tesoro: informe para la UNESCO de la Comisión Internacional sobre la Educación para el Siglo Veintiuno*.

Garrido, J. M., Gros, B., Rodríguez, J., Silva, J., y Nervi, H. (2008). "Más allá de laptops y pizarras digitales: La experiencia chilena de incorporación de TIC en la formación inicial de docentes", *Calidad en la Educación*, No. 29, Diciembre 2008.

Enlaces. (2004). *Proyecto Enlaces Expandido*. Santiago: Ministerio de Educación de Chile.

---. (2010). *El libro abierto de la informativa educativa. Lecciones y desafíos de la red Enlaces*.

Hepp, P. (1998). "La incorporación de la informática como objetivo transversal valida a Enlaces", *Entrevista en Revista Enlaces*, no. 15, 1998.

---, P. (2003). "Enlaces, el programa de informática educativa de la reforma educacional chilena en políticas educacionales en el cambio de siglo", in: *Ed.Universitaria*. Santiago de Chile 2003: Mineduc.

Hinostroza, J.E. (2007). *Políticas de introducción y uso de Tecnologías de Información y Comunicación en educación en Latinoamérica y el Caribe: Estado actual y desafíos futuros, en proceso de publicación*.

Jara, I. (2003). La experiencia chilena de la red Enlaces. in: *Educación y nuevas tecnologías. Experiencias en América Latina.* Buenos Aires: *IIPE-UNESCO.*

Mineduc. (2004). *La Educación Chilena en el Cambio de Siglo: Políticas, Resultados y Desafíos. Informe Nacional de Chile. Oficina Internacional de Educación*. Santiago: UNESCO.

Núñez, Iván. (2007). El Proyecto 'Enlaces" (Chile). *Estudio de Caso. Abriendo una ventana al mundo. Informática, comunicación y educación para todos*. Santiago: UNESCO.

Programa de las Naciones Unidas para el Desarrollo (PNUD). (2006). *Informe sobre desarrollo humano 2006: más allá de la escasez: poder, pobreza y la crisis mundial del agua*. Madrid: Mundi-Prensa Libros.

Rosas, R., Cox, C., & Saragoni, C. (2002). *Evaluación de la Apropiación y Uso de Recursos Tecnológicos del Proyecto Enlaces por parte de las Unidades Educativas*. Santiago: Pontificia Universidad Católica de Chile, Escuela de Psicología.

Interviews:

Entrevista a Cristián Cox, Responsable de los Programas de Mejoramiento de la Equidad y la Calidad Educación (MECE) [Santiago, 4/9/2007].- Enlaces, "El Libro abierto de la Informática Educativa", Centro de Educación y Tecnología del Ministerio de Educación, 2010.

Entrevista a Didier de Saint Pierre, Director de Enlaces 2006-2009 [Santiago, 5/9/2007].- en Enlaces, “El Libro abierto de la Informática Educativa”, Centro de Educación y Tecnología del Ministerio de Educación, 2010.

Entrevista a Hugo Martínez, Director de Enlaces 2004-2006 [Santiago, 4/9/2007].- en Enlaces, “El Libro abierto de la Informática Educativa”, Centro de Educación y Tecnología del Ministerio de Educación, 2010.

Entrevista a Ignacio Jara, Director Enlaces 2000 – 2004 [Santiago, 20/8/2007].- en Enlaces, “El Libro abierto de la Informática Educativa”, Centro de Educación y Tecnología del Ministerio de Educación, 2010.

Entrevista a Pedro Hepp, Director de Enlaces 1992 - 2000 [Santiago, 24/8/2007].- en Enlaces, “El Libro abierto de la Informática Educativa”, Centro de Educación y Tecnología del Ministerio de Educación, 2010.

Entrevista a Teresa Matte [Santiago, 6/9/2007].- en Enlaces, “El Libro abierto de la Informática Educativa”, Centro de Educación y Tecnología del Ministerio de Educación, 2010.

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

6

Lessons from Armenia (NaCET)

Edmond Gaible and Anush Shahverdyan

in this chapter …

Executive summary

The National Center for Education Technology (NaCET) has for nearly ten years served as the primary support for education technology in Armenian schools. NaCET manages the Armenian Schools Internet Network (ASIN), plus school information management, content development and dissemination, training in information technology, and development and dissemination of education content. NaCET was founded to meet urgent needs for technical capacity and contract management with the Ministry of Education and Science (MoES). In meeting these needs, NaCET has overseen the extension of Internet connectivity to more than 99 percent of schools as of 2013. This milestone is accompanied by new pressures—the need to begin the process of upgrading hardware—and by a new opportunity for broader assessment of the role of education technology in schools.

a. Overview of NaCET

NaCET was established by an act of government in 2004, as part of the World Bank-funded Education Quality and Relevance Project to manage access to and distribution of Information and Communication Technologies (ICT) to Armenian schools.

NaCET administers programs in the following areas:

- Armenian Schools Internet Network (ASIN)
- Armenian Education Portal
- Education Management Information System (EMIS) for schools and students
- Training in computer literacy for teachers and other school staff
- Management of software licensing and vendor partnerships
- Development and dissemination of electronic content for education

Unlike some similar organizations in other countries, NaCET is not involved in the specification or procurement of computer or other hardware for schools, although the organization does participate in procurement processes for connectivity and software.

Governance, Funding and Personnel

NaCET receives its mandate from the Ministry of Education and Science (MoES) of Armenia. MoES allocates funds based on budget planning and proposed activities, issuing a new contract to NaCET each year.

Annual budgets over the past five years are as follows:

Year	Budget AMD	Budget USD	Percent change
2008	344.436.500	$1,091,503	-
2009	557.680.200	$1,822,484	+60.0%
2010	697.951.300	$1,846,432	+01.3%
2011	678.029.380	$1,793,739	-03.9%
2012	698.532.200	$1,809,669	+<01.0%

The NaCET Executive Body, comprising the organization's director and Board of Directors, approves the annual NaCET action plan and staffing, reviews and approves financial information, and monitors NaCET activities. (Monitoring information is typically generated by NaCET and shared with the Executive Body.)

NaCET employs a staff of 45, including 18 staff in areas that are primarily technical and administrative; eight staff are engaged in content development.

b. Primary Activities

NaCET's primary activity is management of the Armenia School Internet Network (ASIN), which provides secure, government-funded Internet connectivity to schools. Students and teachers generally access computers in their schools' Internet Computer Centers (ICCs). ICCs are school computer labs—classrooms with computers, Internet connections and related tools, such as printers. NaCET also provides education content, supports school-focused and collaborative communications, builds capacity among school staff, collects and analyzes information from schools, and manages software licensing.

ASIN

NaCET is responsible for network administration, maintenance, and conducting upgrades to the network equipment as needed. As of October, 2012, ASIN connects 1,394 schools plus 50 access points at a maximum of 2 MBPS; more than 99 percent of Armenian secondary schools have Internet connectivity. (Approximately 230 schools have subscribed directly to private-sector Internet service; some of these schools maintain their separate service-agreements as well as using ASIN.)

NaCET also manages contractual, operational and financial relations with the Internet Service Providers (ISPs) that deliver connectivity to schools. NaCET develops technical specifications that serve as the basis for tenders and contracts, conducts an annual open-bidding process among ISPs, receives bids, and selects ISPs to provide ASIN service.

ASIN architecture routes all Internet traffic for Armenian schools through the ASIN central server. This configuration ensures that viruses and objectionable content are filtered. The configuration also supports collection of data on educational Internet use, central network monitoring and maintenance and provision of communications services such as email, FTP, and hosting of approximately 350 school websites.

The ASIN central server is connected directly to Armenia's fibre-optic network at 100 MBPS; the Armenian fibre-optic network is in turn connected through Georgia to the Trans-Asia-Europe fibre-optic backbone.

ASIN marries this nationwide fibre-optic network to various "last-mile" solutions that enable the extension of connectivity to schools. As no schools are connected directly to the fibre-optic network, connectivity is distributed to them via several different technologies, including a wireless gateway, with all of the last-mile networking hardware owned by NaCET.

Content Development and Distribution

A second major sphere of activity within NaCET centers on the development and provision of digital content. Over the past several years, NaCET has conducted a range of activities in this area:

- **Armenian education portal (*www.armedu.am*)**
  The education portal provides information, supports collaboration and offers e-learning courses, primarily on technology topics.

  Information available on the portal includes education news, access to education competitions, information about the Armenian education system, critical legal and

governmental documents pertaining to education, and useful hyperlinks. The portal also provides teachers and students with online collaboration spaces, discussion forums, and with the opportunity to subscribe to RSS feeds and to sign up for email accounts.

- **e-Learning**
  Via the portal, NaCET administers e-learning courses on the e-learning system, informatics, beginning computer graphics, and school-network administration. A secondary-level physics course is in development.

- **e-Textbooks**
  A series of 18 electronic resources has been provided to Armenian schools, in subjects that include Armenian language and literature, geometry, algebra, Russian and English. In addition, NaCET has published both print and digital versions of *Handbook of a Network User* (also available on the portal) to help guide users of school networks and the Internet.

- **Digital library**
  NaCET's digital library provides digitized books for primary and secondary students.

Information Management

In 2008, NaCET assumed management of the Armenian Education Management Information Systems (EMIS) program, which collects data from all Armenian schools. The EMIS program supports planning, management, policy development and other decision-making processes of the central government; EMIS data are also used by regional education departments. These data are published in the annual *General Education in Armenia* report, which is available online.[1]

Training and Outreach

NaCET provides training to teachers and other school personnel focusing on the development of technology skills.

- **ICT training for teachers**
  About 14,000 (or 35 percent) of Armenia's secondary teachers have participated in technology training.

- **Network training for school personnel**
  620 school personnel participated in Network Administration training, improving their abilities to support use of ASIN

- **Training for informatics teachers**
  620 informatics teachers participated in training in the use of online tools for education

NaCET's plans for 2013 call for providing training to network administrators and informatics teachers in an additional 450 schools.

Mobile Internet Computer Station

In 2008, NaCET launched and staffed Mobile Internet Computer Station (MICS) to provide computer and Internet access, plus informatics training, in schools that do not have ICC labs or

[1] http://armedu.am/arm/official.php?sec=org&id=377

that were not included in ASIN. The mobile-lab vehicle is equipped with seven computer workstations, and connects via satellite to the Internet.

Between 2009 and 2012, over 1,900 students and 847 teachers in 80 communities participated in MICS technology training.

Other Activities

Other activities conducted by NaCET include:

- **Electronic diaries**
  Electronic diaries enable parents to view their children's test performances and other education records online.

- **e-Twinning**
  At least one Armenian school has been selected to participate an e-twinning project as part of the e-twinning initiative of the European Commission (EC). The EC e-twinning portal (*www.etwinning.net*) provides online tools that help teachers find partners, set up projects, share ideas and collaborate.

- **Software licensing**
  Since 2009, NaCET has annually purchased a licensing package from Microsoft, providing all Armenian schools with licensed and up-to-date operating-system and office-productivity software.

c. Origins and Influences

NaCET's current activities are shaped by the conditions that led to the organization's founding. The resulting organizational contours, including NaCET's strong technical capacity and management capacities in support of Internet connectivity, via ASIN, reflect the priorities and perspectives in relation to education technology that have come to the fore in Armenia.

Today, technology in Armenian schools is both a set of tools that supports learning and a subject to be learned. By way of the informatics curriculum (taught in middle schools and high schools) and the training of school personnel, technology use in schools focuses primarily on the development of computer skills. Mirroring this emphasis, the main thrust of NaCET's activities is technical: While content development and learning-focused activities are supported, the use of technology for learning across the curriculum and particularly to support different forms of learning (such as project-based learning, collaborative learning, or game-based learning) is not explored intensively or at scale. NaCET's activities and areas of focus have reflected the priorities and approaches of the MoES, and are consistent with those of organizations involved in the initial stages of wide-scale roll-outs of technology in education systems in many other countries.

Project Harmony and the Founding of NaCET

In 2004 NaCET was organized to continue activities of the Armenian Schools Connectivity Project (ASCP), a US $4 million initiative that was co-financed by the governments of Armenia and the United States. ASCP was originally implemented by Project Harmony, a U.S.-based NGO that has also worked in other CIS states, plus Macedonia and Turkey. Through ASCP, information technology was introduced to Armenian schools and the ICC labs as a means of supporting the integration of technology into education and ultimately as a means of providing "Armenians with the 21st century education that today's global economy demands."[2]

The transfer of management and operation of ASCP from Project Harmony to MoES helped to shape NaCET's mandate and organization, and to identify capacities that the organization would require. Planned for 2006 and 2007, the transfer required that MoES have the technical capacity to maintain the existing 350 ICC labs in schools and to start to expand the program across Armenia. Meeting this requirement was the responsibility of NaCET, which at the time was a very young organization.

Project Harmony was designed to provide a range of services to the participating schools that was much wider than IT training and connectivity. These services included staging of seminars and other events focused on integration of technology into education, and organizing more than 55 tele-collaborative projects engaging students and teachers in Armenia and the United States. (Other services included procuring computer hardware for approximately 170 ICC labs and providing training to school staff.) Project Harmony thus established a technology model for schools and introduced elements of a framework for technology-supported learning. This ambitious combination was intended to spark long-term school improvement, information literacy, and increased civic engagement in Armenia.

In contrast, NaCET's founding targeted immediate and specific needs: to assume operation and support of the school network and its central server, and to manage private-sector contracts.

At the time of ASCP's transfer to MoES operation in 2006, however, NaCET did not have the technical capacity to assume management and operation of the school network and server.

[2] From the draft Transfer Plan for the Future of the Armenia School Connectivity Program 2006-2007, a document developed by MoES and Project Harmony (January 2006). For more information about Project Harmony, visit www.ph-int.org.

NaCET staff required substantial related training. At the same time, Project Harmony technical staff, who had been responsible for management of the network to that date, were in the process of creating an Armenian NGO that would service technical needs in schools and the education system after Project Harmony's role in ASCP ceased. To address NaCET's need for increased capacity and to ensure reliable network administration, it was agreed that staff of this new organization, which was to be called Harmony Foundation, would be "seconded" to NaCET to manage network operations and to provide on-the-job coaching and training.

NaCET's focus at that time was both essential and ambitious: to ensure that schools participating in ASIN (the new name for ASCP) had functioning computers and connections, personnel with technical skills, and teachers who were proficient computers users. It is worth noting that at the time, moreover, the Armenian education system was addressing fundamental challenges in the areas of primary- and secondary-school completion, teachers' skills and approaches, and inequalities among schools in rural and urban areas. It is arguable that the transformation of teaching and learning, as framed by Project Harmony, required conditions that did not exist on a system-wide basis in Armenia at the time of NaCET's founding. NaCET's focus on technical and contractual expertise was considered both necessary and appropriate at the time that NaCET was formed and as it built its core capacities.

PIU and ICT in Armenian Schools

While NaCET has highly developed technical and operational capacities, education initiatives involving technology in Armenia are generally conceived by others. NaCET has good relations with the primary initiator of technology programs, the Center for Education Projects, also known as the Project Implementation Unit (PIU).

Established in 1998, PIU has implemented two large-scale projects, the Education Financing and Reform Project (1998-2002) and the Education Quality and Relevance Project (2003-2014), both of which have been funded by the World Bank. These projects include the use of information technologies to improve learning outcomes, enhance information management, deliver professional development to teachers and increase access to curriculum-related content.

In the course of these projects, PIU has launched several important initiatives, including the Armenian Education Portal and the Armenian EMIS. NaCET assumed management of the portal in 2007 and of the Armenian EMIS in 2008. In addition, PIU has undertaken three expansions of ASIN under the Education Quality and Relevance Project, adding 320 schools in 2008, 300 schools in 2010 and 459 schools in 2012. In initiating the ASIN expansion, PIU has developed tenders and managed procurement of hardware and software for schools' ICC labs. As these labs are installed and connected, they become part of ASIN, with NaCET providing secure connectivity and education content.

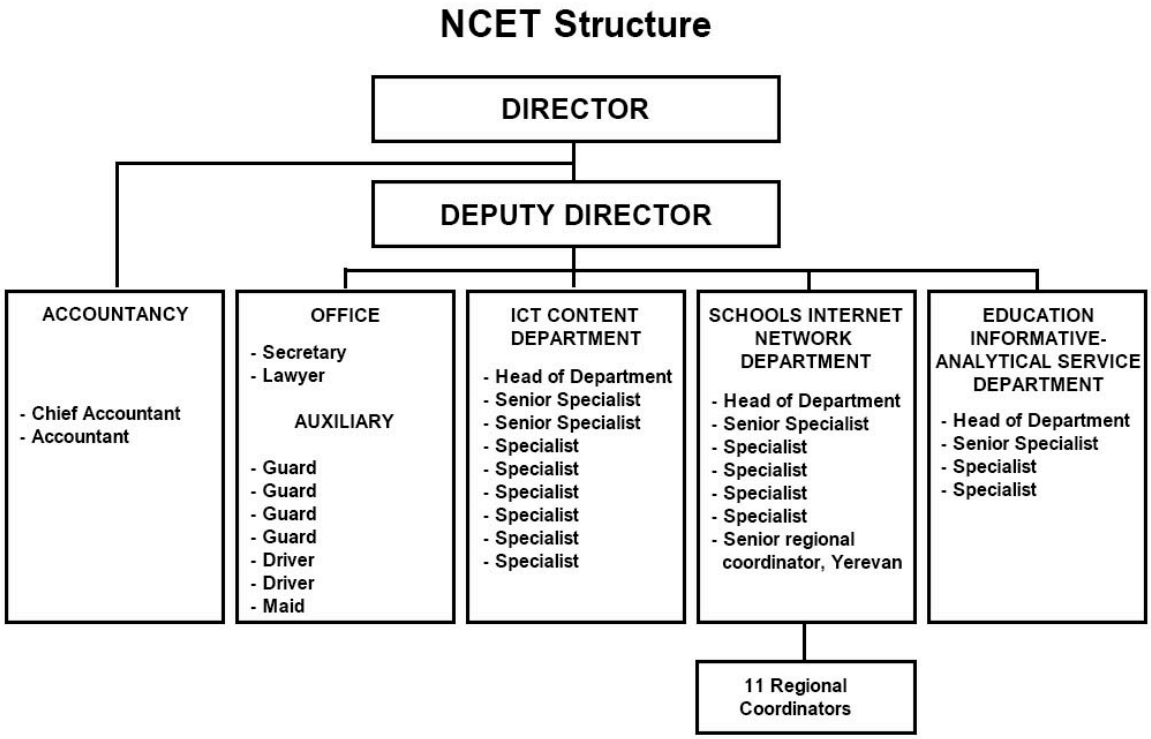
PIU, however, has a portfolio that is much broader than NaCET's, extending into higher education, teacher training, and K-12 education reforms. The resources allocated by PIU to information technology in schools, as a result, are not extensive: In the past two years, PIU's ICT in Education department has been trimmed from two persons to one. (Total staff at PIU is less than 28 people.)

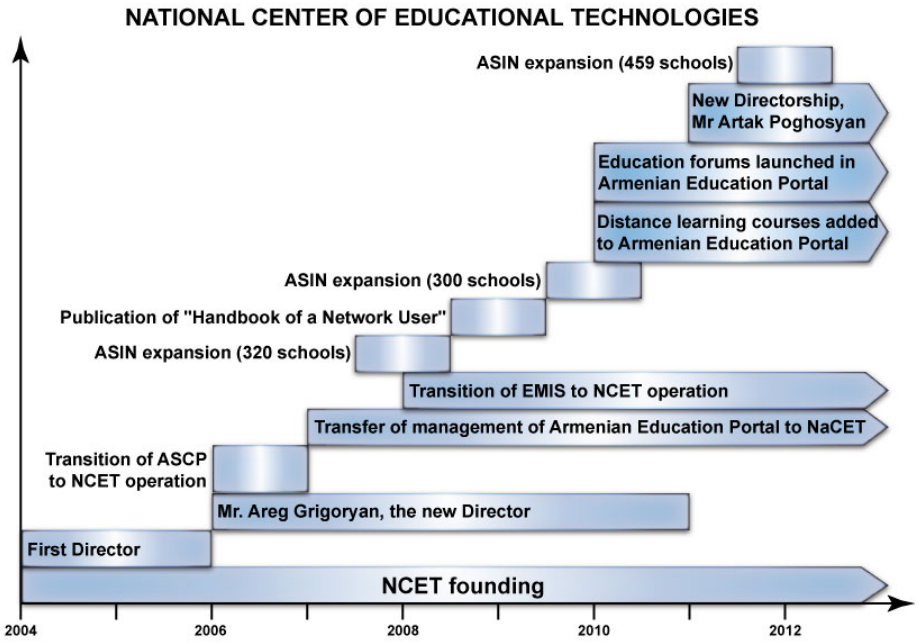
NaCET Today

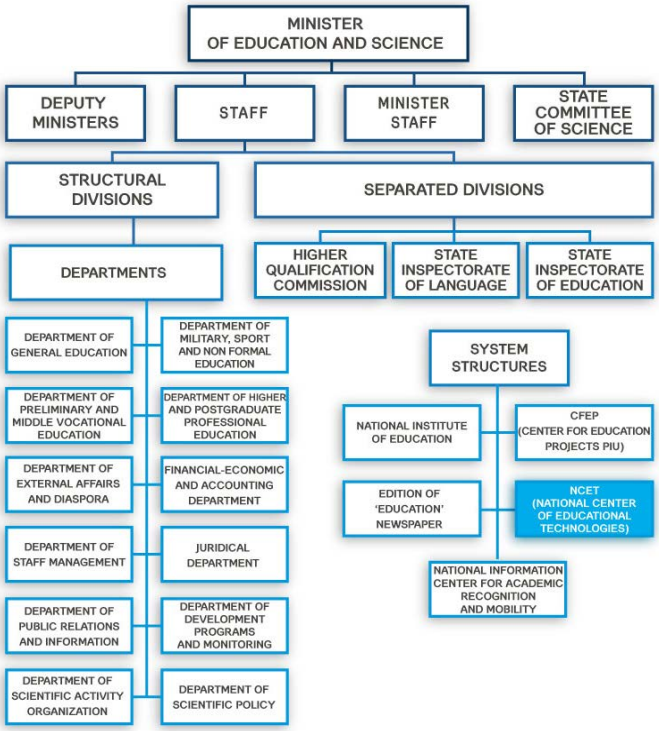
Today, NaCET has developed strong technical and management capacity, plus good relations with partners, such as ISPs and PIU, with MoES as a whole, and with schools.

NaCET leadership changed in 2011, with Mr. Artak Poghosyan assuming the directorship. The founding director of NaCET, Mr. Edward Hovsepyan, served from 2004 to 2006; Mr. Areg Gigoryan served as director from 2006 to 2011.

Under Director Poghosyan, NaCET is implementing new activities. In 2012, these included the extension of Internet connectivity to include an additional 459 schools in ASIN, in coordination with PIU's procurement of hardware, and the design and launch of an online repository for education documents. In 2013, NaCET will extend ASIN-based connectivity and support to 12 vocational education and training colleges. In addition, in response to the second education-sector improvement project, NaCET plans during 2014 to strengthen its technical capacity, to assess and strengthen the technical capacity of school staff, and to increase the efficiency of information management by improving the integration of technology in schools into processes of data collection, analysis, and monitoring and evaluation.




NATIONAL CENTER OF EDUCATIONAL TECHNOLOGIES
ASIN expansion (459 schools)
New Directorship, Mr Artak Poghosyan
Education forums launched in Armenian Education Portal
Distance learning courses added to Armenian Education Portal
ASIN expansion (300 schools)
Publication of "Handbook of a Network User"
ASIN expansion (320 schools)
Transition of EMIS to NCET operation
Transfer of management of Armenian Education Portal to NaCET
Transition of ASCP to NCET operation
Mr. Areg Grigoryan, the new Director
First Director
NCET founding
2004
2006
2008
2010
2012


MINISTER OF EDUCATION AND SCIENCE
DEPUTY MINISTERS
STAFF
MINISTER STAFF
STATE COMMITTEE OF SCIENCE
STRUCTURAL DIVISIONS
SEPARATED DIVISIONS
DEPARTMENTS
HIGHER QUALIFICATION COMMISSION
STATE INSPECTORATE OF LANGUAGE
STATE INSPECTORATE OF EDUCATION
DEPARTMENT OF GENERAL EDUCATION
DEPARTMENT OF MILITARY, SPORT AND NON FORMAL EDUCATION
DEPARTMENT OF PRELIMINARY AND MIDDLE VOCATIONAL EDUCATION
DEPARTMENT OF HIGHER AND POSTGRADUATE PROFESSIONAL EDUCATION
DEPARTMENT OF EXTERNAL AFFAIRS AND DIASPORA
FINANCIAL-ECONOMIC AND ACCOUNTING DEPARTMENT
DEPARTMENT OF STAFF MANAGEMENT
JURIDICAL DEPARTMENT
DEPARTMENT OF PUBLIC RELATIONS AND INFORMATION
DEPARTMENT OF DEVELOPMENT PROGRAMS AND MONITORING
DEPARTMENT OF SCIENTIFIC ACTIVITY ORGANIZATION
DEPARTMENT OF SCIENTIFIC POLICY
SYSTEM STRUCTURES
NATIONAL INSTITUTE OF EDUCATION
CFEP (CENTER FOR EDUCATION PROJECTS PIU)
EDITION OF 'EDUCATION' NEWSPAPER
NCET (NATIONAL CENTER OF EDUCATIONAL TECHNOLOGIES)
NATIONAL INFORMATION CENTER FOR ACADEMIC RECOGNITION AND MOBILITY

d. Issues and Questions

For many education-technology agencies such as NaCET, the establishment of system-wide technology access in schools represents a significant milestone. This achievement can be accompanied by questions about next steps and the potential for new areas of activity.

As of the start of 2013, NaCET has successfully extended access to technology by trained personnel to almost all schools in Armenia, and has built its capacities to deliver education content and resources and to support information management. The first questions confronting NaCET, at this juncture, are both pressing and practical: Eight years have passed since the launch of ASCP by Project Harmony, and the age of the first computers installed in schools and the heterogeneous mix of operating systems and software applications poses a maintenance challenge. This challenge will only increase as the computers age, as will the need to procure replacements. The immediate task for NaCET, one that is perhaps unfamiliar but that is directly linked to its support of ASIN and the ICC labs, is to convince decision-makers of the need to upgrade computer hardware in schools.

However the prospective cost of replacing computers is accompanied by the opportunity to assess current approaches and consider alternatives based on new tools and developments, activities that lie much father beyond the boundaries of NaCET's historic areas of endeavor.

Hardware Replacement and Organizational Change

The issue of hardware maintenance, upgrades and replacement underscores the need for technology-focused advocacy within MoES and frames an example of organizational change arising in response to this need.

Over the past decade, with support from NaCET and PIU, Armenian schools have experienced a rapid influx of computers that has increased the difficulty of hardware and software maintenance. From 2004 to 2012, the ratio of students to computers improved from 400:1 to 23:1. Versions of the Windows operating system released in this eight-year period—during which NaCET maintained licensing agreements with Microsoft—included Windows XP, Windows ME, Windows Vista, and Windows 7, with each version increasing minimum hardware requirements and requiring updates to other software. Today, the nearly 18,000 computers owned by schools and MoES vary greatly in terms of their technical specifications and the software that they are running. The age of some computers poses a challenge in terms of maintenance, and variations among operating systems and other software increases the difficulty of meeting that challenge.

Replacement of computer hardware is becoming a critical issue. Individual schools and the MoES are faced with the need to follow their initial investments in education technology with follow-on investments to upgrade hardware in the ICC labs. The need for investment in hardware upgrades opens an opportunity to consider new tools that have emerged in the decade since the ICC labs were first introduced. Potentially valuable new solutions include tablet computers, pico-projectors and literacy-assessment software, as well as other tools with direct relevance to teaching and learning in schools. Gauging the value and the feasibility of these tools and of new approaches is complementary to, and perhaps no less critical than, the replacement of hardware that can no longer be maintained.

NaCET has begun, within the framework of its mandate to support and improve educational computing in Armenia, to highlight the need for financial planning and funding allocations for the replacement of out-dated equipment. At present, these advocacy activities have taken the form of presentations of the case for replacement by Director Poghosyan to the education mission of the World Bank and to other groups. NaCET's efforts, and MoES decision-making processes

addressing this area, might benefit from a more structured approach to advocacy, in which staff gather relevant information about computer use in schools, effectively marshal that information in relation to policy goals and objectives, and provide evidence that can undergird the director's efforts to secure support. To the extent that such activities constitute a new area of emphasis for NaCET, they create within the organization the need for learning and for the development of new capacities.

NaCET's effort to initiate the replacement of computer hardware represents a significant step beyond its historical role as an implementing agency. NaCET is broadening its portfolio to position itself, at least potentially, as an advocate in its dealings with the policymakers and decision-makers who determine approaches to education technology. This process of organizational change is driven by pressing factors—aging hardware—that have emerged in direct relationship to NaCET's current activities. However there is an opportunity and perhaps a need for further change on the part of NaCET, in response to factors that are less direct but no less pressing, into an organization that both accurately assesses the role of computers in Armenian schools today and that provides guidance about the new tools and new approaches that can enhance technology-supported learning tomorrow.

Observations and Lessons Learned

The eight-year history of NaCET's development in relation to education computing in Armenia yields observations that are potentially relevant to the establishment and direction of other national education-technology agencies. These include:

Collecting information about computer use in schools is an essential function. Although NaCET manages the Armenian EMIS program, there is a need for improved information about the education technologies that have been deployed. The need to replace aging hardware sharpens focus on such information, however informed (data-driven) decision-making in many areas, both within NaCET and at the levels of policy and planning, requires ongoing capture and analysis of the ways that students and teachers use computers in schools. While extremely valuable information can be generated through smaller-scale research, monitoring and evaluation activities, system-wide information can be most relevant for the crafting of policy and plans. And while ASIN serves as a platform for the cost-effective collection of information with regard to web use and communications, additional information such as students' rates of usage, in-class activities and attitudes with regard to technology could provide valuable support for educational computing.

Financial sustainability calls for an agency with the skills and mandate for advocacy. While almost all school-based technology implementations require ongoing funding, in some instances these costs are unanticipated or otherwise excluded from plans and budgets. Organizational capacity to support sustainability planning is a necessity. However, decision-making bodies should also institute regular consultations with implementing agencies to support planning for near-term and long-term sustainability.

Initiation and implementation are interrelated and equally important capacities. Although NaCET was originally conceived as an agency with capacity to implement or assume management of existing initiatives—such as ASIN, the Armenia EMIS, the education portal—the effective continuation of those initiatives demands vision and initiative. In the successive expansions of ASIN, NaCET and PIU have envisioned, procured, implemented and maintained a series of solutions to the problem of "last-mile" connectivity, such as use of a wireless gateway, to extend Internet access to rural and hard-to-reach schools. These expansions, which would have been impossible to approach as a sequence of replications, required problem solving, technical capacity, collaboration with the private sector, and the ability and willingness to try new approaches. Support of the portal, of information gathering, and certainly of the distribution of

education resources and content would benefit from application of these same activities and skills.

Mechanisms for change should be established in conjunction with establishment of the organization.
An organization's structure, capacities and areas of focus can be persistent, and that persistence can inhibit learning or change. In such instances, NaCET and similar organizations can become locked in on strengthening existing capacities and expanding current initiatives, although new capacities and new paths might be called for. In light of the tremendous levels of experimentation and rates of change associated with technologies in education, attention to organizational learning is important. However the processes of learning and change are likely to require regular prompting and support. Forecasting can, for example, be built into periodic reviews and annual reports. Such forecasts can identify relevant trends, innovations that have potential, upcoming technology-related challenges within the education system (such as the looming need to replace hardware), and appropriate responses that can be taken. These forecasts can be accompanied by identification of new capacities or capacities to be strengthened to support the agency's proposed response. (This observation is interrelated with the preceding observations about support for sustainability planning and about the need for both initiation capacity and implementation capacity.)

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

7

Lessons from Uruguay (Plan Ceibal)

Eugenio Severin

in this chapter …

Executive summary

Despite many initiatives that were introduced beginning in 1990, Uruguay had had trouble implementing a national policy to introduce ICT in schools, especially in primary education. However, in 2006, a new initiative -- 'Plan Ceibal' -- was announced to provide laptops for all students and teachers in government-supported primary schools over a three-year period. *Plan Ceibal* had three pillars: (1) equity, social inclusion and equality in access to technology; (2) technology as a means to achieve these goals; and (3) education, universal law that aims to equal opportunities. The implementation phase of the Plan Ceibal was carried out in four stages, including a pilot phase that began in early 2007, As a result of the initial phases of Plan Ceibal, all of these primary schools (with subsequent stages of the project focusing on all secondary schools, teachers, students and their families) had the opportunity to use and learn with ICTs.

The implementation of Plan Ceibal was been heavily influenced by the specific characteristics of the country and of Uruguayan society. Operational issues related to the project's technological component (connectivity, computers, services) were handled directly by on institution, LATU, while another organization, ANEP, had oversight of the project's education components. A central decision-making and coordination body, the Ceibal Board, coordinated the activities of agencies which participated in various ways with Plan Ceibal and included representatives from key actor and stakeholder groups. As the project grew in scope and complexity, a new, specialized institution, Centro Ceibal, was created to oversee the strategic management of the project.

Despite its many notable achievements, Ceibal continues to face challenges in terms of technical and pedagogical support, digital learning content, sustainability and broadband Internet connectivity. Furthermore, while the integration of ICT in education activities should be facilitated by greater access to laptops, the intensive and appropriate use of ICT to promote new ways of learning and better educational outcomes remains a challenge for Ceibal. Going forward, strategies that consider detailed and coordinated actions to address issues related to curriculum, assessment, content and professional development of teachers will increase in importance, now that the initial challenge of providing increased access to ICT has largely been addressed

Although Ceibal has an explicit educational purpose and has been implemented throughout the Uruguayan educational system, its reach and impact extends far beyond only schools. While it seeks to make a positive impact on schools and teachers' pedagogical practices, its broader purpose extends far beyond just the formal schooling sector, supporting advancements for children, families and in larger Uruguayan society.

a. Background

Uruguay is known for its advanced educational system and high (98%) literacy rate[1], the highest in Latin America. 92% of children 14 years of age have completed six years of school[2]. Most schools in Uruguay are public (81%), which means they are run by the state. A smaller percentage are private schools (19%), subsidized through a specific tax exemption.[3]

Uruguay introduced universal primary education -- free, secular and compulsory – in the nineteenth century. Rather unique from a global perspective, three institutions currently oversee activities in the education sector in Uruguay: the Ministry of Education and Culture (MEC); the National Agency of Public Education (ANEP); and the University of the Republic (UDELAR).[4]

The *MEC* is responsible for the coordination of national education. It promotes the country's cultural development and artistic, historical and cultural heritage; innovation, science and technology; and the preservation of human rights. It is also responsible for boosting the population's access to digital information. The MEC, however, is not responsible for managing the public education system – that is the responsibility of ANEP.

Established in 1985, *ANEP* has the technical and administrative autonomy of an executive body, but without financial autonomy. Its main objectives are the establishment of the country's education policy; planning; operational management and administration of the public education system (including pre-school, primary and secondary and technical education; teacher training; and the supervision of the private schools sector. ANEP's governing councils are advised by the Technical Assembly Teachers (ATD)[5] and governed by a Central Board (CODICEN).[6]

The *University of the Republic* is the only public university in Uruguay. Access to public higher education is free and unrestricted.[7]

[1] *Hinostroza, J.E., Jara, I., & Brun, M. (2011). "Case study: Uruguay" in: UNESCO (2011). Transforming education: the power of ICT policies. Paris: UNESCO.*
[2] *Edelman, A. & Fernández, A. (2009). CEIBAL plan "One Laptop Per Child" in Uruguay. Revista de Antiguos Alumnos del IEEM, Febrero 2010, Universidad de Montevideo, 24-42.*
[3] *Hinojosa (2011)*
[4] *Ibid.*
[5] *Edelman & Fernández (2009)*
[6] *Hinojosa (2011)*
[7] *Ibid.*

b. Plan Ceibal: The Conception

In 2005 Uruguay was in the process of reformulating its national development strategies and, as part of this process, a new institutional framework was created to address problems and challenges related to the emerging 'information and knowledge society'. A number of related new agencies were created, including the Agency for Electronic Government and Information Society and Knowledge (AGESIC) and National Agency for Research and Innovation (ANII).[8] At the same time, links were established with One Laptop Per Child (OLPC) organization to explore the possibility of bringing that project to Uruguay.

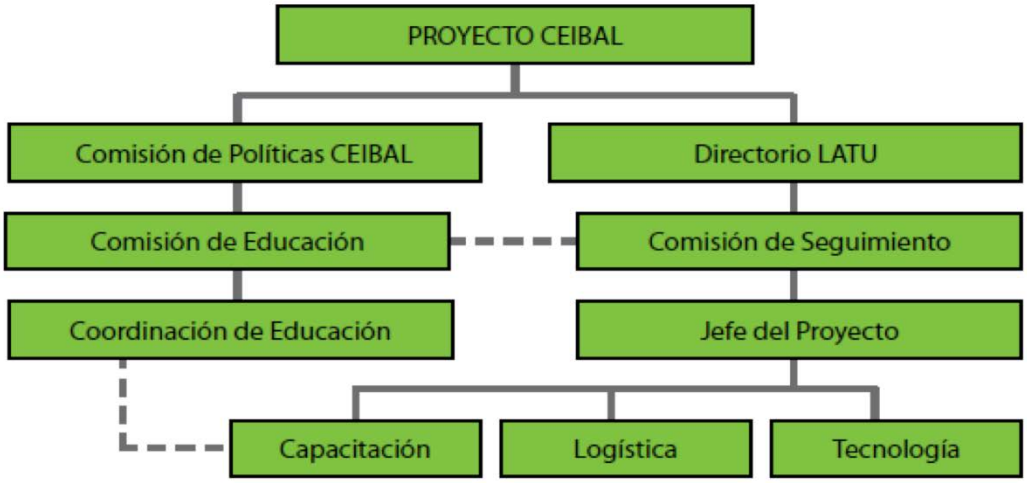
Announced in December 2006, Plan Ceibal promised to provide a computer to every school and every public school teacher. Ceibal was one of the main projects of the socialist government of president Tabare Vazquez, and the administration felt that it was urgent to complete the initial project before the end of Vasquez's presidential term in 2009.[9]

Under the authority of the president, whose leadership, attention and commitment is widely credited with being of singular importance in the early years of Plan Ceibal, a political committee was created comprising a broad number of stakeholder groups, including the key institutions that managed the public education system, agencies and institutions in charge of 'digital development', research and innovation, and telecommunication authorities. The Technological Laboratory of Uruguay (LATU) was mandated to lead the implementation of Plan Ceibal, in charge of defining and implementing policies relating to the initiative.[10] President Vasquez not only pushed this project forward, but also gave authority to relevant institutions to streamline processes, facilitate decisions and have more budgetary discretion in order to make it happen. Within this operational framework, Plan Ceibal was constituted and implemented as a 'presidential project', supported by a national policy notable for an innovative institutional design that separated the management of key policy areas among different actors.[11]

LATU created a new, dedicated parallel organization to implement the Ceibal project. For administrative and accounting purposes within LATU, the project functioned as an internal body, with LATU providing administrative support and related services. In all other respects, the project was self-sufficient and had internal decisionmaking autonomy. At the beginning, the organization was extremely small and operated under a tight budget. Technical staff from both within and outside of LATU were on fixed-term contracts; most were quite young (less than a handful were over 30) and were characterized by high levels of initiative and motivation.[12]

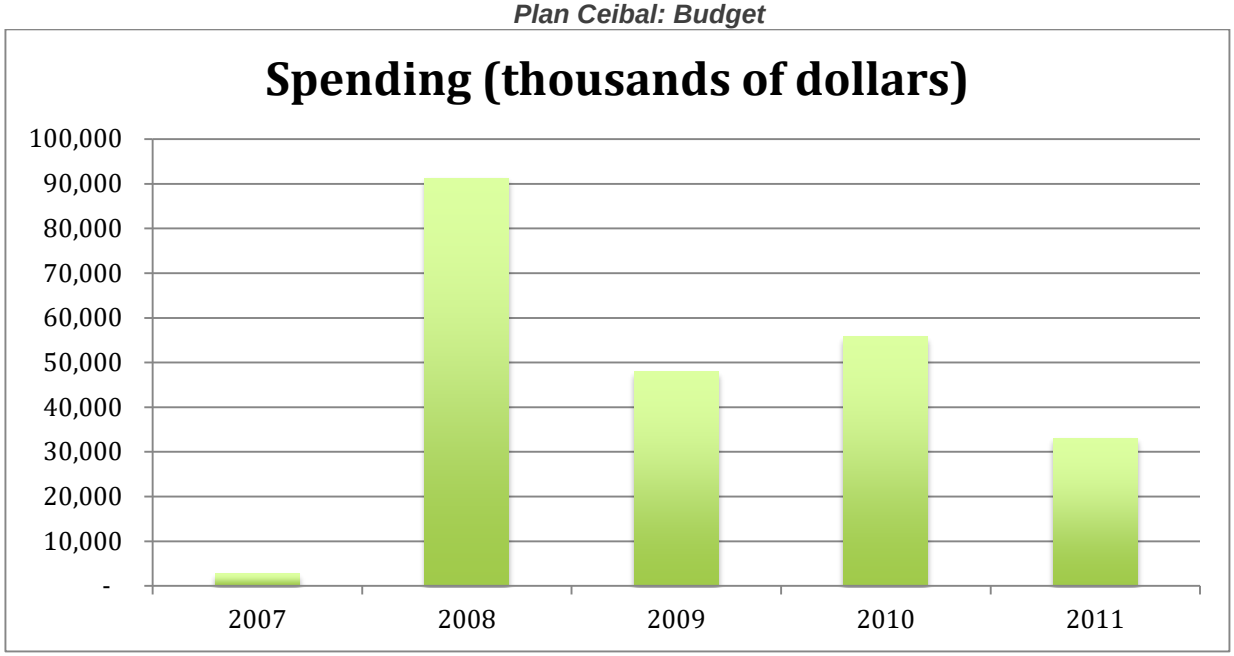
[8] *Ibid.*
[9] *Ibid.*
[10] *Bianchi, L. & Spiller, G. (2011/12). Plan CEIBAL. Equidad, tecnología y educación para el desarrollo humano. Montevideo: Centro CEIBAL.*
[11] *Ibid.*
[12] *Edelman & Fernández (2009)*

Ceibal: Organizational structure



Public funds allocated approximately USD 100 per child per year to Plan Ceibal, which represented 5% of total public expenditure on primary and secondary education, a figure equivalent to .02% of the country's GDP. This amount included all costs (support and maintenance, teacher training, connectivity, logistics and other); the investment in hardware (laptops and servers) was amortized over four years.[13]

Plan Ceibal: Budget



[13] *Bianchi & Spiller (2011/12)*

c. The implementation of Plan Ceibal

The implementation of Plan Ceibal was been heavily influenced by the specific characteristics of the country and of Uruguayan society, which differ in important ways from many other countries in Latin America (and indeed the world). Uruguay's small population, geographic position between Argentina and Brazil, historical development and, from a Latin American perspective, absence of major social disparities, contributed to and informed the way in which Plan Ceibal developed. These factors were important in enabling Uruguay's efforts to introduce so-called 'one-to-one computing', which in many other countries have experienced political difficulties, financial constraints and organizational challenges. From the very start, the project was highly localized in conception and experimental in nature.

From an organizational perspective, Plan Ceibal had a decision-making system based on consensus and participation, operationalized through a 'policy committee'. This is an essential feature of Uruguayan political culture and was considered a great asset when trying to implement and sustainability an initiative as ambitious as Ceibal. An emphasis on consensus building and the voicing of opinions of key stakeholder groups made related decision-making process sometimes slow, but, once decisions were made, buy-in from all stakeholders was assured and so implementation then proceeded swiftly. Operational issues related to the project's technological component (connectivity, computers, services) were handled directly by LATU, while ANEP had oversight of the project's education components.[14]

The implementation phase of the Plan Ceibal was carried out in four stages, including a pilot phase that began in early 2007. It also included three waves of expansion beginning in late 2007. From 2007 -- 2009, the initial stages of Ceibal implementation were characterized by efforts to provide a laptop to each child and public elementary education teacher. One of the major challenges of this phase was the relatively limited time available to implement the project.[15]

Stage 1 (first half of 2007):

On April 18, 2007, President Vasquez created a council to formally lead the Ceibal project, with LATU designated as the organization responsible for the project's technical and operational implementation. In May, the first pilot began in a small school of 150 students in the small town of Villa Cardal (population: 1290) in the country's Florida region, using laptops donated by the OLPC organization. At this stage of work, the team was quite small but highly motivated and capable, with team members recruited directly by LATU to ensure a rapid implementation.

One early challenge was that information about the project within the local community was not widely distributed, as ANEP, which was tasked with the process of information dissemination and local outreach, was more accustomed to working directly with schools, and not with other local stakeholder groups. This led to some basic challenges with project implementation, as key local actors and individuals did not feel sufficiently 'in the loop' on what was going on, and what was planned.[16]

Stage 2 (second half of 2007):

The project was quickly extended to the rest of the Florida region, which was soon completely covered. In October of 2007, the first 100,000 'XO' laptops and 200 servers were purchased

[14] *Hinojosa (2011)*
[15] *Martínez, A.L. (coord.), Alonso, S., & Díaz, D. (2009b). Monitoreo y evaluación de impacto social del Plan CEIBAL. Metodología y primeros resultados a nivel nacional. Montevideo: Área de Monitoreo y Evaluación de Impacto Social del Plan Ceibal.*
[16] *Báez, M., García, J.M. & Rabajoli, G. (compiladores). (2011). El modelo CEIBAL. Nuevas tendencias para el aprendizaje. Montevideo: CEIBAL/ANEP.*

through a competitive bidding process. By the end of the year, 100% of children and teachers in Florida had received their new computers (6,289 computers in total).

As in the first stage, the main focus of work in this stage was done by LATU and related to technical issues: equipment distribution; local reception and configuration; technical support; and connectivity. The implementation structure was markedly decentralized and featured a great deal of local autonomy. Initial trainings of teachers and schools inspectors, for example, were led by the local Augustine Center Ferreiro (CAF). The function of the 'Project Ceibal Pedagogical Coordination' was established under the auspices of the Primary Education Council, strengthening the role of the Education Commission within the project and aiding the expansion of Plan Ceibal beyond Florida into other regions of Uruguay.

As implementation roll-outs increased, the project received increasing (positive) press coverage, and word spread from communities which had already received their equipment and initial training. Initial distrust began to dissipate and public satisfaction grew. The support of local volunteers emerged and became increasingly key to local implementation activities, serving "to add value to the delivery of computers, stand alongside families, administrators, classroom teachers and the community, explaining and supporting the proper use of the new equipment."[17]

Stage 3 (2008):

In stage three, more than 175,000 computers were delivered, with all schools across the country covered except for a part of the region of Canelones and the capital city of Montevideo and its surrounding metropolitan area.

The end of the second stage and the beginning of the third were marked by increased public support for the project and the participation of thousands of volunteers across the country. To help organize these volunteers, a national network of volunteer support groups (RAP) was established, building on and consolidating many local efforts, which grew rapidly and comprised over 1600 people from all regions departments and of all ages who actively supported Ceibal in their local communities.

Strong support also developed in local authorities, including in municipal councils that actively supported various components of the projects by, for example, covering some local expenses, providing transportation for volunteers and facilitating training activities. Complementing these local networks were virtual networks, including websites such as RAP CEIBAL, Reducativa, South OLPC CeibalJAM!, as well as numerous blogs by teachers who, individually or in groups, began to share information about their participation in the project on the Internet. Referencing and cross-linking with each other, these web sites supported each other in important ways, collectively facilitating greater access to information about the project and promoting its activities.[18]

In mid-2008, the Government of Uruguay began a dialogue with the Inter-American Development Bank (IDB), which led to IDB providing financial and technical support to Plan Ceibal, with specific attention to the interactions between pedagogy and technology and the exchange of information, know-how and best practices between schools. IDB support helped change the model of teacher education, introduce new digital educational resources, develop platforms and tools to record and share key academic data, support online measurement of student learning and enhance the ability of Ceibal to monitor and evaluate its activities.

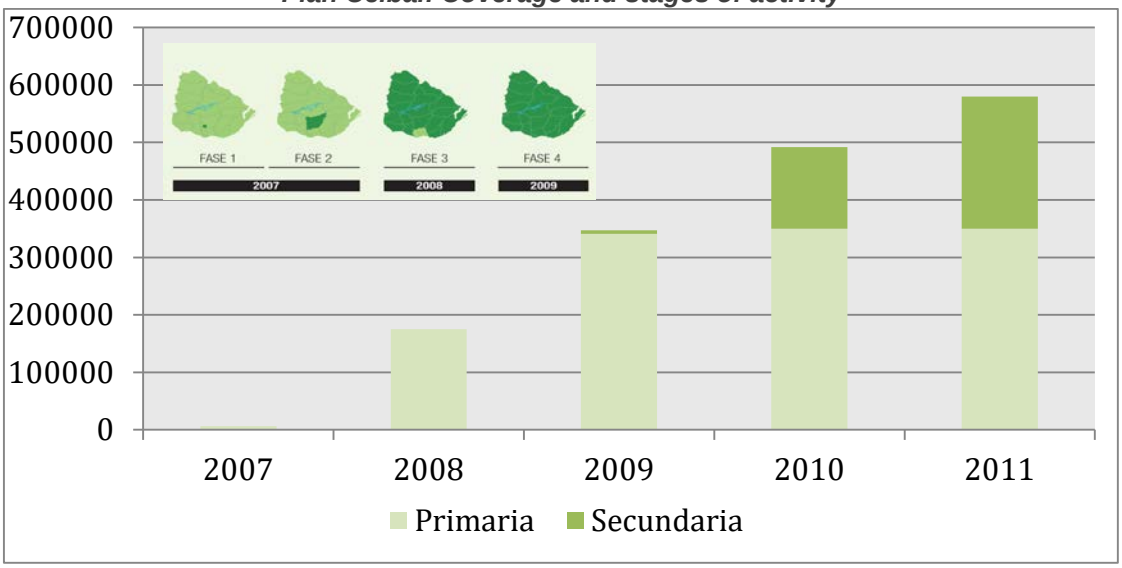
A new team was formed to lead efforts related to "monitoring and evaluation", working in coordination with both LATU and ANEP. Its main objective was to produce valid and reliable information about the implementation, results and impact of Plan Ceibal, with a special focus on

[17] *Ibid.*
[18] *Ibid.*

the role of new technologies in reducing social inequities and broadening access to ICTs. Results from the work of this team became key to helping implementing groups overcome challenges and deepen the impact of the project.[19]

On December 15, a presidential decree extended Plan Ceibal to cover private educational institutions, as well as to students and teachers of the first years of public secondary education.

Plan Ceibal: Coverage and stages of activity



Stage 4 (2009):

By the end of 2009, distribution of laptops was complete in Canelones, as well as in Montevideo and the surrounding metropolitan area. 341,259 children and 18,000 primary school teachers had received their laptops, over 6,000 of which had also been delivered to secondary schools.[20] A second stage of evaluation commenced,[21] examining a nationally representative sample of teachers, principals, children and families, complemented by a qualitative study in 20 communities. In total, data collection considered 5,682 children in grades 3-5, 7620 families, 1050 teachers and 200 principals.[22]

Throughout these stages, the team within LATU grew, providing a solid backbone of both logistical and technical support for the Ceibal project. Over time, three new areas of activities were added, as requirements within the project grew: application development; volunteer coordination; and impact assessment. The information system and processes implemented by the Ceibal team at LATU enabled the tracking of all computer hardware throughout the stages and lifecycle of the project and featured an advanced mapping systems (using public satellite images from NASA) to aid in laptop distribution, local network designs, and server support, among many activities and responsibilities. A call center and a service center were established, and LATU also managed the tenders for purchasing technology for schools and to support the project's operations at LATU.[23]

[19] *Martinez & Perez (2009), Hinojosa (2011)*
[20] *Hinojosa (2011)*
[21] *Salamano, I., Pagés, P., Baraibar, A., Ferro, H., Pérez, L. & Pérez, M. (2009). Monitoreo y evaluación educativa del Plan CEIBAL. Primeros resultados a nivel nacional. Montevideo: Área de Evaluación del Plan Ceibal.*
[22] *Ibid.*
[23] *Cyranek, G. (2008). CEIBAL en la sociedad del siglo XXI. Montevideo: UNESCO.*

The pedagogical components of the project were less developed. As the Ceibal project was led by LATU, and thus from outside the education system, it met with resistance from many teachers, and from ANEP as well. Other groups within the education system supported the concept and implementation of Ceibal but had neither the time nor the resources to move quickly in support of the technology implementation component of the project. Referring to institutional tensions between ANEP and LATU, the head of LATU noted that, "For a long time we had a fairly high level of conflict. Only now they have understood that we have no intention of replacing them in the management of the education system."[24]

The Ceibal Board helped coordinate the activities of all the agencies which participated in various ways with Plan Ceibal and included representatives from each of the entities involved. It met once a week to identify and analyze problems which had developed and defined next steps for action. Represented on the board were two main sorts of groups: LATU, which took care of logistics and technical execution; and the Education Commission, comprised of MEC and other education authorities (AGESIC, ANEP, CODICEN, ANTEL, ANII), which led the project's educational and social components. Over time, the interactions of these two sections of the Board helped slowly file down the rough edges in coordination and communication and helped in the construction of the necessary consensus, so that, eventually, the points of overlap and connection between the work of individual groups were less and less apparent, despite the fact that they worked highly independently on a day-to-day basis. The board democratically decided where and when laptops would be distributed, as well as how and when each individual entity would do its part in the process. It also analyzed specific cases and decisions were made on issues that only became apparent after a given implementation activity had started, such as those related to children lacking official identity numbers; immigrants; and schools without electricity.[25]

By the beginning of 2009, just over 40 people were working on the core team of Plan Ceibal. By the end of the year, headcount reached nearly 100, not counting the 500 teachers who were trained as "Ceibal Masters" to support the project at the local school level.

In late 2009, the project faced a major challenge. Impending presidential elections meant that, in March of the following year, a new government was expected. While Plan Ceibal was broadly popular across the population and no candidates seemed in favor of ending the project, project leaders sought to strengthen the institutional structure of the project in order to ensure its continuity after the election. One element of this effort was realized when the support of the Inter-American Development Bank for the project was finalized, which provided a sort of international guarantee that various activities would continue, but this represented only a partial solution. The contracts of most team members were due to expire on February 28, 2010, concomitant with the end of the Vasquez government. This represented a big risk for the project, as it was unclear the extent to which it would be able to continue to draw on the experience of the core team that had led the project since its earliest days. LATU had acted as an incubator for kickstarting Plan Ceibal, but it was not clear whether it was the appropriate institution to sustain the project going forward, even when considering the fact that the budget of Plan Ceibal was much larger than the operating budget of LATU itself. The scale to which Plan Ceibal had grown, and the increasingly varied and complex challenges it faced, helped give rise to questions about what kind of institution might be most appropriate to lead it going forward.

In this regard, three options were considered. The first was to delineate and separate out the various core functions, leaving LATU in charge of operational and technological work, ANEP in charge of education management ANEP, and creating another organization to assume strategic leadership (research, development and evaluation). A second option was to separate Ceibal from LATU as a new public-private partnership. The third option, which was the one that was

[24] *Interview with Miguel Brechner (September 2009)*
[25] *Cyranek (2008)*

adopted in the end, was to create a specialized public body, responsible for the strategic management of the Plan as a whole: the Ceibal Center (Centro Ceibal).

d. A new institution

Following this last phase of implementation, a key change was made to the way Plan Ceibal had been governed since its inception. On December 30, 2009 the Uruguayan Senate approved Law 18,640 ("Health Promotion and Education in childhood and adolescence, in the field of public education") that created a new Center for Social Inclusion and Technology (CITS). Following the adoption of this law, the implementation arm of Ceibal within LATU migrated to the CITS. The new law covered the ownership and maintenance of networks and servers which were part of the Ceibal project. The transfer also included programs, services and activities which had until then been performed by LATU. Finally, the law established that the transition process would be managed by LATU until the time that CITS was officially up and running, after which time LATU be part of the CITS Board.

Article 9 of the law expressly provided that the CITS, known henceforth as Ceibal Center (Centro Ceibal), would be committed "to promote, coordinate and develop plans and programs to support education policy, prevention and care for children and adolescents of Public Education." Specifically, CITS would "promote, coordinate and develop plans and programs for the educational use of ICT." With its own budget now allocated and assigned by law, Plan Ceibal became a project focused on “innovation and development”, with a special attention to conditions of inequality, in order to ensure that all potential beneficiaries could made a meaningful use technology.[26]

Ceibal Center also assumed responsibility to respond to requests for support, advice and collaboration from other countries considering the use of ICTs in their education systems, so that lessons from the Ceibal experience could be shared with other groups introducing new technologies in education, reducing risks and shortening implementation times -- and therefore reducing costs as well.[27]

Under the auspices of the new Ceibal Center, a second evaluation began in July 2010. That year, a report shared the results of a related national survey effort, featuring an evolved set of indicators to assess progress in achieving project results and which identified areas of improvement under the objectives of the Plan Ceibal. This report focused on the evolution of access to computers and the Internet by Uruguayan families; maintenance of the XO laptop; the types and frequency of use by children and families; the incorporation of the tool into teaching and learning processes at the classroom and school; and the views of children, teachers and parents on the implementation of the Plan.[28] Additionally, the evaluation model considered the collection of data on outcomes and indirect impacts, taking into account the reduction of the digital divide and promoting digital inclusion as multidimensional challenges, including access to ICT; perceptions of children and teachers about owning computing equipment; and its impact on the country more broadly.[29]

By 2011, there were a total of 255 staff working directly on the implementation of activities under Plan Ceibal, both at Ceibal Center and within a dedicated team at ANEP.

[26] *Bianchi & Spiller (2011)*
[27] *Ibid.*
[28] *CEIBAL. (2011). Segundo informe nacional de monitoreo y evaluación del Plan CEIBAL, 2010. Montevideo: Departamento de Monitoreo y Evaluación del Plan CEIBAL.*
[29] *Hinostroza (2011)*

e. Conclusion and challenges

The success of Plan Ceibal was a result of three key characteristics of the project. *First*, the political support of the President of Uruguay was paramount in its inception and initial implementation. *Second*, the separating of implementation responsibilities related to technical and education issues. *Third*, Plan Ceibal was defined explicitly, and was deployed, as a 'project of innovation and development with special attention to the conditions of inequality', in order to ensure that implementation impacted all designated beneficiary groups.

The rapid implementation of Plan Ceibal was made possible due to the commitment of the country's highest political authority -- the President of Uruguay -- who brought together key actors and stakeholder groups from across political sectors, institutions and civil society to achieve a common goal. In a sense, it is possible to say that, along with the deployment of laptops, Internet and training, Ceibal was able to mobilize the Uruguayan society around this policy as if it were a "crusade", a renewal and re-imagining of the country's earlier "Vareliana Revolution" which had been the genesis of the national public education system in Uruguay in the nineteenth century.

It is important to note that Uruguay had institutions with the technical, organizational and leadership flexibility and capacity needed to manage and coordinate the implementation of the different dimensions of this complex project. The project's institutional design placed its technical and logistical functions within an organization which had the necessary flexibility for action, overseen and supported by a highly trained professional team. This division of effort -- leaving educational work within in the public school system, supported by an organization outside of the system -- accelerated the development and implementation of Plan Ceibal.

The first and obvious achievement of Plan Ceibal was to have secured access to technology, connectivity and content for groups across the country's entire population, offering equal opportunities to those who, under other scenarios, would likely have not had access to them for another decade. That said, the main impact that the project intended to produce in the long run relates to education and learning. The Ceibal experience has demonstrated that, regardless of the implementation and governance models model which support efforts such as these, those responsible for public policymaking need to include complementary strategies to ensure the professional development of teachers; the availability of appropriate digital educational resources; and the provision of technical and pedagogical support; alongside the procurement, distribution and maintenance of computer hardware.

Plan Ceibal was a product of institutional dynamism. Beginning with a small group of young and enthusiastic leaders, the institutional roles and activities coordinated by Ceibal Center evolved, changing as needed in ways consistent with the change in scale and scope of the project itself. The consensus building at the heart of the project played an important role in supporting the persistence and perseverance of the overall effort. Going forward, however, Plan Ceibal will have to address three important organizational challenges. The *first* challenge relates to the transition of key personnel, as those who have led the project since its inception, within both LATU and ANEP, will leave their jobs, taking with them much of the "social capital" that has been behind the collective construction of consensus that has characterized Plan Ceibal since its inception. New leaders will emerge with new ideas. The *second* challenge is the danger of routine. Once Plan Ceibal had rolled out across the country, fundamental technical challenges had been overcome and the project itself consolidated as a natural part of the Uruguayan educational landscape, maintaining the focus and priority of political authorities became an increasing concern. Finally, Plan Ceibal will face challenges related to its results and impact going forward – or lack of them. In its initial stages, everyone understood that Plan Ceibal was a work-in-progress, but, over time, the project will need to demonstrate clear impacts and related

cost effectiveness of its activities. If, for example, Uruguayan educational outcomes in national and international tests show no improvements in the coming years, it may be difficult to maintain a consensus in support of the significant investments of resources which support the project in its initial stages.

Sources

Báez, M., García, J.M. & Rabajoli, G. (compiladores). (2011). *El modelo CEIBAL. Nuevas tendencias para el aprendizaje*. Montevideo: CEIBAL/ANEP.

Bianchi, L. & Spiller, G. (2011/12). *Plan CEIBAL. Equidad, tecnología y educación para el desarrollo humano*. Montevideo: Centro CEIBAL.

CEIBAL. (2011). *Segundo informe nacional de monitoreo y evaluación del Plan CEIBAL, 2010*. Montevideo: Departamento de Monitoreo y Evaluación del Plan CEIBAL.

Cyranek, G. (2008). *CEIBAL en la sociedad del siglo XXI. Montevideo:UNESCO*.

Cyranek, G. (ed.) (2009). En el camino del Plan CEIBAL. Montevideo: UNESCO

Edelman, A. & Fernández, A. (2009). *CEIBAL plan "One Laptop Per Child" in Uruguay*. Revista de Antiguos Alumnos del IEEM, Febrero 2010, Universidad de Montevideo, 24-42.

Hinostroza, J.E., Jara, I., & Brun, M. (2011). "Case study: Uruguay" in: UNESCO (2011). *Transforming education: the power of ICT policies*. Paris: UNESCO 125-165.

Martínez, A.L. (coord.), Alonso, S., & Díaz, D. (2009a). *Primer informe nacional de monitoreo y evaluación de impacto social del Plan CEIBAL, 2009*. Montevideo: Área de Monitoreo y Evaluación de Impacto Social del Plan CEIBAL.

Martínez, A.L. (coord.), Alonso, S., & Díaz, D. (2009b). *Monitoreo y evaluación de impacto social del Plan CEIBAL. Metodología y primeros resultados a nivel nacional*. Montevideo: Área de Monitoreo y Evaluación de Impacto Social del Plan Ceibal.

Salamano, I., Pagés, P., Baraibar, A., Ferro, H., Pérez, L. & Pérez, M. (2009). *Monitoreo y evaluación educativa del Plan CEIBAL. Primeros resultados a nivel nacional*. Montevideo: Área de Evaluación del Plan Ceibal.

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

8

Lessons from Indonesia (PUSTEKKOM)

Neil Butcher and Petra Bodrogini

in this chapter …

Executive summary

This case study explores the establishment and changing role of Pustekkom, the Centre for Information and Communication Technology for Education, which is part of the Ministry of Education and Culture in Indonesia. Originally established a content development house, with a focus on audio/radio and video/film/television content, Pustekkom is currently grappling with a requirement to change its role, given a new mandate that it has been given to plan and provide ICT infrastructure, services, professional development and resources to schools. Thus, this case study explores the challenges facing Pustekkom, as well as how it is responding to a common challenge facing education systems around the world: How do well established systems and organizations that have operated on a relatively stable set of assumptions for many years cope with the institutional transformation that is being forced on them as growing ICT penetration within societies challenges traditional ways of operating and disrupts entrenched power structures in education? This exploration of a national ICT in education agency with a transforming mandate yields some key lessons of potential relevance globally.

a. Introduction: Continuity and Change

Established in 1978, the mandate of Pustekkom, the Centre for Information and Communication Technology for Education (***Pusat Teknologi Informasi dan Komunikasi untuk Pendidikan)*** was that of a content development house. Since its inception, Pustekkom has played a significant role in producing educational materials for the Indonesian education system, originally with a focus on audio/radio and video/film/television content, but more recently also with an expanded focus on computer-based multimedia. This content development function has been a very important one throughout the history of Pustekkom, because the formal language of instruction in Indonesian schools, *Bahasa Indonesia*, is not spoken in any other countries, so indigenous content development takes on particular importance in the country.

Like so many other educational support agencies whose existence pre-dates the relatively recent explosive development of Information and Communication Technologies (ICT), Pustekkom has had to grapple with a changing mandate and an accompanying need to reconfigure itself to implement this mandate effectively. The Government of Indonesia has recognized the potential benefits of ICT in education and committed substantial financial resources to bring ICT into schools. The National ICT Council *(Detiknas)* was formed in 2006, with ICT in education (or e-Education) as a national flagship project and the Ministry of Education and Culture (MoEC) identified as the government agency responsible for implementation. As a consequence of this, within MoEC, Pustekkom was relatively recently appointed to plan and provide ICT infrastructure, services, professional development and resources to schools. In 2008, Pustekkom was handed formal responsibility for the ICT and education arena in Indonesia. This mandate was given based on Ministerial Regulation #38 of that year as an enhanced function of its role established by MoEC in 2005.

Thus, while Pustekkom continues to run several more traditional content development activities and maintains various broadcasting services for Indonesia, it is simultaneously undergoing a significant process of change that reflect the growing importance of ICT in education. This change is both exciting and daunting. On the one hand, it creates opportunities to offer innovative and potentially transformative new educational services to the schooling systems in Indonesia. On the other, it requires new functions and different kinds of expertise, demands a shift in mindset from ‘content production’ to ‘e-service delivery’, and generates political challenges as changing mandates lead to some uncertainty about where responsibility for different functions lies within the overall structures of the MoEC. Although many of these challenges are unique to Indonesia and Pustekkom, they do reflect a common underlying challenge facing education systems all around the world: How do well established systems and organizations that have operated on a relatively stable set of assumptions for many years cope with the institutional transformation that is being forced on them as growing ICT penetration within societies challenges traditional ways of operating and disrupts entrenched power structures in education?

b. The Policy Challenge: Defining and Securing a New Mandate

From a policy perspective, Indonesia's commitment to greater integration of ICT into education is clearly defined. Strategic and system-wide use of ICT in Indonesian education is considered integral to achieving the MoEC's overall educational objectives as outlined in the *2010-2014 MoNE Strategic Plan (Renstra): Strategy and direction of national education development policy year 2010-2014*. Use of ICT is believed to support efforts to increase and equalize access to education, improved quality, relevance, and education competitiveness, along with management, accountability, and public image toward education. The MoEC believes that application of ICT for education can expand the affordability of education and strengthen governance at the same time.

However, according to the *2010-2014 MoNE Strategic Plan*,[1] 'there still exist ICT literacy gaps between the regions on one side and the development of the internet that also brought negative impact on values and norms of society and provided opportunities of plagiarism and IPR violations on the other side'.[2] Consequently, the MoEC defined the following key activities in its current Strategic Plan:

1) The provision of ICT infrastructure and facilities and ICT-based learning content for the strengthening and expansion of e-learning at all levels of education.
2) Development of e-management, e-reporting, and e-services to enhance the effectiveness of governance and public service.
3) Development of knowledge management systems to facilitate the sharing of information and knowledge among learners and educators.
4) Development of ICT-based learning resource centres in elementary and secondary education.
5) Increasing human resource capacity to support the efficient use of ICT in the central and local level.[3]

Much of the responsibility for overseeing these activities was given to Pustekkom in 2008. Despite this, however, there is an ongoing requirement to determine clear authority for this shift in Pustekkom's mandate. Activities across all five of the above broad areas can be found in several Directorates within the MoEC. For example, the Directorate of Development for Primary Schools was, until 2011, provision of block grants to Junior Secondary schools to purchase computer laboratories (with a budget to distribute 15,000 such grants in 2011), and a similar, smaller-scale initiative at primary level coordinated through the Directorate of Development of Junior Secondary Schools. In 2012, the financial resources for these activities have subsequently been shifted into the country's schools rehabilitation programme. Likewise, a recent audit conducted by Pustekkom of the MoEC web presence has identified around numerous unique websites and online services.

Compounding this, many activities are also implemented, often without direct central coordination, at both the provincial and district levels of the country. Indonesia has one of the world's most decentralized education systems, a situation magnified by the sheer size and complexity of the country. With over '50 million students and 2.6 million teachers in more than

[1] *Chapter I of the 2010 - 2014 MoNE Strategic Plan (Renstra): "Strategy and direction of national education development policy year 2010-2014".*
[2] *Chapter IV of the 2010 - 2014 MoNE Strategic Plan (Renstra): "Strategy and direction of national education development policy year 2010-2014".*
[3] *ibid.*

250,000 schools'[4], Indonesia is the third largest education system in the Asia region and the fourth largest in the world (behind only China, India, and the United States of America). The scale, distribution and diversity of the Indonesian archipelago, with over 17,000 islands, poses challenges in managing and delivering support to schools in places that are minimally served by transportation, electricity, and communication.

Within this context, a Decentralization Law was issued, based on Indonesian Law # 22 year 1999, which grants decentralized power to 497 districts and municipalities.[5] This authorizes districts (or *kabupaten*) and municipalities (or *kota)* to govern, to plan development programmes according to local needs, and to decide on financial budgeting and expenditure based on proportions determined at a national level. Within this framework of decentralization, Indonesia's 33 provinces implement tasks in the provinces as the central government's representatives.

Consequently, Pustekkom is required to operate across a wide-ranging and complex political terrain, involving many different players with varying and sometimes overlapping responsibilities. While there is great merit in the importance of securing buy-in to new initiatives, as Pustekkom is currently required to do, the parallel reality is that innovative and often disruptive effects of ICT in broader Indonesian society are being felt much faster than this political process is facilitating adjustment by both Pustekkom and the wider educational system of which it is part. This is a challenging situation to confront, not only for the Indonesian education system but indeed globally. Key to successful integration of ICT into education for Pustekkom will be to shift planning and implementation away from seeing ICT as an add-on to education systems that function largely as they have for many years towards developing e-services that are driven by ICT and that enable the education system to harness the full potential productivity and efficiency gains offered by technology.

Given these realities, the first key challenge for Pustekkom is to secure clear political commitment to implement its new mandate in ICT in education. As the above examples illustrate, this is a long process requiring engagement with, and buy-in from, a wide range of stakeholders. This challenge is compounded by Pustekkom's historical role, as many people and organizations associate it so strongly with these historical roles that they tend to pigeon-hole the agency as a content developer. Unfortunately, the current Ministerial Regulation does not supply sufficient direction on the precise role expected of Pustekkom and its relationship to other structures within the MoEC, at national, provincial and district levels. Because of this – during 2012 – Pustekkom will be leading a process of developing a refinement of the current Ministerial Regulation No. 38/2008 regarding ICT Management within the MoEC. The objective of this will be to establish a clear legal mechanism for Pustekkom to pursue its expanded mandate. Hopefully, this will provide a clear and strong policy platform from which the agency can effectively coordinate ICT in education investments in the Indonesia.

[4] *http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/INDONESIAEXTN/0,,contentMDK:21521167~pagePK:141137~piPK:141127~theSitePK:226309,00.html*

[5] *http://www.depdagri.go.id/basis-data/2010/01/28/daftar-provinsi*

c. New Functions, Hybrid Structures

The second key challenge that Pustekkom has faced is the need to restructure itself to reflect its changing mandate. Pustekkom has reorganized itself into three key Divisions:

1. Radio, Television, and Film-Based Technology Development for Teaching and Learning;
2. Multimedia and Web-Based Technology Development for Teaching and Learning; and
3. Network/Connectivity Development.

In total, Pustekkom now has 227 staff, 70 of whom are administrative, 83 in the Radio, Television, and Film Division, 41 in Multimedia and Web-Based Technology Development, and 33 in Network/Connectivity Development. This reorganization of Pustekkom reflects a clear effort to discharge its new mandate: the legacy functions of the organization are all clustered into the first division, which focuses on broadcasting, while the other two are responsible for implementation of new responsibilities. Nevertheless, the use of the word 'Development' in each title still reflects a strong tendency within Pustekkom to approach its work as a function of *supply*, rather than shifting to delivery of *services* and facilitating *use* of technology. Perhaps the most obvious example of this is that the above organizational structure offers no clear location for the function of teacher professional development, although this has long been understood, both globally and within Indonesia, as a key requirement for effective ICT integration.

Having noted this, it is clear that there has been a concerted effort to expand Pustekkom's roles in each of the above areas, which is worth exploring in more depth.

Radio, Television, and Film-Based Technology Development for Teaching and Learning

This Division constituted the original core focus of Pustekkom, and has thereby generated a long track record of content development in different media. To date, it has produced over 8,000 video/television titles and in excess of 1,000 audio/radio titles. For its core business of television (TV Edukasi or TV-E), Pustekkom has two dedicated satellite channels, one for schools and one aimed at teachers and higher education institutions. To broaden the reach of its content, it also broadcasts content on the national channel, TVRI (***Televisi Republik Indonesia)***, and has partnerships with approximately 80 local television partners that broadcast its content (although there is also a much wider network of up to 200 community-based television stations that are broadcasting Pustekkom content).

TV-E would ideally prefer to have its own dedicated terrestrial television channel, but a change in the law is required to enable this (Pustekkom used to have its own dedicated channel, but this was converted into a commercial channel in the mid-1990s). It is hoped that this legal change might occur in 2012, thus paving the way for launch of a dedicated TV-E channel, which would enable Pustekkom to save significantly on the fees it pays to TVRI to carry content. To broaden its reach further, Pustekkom also plans to launch an IP TV channel in 2012. It is currently digitizing its video archive in order to provide access to video-on-demand for its entire back catalogue (although the focus is currently on digitizing only those materials that are still considered educationally relevant for students in the 21st Century). Consequently, there is early evidence that, even in this area, Pustekkom is grappling with the challenge of reinventing itself for a digital world, in which the boundaries between broadcasting and Internet-based distribution of content become increasingly irrelevant as these distribution platforms merge online.

In the area of radio, Pustekkom has been producing audio programmes since its inception in 1978. In 2009, it launched the *Suara Edukasi* (Education Voice Radio), the latest iteration of its audio offering. Through this platform, radio programmes are broadcast via satellite and on an AM radio station operating around Jakarta. This content is aimed at school students.

Pustekkom's main challenge in this area is to measure the effect of its activities, as well as to participate in ongoing external evaluation activities that help to refine its strategic direction. There is currently no reliable data on how many schools have receiving equipment for the channels (i.e. televisions/radios and, where relevant, satellite equipment), including the many schools that have received such equipment from local governments. Although a survey is sent to schools annually asking about use of the services, no formal evaluation has yet been completed of the educational effectiveness of these services, and this is therefore a high priority activity for Pustekkom in 2012. The lack of any formal evaluation activity focused on Pustekkom's activities illustrates strongly a mindset that is focused primarily on supply of content, rather than facilitating its effective educational use.

Multimedia and Web-Based Technology Development for Teaching and Learning

Indonesia has a rich and varied online landscape of educational materials, and production of multimedia and web content is now one of Pustekkom's core functions. Many of Pustekkom's materials can be found on its online portal, E-dukasi.net (*http://www.e-dukasi.net*). E-dukasi.net was established in recognition of the need for more online teaching and learning materials in local languages. Launched in August 2003, E-dukasi.net is intended to facilitate inter-school communication and collaboration, as well as the production of varied and abundant digital learning resources.

Overall, Pustekkom has registered some significant achievements with respect to online content, possibly the most notable of which is that all commercial publishers selling textbooks to schools in the country are required to make available PDF versions of their books available so that these can be placed online and downloaded free of charge (which makes Indonesia one of the most advanced countries in the world with respect to its efforts to harness the concept of Open Educational Resources, or OER, to the financial and educational benefit of students). In addition, though there is a vast and sometimes bewildering array of online content development initiatives, which mean that there is an abundance of educational content in *Bahasa Indonesia* accessible online.

However, a key problem associated with this explosion of content has been its decentralized nature. Between them, government educational structures have proliferated around 240 websites, many of which overlap in function and carry similar kinds of content. As might be imagined, there are also challenges with sustainability and quality assurance for many of these sites. Consequently, a key focus for Pustekkom currently is to consolidate all of these websites into a single, integrated web portal. This new portal has been dubbed the *Rumah Belajar* (House of Learning) and will function as the official portal for e-learning of the MoEC (*http://belajar.kemdiknas.go.id*). The objective of the portal is to provide learning resources, communication, and interactive facilities for education communities and is targeted at students, educators, and anyone who wants to learn.

There are several challenges in establishing the *Rumah Belajar*. Key amongst these is to review the quality and relevant of content from the disparate existing websites. Although a formal analysis has not been done, Pustekkom estimates that only 8% of this content will be useful and relevant currently. Consequently, working through the websites and auditing the quality and

relevance of content is a major undertaking, which may take as long as three years to complete. A final consideration in this regard is to ensure that content is suitable for download in contexts with limited bandwidth. Thus, there is also a need to ensure that content is in sizes that are easy to download, which Pustekkom has been seeking to do in its online content development activities (using formats and development approaches that keep file and HTML page sizes as small as possible). However, this problem will hopefully be less of an issue in future, as the Indonesian telecommunications environment is expanding rapidly, thus delivering more and faster connectivity across the country.

A next key challenge is to focus on ongoing production of new content. From this perspective, Pustekkom is placing strong emphasis on the creation of lesson plans by teachers, an estimated 15 to 18 of which are required per semester per subject. It has produced a template that teachers use to develop plans and has piloted this during 2011 through a series of training workshops for teachers. As a result, teachers have already begun voluntarily producing lesson plans and uploading these. These are uploaded without centralized quality control, the emphasis being on quality resources being self-selected as teachers start to use the content. In the longer term, it is anticipated that rollout of these activities will be driven by provinces working with and developing capacity of the district offices.

While these are all important developments and the consolidation of the educational web presence into a single *Rumah Belajar* is a necessary step to streamline the online experience for teachers and students, it remains striking that the dominant focus is on supply of content and website functionality. Significant investments have been made in producing online content, but there is little evidence yet of any formal effort to evaluate its effectiveness in classroom practice or to assess the extent of its take-up and use. As noted previously, the omission of a parallel emphasis on teacher professional development is a significant gap, as this has been proven globally to be a key requirement for effective take-up and use of online content and services. Likewise, the provision of web templates and facilities to enable teachers to produce and upload lesson plans reflects a belief in the idea that simply making online facilities available will translate into their extensive use by teachers and generate vibrant online communities of practice. Unfortunately, there is a long history of national and indeed global portals that have failed precisely because they focused predominantly on the supply of online services and content and inadequately (or not at all) on the conditions required to make target audiences both aware of their existence and motivated to integrate their use into daily teaching and learning practices. Thus, a major challenge moving forward will be to shift from simply producing content to developing a wider range of services that raises awareness of the potential of ICT use in the classroom, markets available services, and support teachers to develop the skills required to harness these effectively to support education in the country.

Network/Connectivity Development

Central to its mandate to provide leadership on ICT in education, Pustekkom was given responsibility for *Jardiknas*, an Indonesia-wide connectivity project which uses a private network to provide internet access to one ICT Centre at each district office, with additional schools near that office connected via wireless networks. Jardiknas comprises three zones, targeting schools, education provincial and district offices, and universities respectively (although it has recently been decided to integrate these three zones into one network). From an architectural perspective, an important aspect of Jardiknas is the coupling of all traffic to a central point in Jakarta, which gives greater control over what users can do and access via the Network, but creates inefficiencies with respect to data traffic. Having initially established 4,344 nodes in 2006, Jardiknas subsequently grew to include 33,140 nodes in 2010.

In 2011, however, budget cuts required Pustekkom to scale down the number of connected schools early in the year, although financial plans were also subsequently made to supplement the initial budgets. Partly this has been achieved through the complementary SchoolNet programme, which is also managed by Pustekkom. This programme makes fixed broadband (ADSL/'Speedy') connections from PT Telkom (the incumbent telecommunications supplier in Indonesia) available to schools free of charge. In 2011, 32,678 schools were connected via either Jardiknas or SchoolNet. In addition, an undetermined number of schools are connected to the Internet through their own initiative and funds.

Although the number of schools connected represents a significant achievement, Pustekkom's activity faces key challenges in this area. Most notable amongst these are:

1. Budget allocations for Jardiknas and SchoolNet are made annually, which means that Pustekkom is only able to enter into one-year agreements with telecommunications suppliers. This creates significant problems, as tender processes are often not concluded by the time of expiry of previous contracts, leading to disruptions in connectivity supply.
2. Uncertainties about available budgets make it difficult to determine how many schools will be able to participate in the programme in each year. In both 2011 and 2012, Pustekkom has been required to make representations to Parliament to justify spending in this area, and was – in 2011 – forced to drop schools from the Jardiknas Network at the beginning of the financial year due to budget reductions.
3. In Indonesia, very strong emphasis is placed on suitability of content and services accessed online, with the result that Jardiknas has been established as a private network, with all data being routed through Jakarta. While the imperative to provide security to schools and students regarding the content and services that can be accessed is a key consideration, the resulting technical architecture for Jardiknas creates problems with latency and packet loss, which degrade the Network's performance significantly.

Again, these activities reflect strongly a mindset of supply rather than a focus on use, both within and around Pustekkom. The driving objective of both Jardiknas and SchoolNet is to increase the number of schools connected to the Internet, but there is little accompanying rationale for why this connection is essential to the school's operations. As the rationale for providing these connections is weakly defined (focusing on issues such as provision of access to the *Rumah Belajar*) and is limited by the number of schools that can be connected, there is little compelling political or educational incentive for sustaining these connections, a fact reflected in the annual budgeting processes and 2011's budget cuts. Unfortunately, this leaves Internet access at the margins of school behaviour, which reinforces the notion that its provision is both expensive and hard to justify. The provision of Internet access is not yet accompanied by a clear and compelling vision of how *all* schools in Indonesia will be transformed through provision of ICT infrastructure and Internet access and how this transformation will be both educationally effective and sustainable in the long term.

Although there are efforts to define this vision, they are largely happening around – and with support from Pustekkom – rather than being clearly led by it. This is partly because, understandably, the agency is anxious first to secure its political mandate clearly through re-working of the Ministerial Regulation of 2008. However, this tentativeness does also reflect Pustekkom's own internal challenges as it grapples with the implications of shifting from content supply to leading a process of systemic transformation through ICT integration. Pustekkom is undergoing a challenging change management process, as it transforms from being essentially a content production house to facilitating rollout of ICT and e-learning across the national education system. Although there are overlaps in these functions, the skills and management approaches required are significantly different, and there is still much work to be done in developing new skills and capacity within Pustekkom to enable it to discharge its new expanded mandate effectively.

This is particularly important currently, because Indonesia is well positioned to make much more effective systemic use of ICT in education. Up to 95% of all schools in Indonesia can already be connected to the Internet using today's telecommunications infrastructure. Of these, 78,000 schools can get fixed broadband connections, which would allow them full access to digital e-content and online services offered by the MoEC. Another 169,000 can be connected via mobile Internet. While not all of those schools would benefit immediately from broadband Internet connections, the rapid rollout of fibre-optic upgrades around the country means that the number of schools connected via broadband rather than slower connections can increase very rapidly over the next couple of years. This leaves fewer than 5% of schools that could not get Internet access today, other than through very expensive satellite connections. However, with the rollout of large telecommunication projects such as the Palapa Ring undersea cables and the ongoing roll-out of mobile networks in rural areas, the number of schools that cannot be connected to the Internet is set to reduce quite rapidly. At the same time, developments in solar technology and low-power devices mean that it is possible to get ICT into remote rural environments cost-effectively. Taking advantage of this potential affordably will, therefore, require a sea change in Pustekkom's current approach to delivery of Internet connections to schools.

d. Political Support

Pustekkom has been undertaking a significant and complex transformation as it has received a new operational mandate. This has been further complicated by the absence of a sufficiently clear policy defining this new mandate and by Pustekkom's own internal challenges of defining what this new mandate means for its daily operations and how it should prioritize activities between its legacy functions and its new ones. However, this challenge is also reflected in a wider challenge of needing to persuade decision-makers in Indonesia of the importance of investing in ICT in education, a problem clearly reflected in 2011's budget cuts to schools connectivity initiatives. Thus, Pustekkom is placed in a difficult position of having to defend expenditure on ICT in education, but is not yet optimally positioned in either policy or organizational terms to fulfil its ICT coordinating function. This is complicated by the fact that there are several stakeholders with interest and decision-making influence over education, including the Presidential Working Unit for Development Control and Supervision, the MoEC, District/Municipal governments, Central and Local Parliaments, and Local Education Councils.

Indonesia is a geographically vast and politically complex country. As an archipelago of over 17,000 islands, there is perhaps no other country where the challenges of delivering hardware and broadband connectivity to all schools in the country are so great, although recent rollout of connectivity has been sufficiently impressive to enable up to 95% of schools to access some form of Internet connectivity, as of 2011. However, terrains are difficult to negotiate in some provinces and distances across the entire archipelago massive. In addition, though, the country's political complexity has been a key driver behind the Decentralization Law, which effectively now means that financial decision-making is spread across 497 districts.

Further complicating matters, Indonesia has placed heavy emphasis on Internet security in its policies to date, and is particularly keen to ensure that school children are protected from harmful online content. While this is an understandable policy position, it has manifested itself in the form of a complex, expensive, and complicated underlying technical architecture for Jardiknas, which – in its current form – effectively prevents implementation of strategies to connect all schools to the MoEC, to their *kabupaten*, to each other, and to the Internet. Unless these technical hurdles are overcome in a way that remains politically acceptable, there is a danger that rollout of ICT in education will likely remain a largely supplementary and marginal activity in Indonesia, rather than becoming a key driver of systemic change and improvement.

The above problem is also complicated by the current annual budgeting process, which makes long-term planning for supply of connectivity to schools using central funding largely impossible (although schools can use their own allocated finances to purchase Internet connections). Annual budgets currently require Pustekkom to negotiate contracts with suppliers annually, which is both time-consuming and expensive. In addition, it means that Internet services to schools cannot be guaranteed for longer than 12 months, with the result that schools and their district offices are unable to make long-term changes to their operations based on expectation of reliable, sustainable Internet connections.

Creative political solutions and strong political leadership are needed to enable effective central coordination of ICT in education within this context. While Pustekkom can provide expert leadership in the area of ICT in education, it does require separate, higher level political support to perform this function effectively, as the organization is ultimately a structure within the bureaucracy of the MoEC and not a political entity – and thus subject to the normal hierarchical decision-making structures and processes of central government systems. Pustekkom can only effective provide leadership in ICT integration when there is strong political leadership under which it operates. In this regard, though, Ministerial Regulations – while a useful starting point – are not sufficient expression of political leadership. A sustained commitment to systemic

transformation is required, combined with long-term budget allocations to enable this transformation to take hold across all schools in the country.

Fortunately, there is a growing political push, both within and beyond the MoEC (and of which Pustekkom is a part), to make ICT a central component of systems implementation in education in Indonesia. Increasingly, educational decision-makers within Indonesia understand that:

1. **Use of ICT can lead to improved information management** at the national, district, and institutional levels, which will also benefit teachers and students. This would include:
    a. Increased reliability, validity and comprehensiveness of reporting by educational institutions, ensuring submission of Bantuan Operasional Sekolah (BOS) financial data) financial data and schools' rehabilitation monitoring and evaluation data through Special Allocation Funds (DAK) and General Allocation Funds (DAU) – effectively Educational Management Information – and thereby accelerating financial disbursements and strengthening monitoring processes;
    b. Institutional improvement through the use of information to assess strengths and weaknesses and access support;
    c. Transparency in the significant investments taking place to refurbish schools through the Government's Special Allocation Fund and by creating online refurbishment request tracking facilities connecting schools, districts, provinces, and MoEC; and
    d. Evidence-based policy-making, planning and financial management.

2. **Increased communication and information sharing can help improve school performance.** Widespread 'ICT infrastructure' will help to strengthen MoEC management, while supporting school management and monitoring to increase educational institutions' accountability.

3. **Digital curriculum resources and distance education can help educators to improve their classroom practice.** Increasing participation in professional development for teachers can be accomplished cost effectively using e-learning, and can be combined with access to high-quality learning resources (currently being aggregated through the *Rumah Belajar*), with a particular emphasis on improving practices in rural and low-performing schools.

While the above activities would include a wide range of stakeholders, Pustekkom has a potentially significant role to play in coordinating their effective implementation.

If commitments to these kinds of systemic changes can be enshrined in a revised Ministerial Regulation for Pustekkom and accompanied by both strong political support and appropriate financing mechanisms, this should help the organization significantly to drive through the necessary internal change management and professional development processes (possibly accompanied by some further internal restructuring so that its structures reflect more clearly its new mandate) and play a key leadership role in ICT integration in Indonesia.

e. Conclusion

Pustekkom is the national agency focused on ICT in education in Indonesia, with a long and distinguished track record. It has fulfilled a critical role in producing educational resources in various media, with strong emphasis on supplying content in *Bahasa Indonesia* which would otherwise likely never have been made available to teachers and students in the country. As technological change has occurred through the proliferation of ICT both globally and within Indonesian society, Pustekkom has responded by expanding its mandate from broadcasting technology to encompass multimedia and web content, while also playing a critical role in supplying connectivity to schools in the country. In this regard, both it and Indonesia have registered important gains in ICT in education, as well implementing some truly innovative and unique initiatives in the field.

Nevertheless, the experience of Pustekkom as a national ICT in education agency with a transforming mandate yields some key lessons of potential relevance globally. These are:

1. Ideally, shifts in function of key national agencies should be accompanied by immediate changes to the legal and regulatory environment in order to ensure that these changes are clearly understood across the entire system and that roles of central coordination have a clear, enforceable legal basis.

2. As organizations are asked to play growing roles in coordinating ICT in education activities, this role should be accompanied not only by clear policy commitments and objectives (which are already in place in Indonesia at a high level), but also by long-term political support and financial allocations to enable achievement of stated objectives.

3. Most importantly, though, underpinning the establishment – or re-deployment – of any dedicated agency focused on ICT integration in education has to be a clear and compelling vision of how, systemically, ICT integration will transform the operations of education in ways that are both educationally effective and cost-efficient. If the function of a dedicated agency is simply to 'provide' hardware, connectivity, and digital content to a system that continues to operate largely as it did before the development of ICT, its impact will ultimately always be marginal and unsustainable in the long term.

4. Linked to the above, it will be essential to ensure that there is a systematic and ongoing approach to research, monitoring, and evaluation in order to assess what is working effectively and what is not. As the kinds of e-services envisaged are significant innovations, it is critical that there is a planning culture that makes provision for learning from practice and integrating these lessons as relevant into implementation strategies. This is essential in moving from a culture of *supply* to one of delivery of integrated *e-services* and facilitating *use* of technology.

5. As might be expected, significant shifts in core function of organizations should be accompanied by extended programmes of professional development and change management, both within and around those organizations, in order to ensure that the agency concerned feels confident to implement revised and expanded mandates effectively.

Despite these challenges, the future remains an exciting and promising one. Almost all schools in Indonesia are within reach of affordable Internet connections. If this growth in connectivity can be harnessed systematically, it can be used by Pustekkom as a mechanism to get all schools connected to the Internet, to each other, to district offices, and to the MoEC, so that the kinds of functions outlined in the previous section can be implemented to transform operations across the entire system. Thus, as technology penetration expands, political pressure to invest in ICT

in education mounts, and the changing role of Pustekkom is enshrined in a revised Ministerial Regulation, the organization is poised to be at the forefront of a significant digital and educational revolution in Indonesia.

Annex:
Pustekkom Timeline

The timeline below highlights key events and milestones in the history of Pustekkom.

1968. Two research studies supported by UNESCO were conducted. Emerson's research, 'Diagnosis of the present situation with identification of priorities development' concluded that educational radio and television programmes are an integral part of education, therefore needs to be prioritized. Jamison stated in his paper, 'Alternative Strategies for Primary Education in Indonesia: A Cost Effectiveness Analysis', that the fixed cost unit in basic education system improvement can be implemented by means of radio programmes in enhancing teacher-student ratio.
1973-1974. Pilot conducted to test radio broadcast programme in Central Java and Yogyakarta, lead by BPP (Balai Pengembangan Pendidikan or *Education Development Agency)* of the Department of Education and Culture and supported by UNESCO, ITB (Bandung Institution of Technology), UPI (Indonesian Education University), and IKIP Semarang (Semarang Teacher Training Institute).
1976. Minister of Education and Culture formed TKPK or *Teknologi Komunikasi untuk Pendidikan dan Kebudayaan*/ICT for Education and Culture task force at national, provincial, and district level: *National TKPK*: Jakarta, Semarang (Central Java), Yogyakarta and Surabaya (East Java); *Provincial*: in 11 provinces (Irian Jaya, Maluku, South-East Sulawesi, Central Sulawesi, South Sulawesi, East Nusa Tenggara, West Nusa Tenggara, East Kalimantan, Central Kalimantan, West Kalimantan, and West Java); *District*: 9 districts in 3 provinces (names to be completed and confirmed).
1978 (30 September). TKPK task force upgraded into Centre for Communication Technology for Education and Culture or *Pusat Teknologi Komunikasi untuk Pendidikan dan Kebudayaan* and abbreviated to Pustekkom.
1979. Pustekkom, in collaboration with TVRI (Indonesian National TV), started to develop and produce ACI (Aku Cinta Indonesia) TV serial.
1980 (11 September). Former provincial and districts TKPK changed into *Balai Produksi Media* or Media Production Centres and *Sanggar Tekkom or* Education Communication Technology Workshop.
1990-1996. Pustekkom, in collaboration with TPI (Televisi Pendidikan Indonesia) or Indonesian Education Television, produced learning materials for Junior and Senior Secondary schools and broadcast them four hours per day at TPI.
1996 (5 February). Minister of Education and Culture opened new 7 Education Communication Technology Workshops in Aceh, Riau, West Sumatera, Jambi, South Kalimantan, and East Timor (East Timor workshop is no longer functioning due to the country's independence).
2000 (24 January). Pustekkom was given a new mandate to expand the scope of work to integrate the information component into its work. It became an Information and Communication Technology Centre for Education and Culture. The acronym 'Pustekkom' is still retained.
2004 (14 October). Television Edukasi (Educational television) broadcast via satellite throughout the country. TV-E presently has two channels, one for learners and one for educators.
2004-2005. Based on the Local Government Autonomy Law, all media production centres and communication technology workshops were handed over to provincial governments and continue working with Pustekkom based on coordination mandate. To date, Pustekkom coordinates 32 *Balai Tekkom* (Technology & Communication Center) at provincial level.
2004. Pustekkom established first international cooperation for Television Edukasi with Japan Foundation Indonesia. TV-E received 85 educational programmes (science, and math) from NHK International to be broadcast through Japan Foundation Aid. The programmes gained huge attention from TV-E's audience, the audience gave feedback after seeing the programme

by SMS and telephone, expressing their opinion about the programme. The programme aired from 2004 until 2006.
2005. Ministerial Regulation # 23 (2005) issued to provide mandate to Pustekkom as one of MoEC's institution responsible for ICT use in education, in which Pustekkom is to report to the Minister through the coordinative function of Secretariat General. *Also that year*: Pustekkom established partnerships with Local TV to broaden the access of TV-E across Indonesia.
2006. Jardiknas rolled out to 4,344 nodes. *Also that year*: Pustekkom signed MOU with TVRI (Indonesian National Television) to broaden TV Edukasi's access through terrestrial. (MOU was due to end in 2011, but will be renewed for an additional five years).
2007 (21 August). First issue of 'technology' journal (*Teknodik*) published. *Also that year*: Pustekkom signed MOU with Goethe Institute to produce a basic German language learning programme German Language Programme *Radio D*, targeting an Indonesian audience.
2007. Pustekkom started to relay International TV Programmes.
2008 (16 July). Ministerial Regulation #38 signed, giving Pustekkom overall responsibility to develop, foster, and evaluate activities in the field of educational technology and use of ICT for education. (26 August). Radio-edukasi launched and broadcast via satellite throughout the country. (October). Pustekkom SchoolNet (Speedy) service initiated. *Also that year*: Pustekkom handed formal responsibility for the ICT and education arena in Indonesia (based on Ministerial Regulation #38 of year 2008). Pustekkom and Goethe Institut produce another adaptation programme called 'Einblicke', focused on culture and education in Germany. Pustekkom and the Open University do joint production supporting the students of the Open University in their studying.
2009. Pustekkom and the Goethe Institut produced another programme, *Wilkommen*, based on the book published by Goethe majoring in tourism.
2010. Jardiknas grew to include 33,140 nodes. *Also that year*: Ministerial Regulation #36 (2010) issued to alter Pustekkom 'sorganizational structure. Three divisions were formally established: (a) Radio, Television, and Film-based Learning Technology; (b) Multimedia and web-based technology; and (c) ICT Network Development.
2011. Pustekkom initiated process of consolidating wide range of educational content that has been produced and made available in different forms so that it can all become accessible via a single web address.

Appendix:
Pustekkom Organograms

Figure 1 Pustekkom's organizational structure

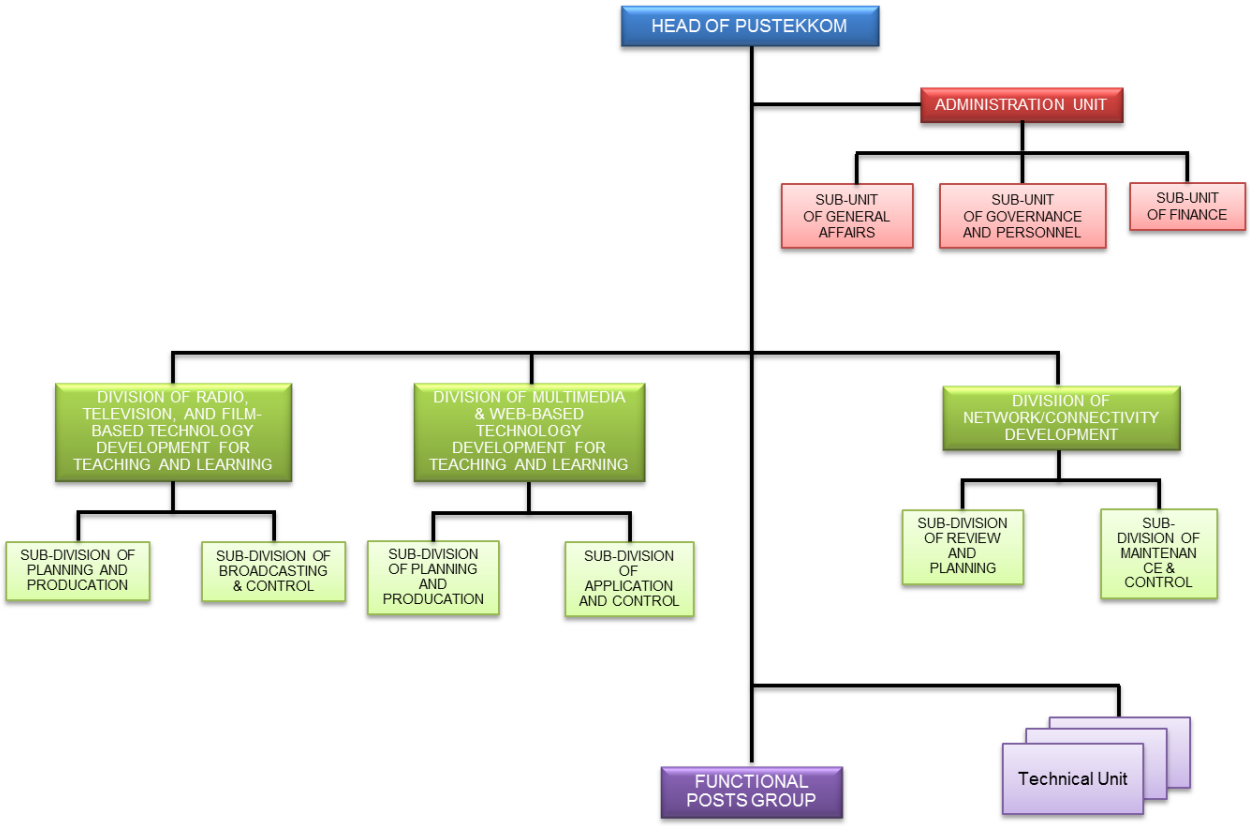
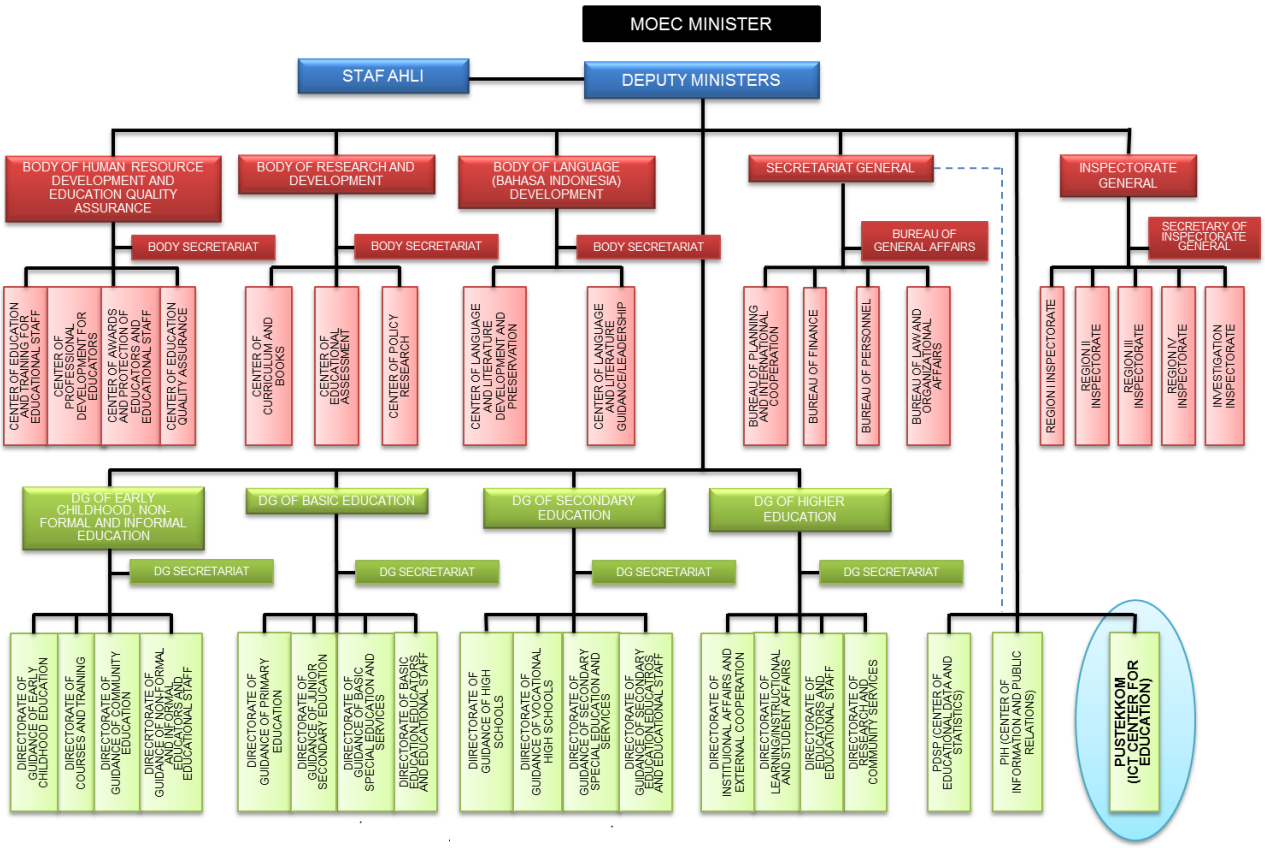


Figure 2 Pustekkom's relationship to other key actors and stakeholders within the MoEC Organisation Structure



Sources

Beschorner, N.; Chan, T.; Gaible, E.; Hung, W.C.; Lim, C.P.; & van Rees, J. (23 June, 2010). *Strategic Approaches to ICT in Education in Indonesia: Options for Consideration*. Jakarta: The World Bank.

MoNE. (2010). *2010 - 2014 MoNE Strategic Plan (Renstra): Strategy and direction of national education development policy year 2010-2014*. Jakarta: MoNE.

Pusat Teknologi Informasi dan Komunikasi. (2010). *Duties and functions of the new structure*. Jakarta: PUSTEKKOM.

Pusat Teknologi Informasi dan Komunikasi. (2011). *Pustekkom - Socialisation Material*. Jakarta: PUSTEKKOM.

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

9

Lessons from Costa Rica (Omar Dengo Foundation)

Carla Jimenez Iglesias

in this chapter …

Executive summary

Since its creation over 25 years ago, the *Omar Dengo Foundation* (ODF) has played a critical role in developments related to use of educational technologies in schools in Costa Rica. The integration of technology into Costa Rican public schools took off in 1987 with the creation by the Ministry of Public Education of the National Program of Educational Informatics, which became the flagship program of the newly created Omar Dengo Foundation. This paper explores the development of ODF as a key partner institution to the Costa Rican Ministry of Public Education and how changes in key legislation went hand-in-hand with ODF's growth and impact. It explores key lessons learned for policymakers looking for insights on how an external ICT/education agency can work productively in collaboration with the Ministry of Public Education and other government agencies to serve as main implementation agency for a large scale, national ICT in education initiative.

a. Introducing computers in schools in Costa Rica: The birth of ODF and PRONIE

As the result of a presidential campaign promise to place "one computer in every school", in 1987 the *Omar Dengo Foundation* (ODF)[1] was created to provide operational support to Costa Rica's new National Program of Educational Informatics (commonly referred to as PRONIE; its official name is the *Programa Nacional de Informática Educativa*[2]). PRONIE had a number of key objectives, including: to breach the technology gap; to promote creativity and innovation; to democratize access to technology and quality education; and to foster the development of a technology industry. The introduction of computers into schools was meant to help enable all of these objectives, while at the same time contributing to the quality of the educational system by providing learning environments that fostered the development of problem solving abilities, technological fluency, the promotion of teamwork and the development of creativity. The project was revolutionary in many aspects, including the fact that, from the very start and by design, it benefited children in rural communities who would not have normally been reached by other technology projects, and because it introduced certain new concepts and practices – including, notably, pedagogical robotics in the classroom – for the first time. From the start, PRONIE gave a strong emphasis to teacher training, introducing a well-developed in-service training program, which included a network of 'teacher advisors' who visited each school to provide support for teachers participating in the program. This grew to encompass a wide variety of other teacher support mechanisms, including special academic programs for teachers, annual training sessions (both virtual and face-to-face), and, beginning in 1988, a large biannual national teachers conference.

The Omar Dengo Foundation was legally registered on June 19, 1987, as a private, not-for-profit organization governed by the *Law of Foundations of the Republic of Costa Rica*. Its mandate specified its main objectives: "the development and increase of the quality of education, by means of the computer science and the application of new technologies to educational processes carried out in the Costa Rican educational system, which involves the application of modern educational concepts of education and their translation to practical use, aided by the use of computers as support tools."[3] The ODF mission was to stimulate the educational, social and economic development of people through research learning, entrepreneurship skills and the innovative and productive use of digital technologies. The idea behind its establishment was that an independent non-governmental organization closely linked with the Ministry of Public Education (MPE)[4] would have more administrative and financial flexibility to introduce the types of activities envisioned at that time under PRONIE, than would the Ministry itself. In addition, there was a firm belief that having the main responsibilities for the implementation of PRONIE lie in a structure outside of the Ministry would help insulate the project from the political winds that often impact actions by government on a day-to-day level.

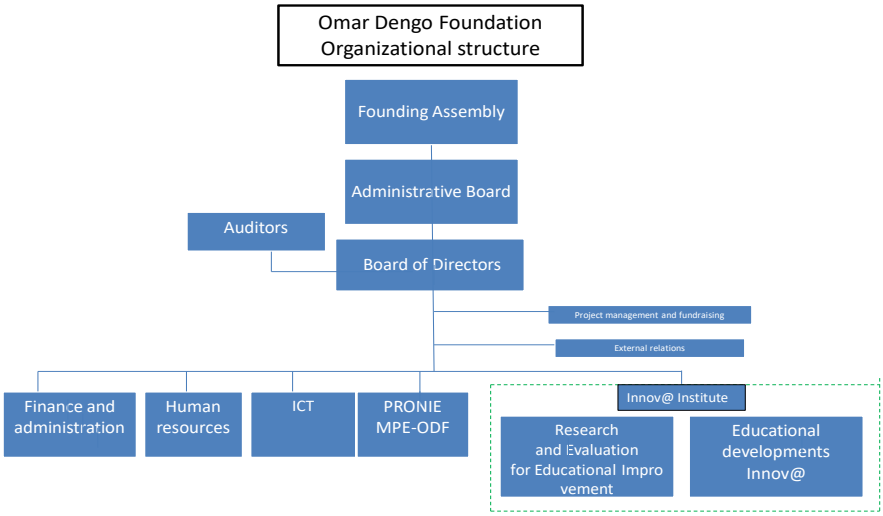
> *"The government of Costa Rica created a foundation to supervise the project – an unusual case in which the government itself made the decision of protecting a project from its own bureaucracy![5]*
>
> *-- Seymour Papert, educational technology pioneer*

[1] *Its official name is Fundación Omar Dengo (FOD).*
[2] *National Program of Informatics, commonly referred to as PRONIE.*
[3] *ODF organizational profile, 2010 (internal document)*
[4] *Ministerio de Educación Pública, commonly referred to as MEP (for its acronym in Spanish), referred to as MPE for the purposes of this paper.*
[5] *Bujanda, M. E. & Castro, R. (2007). Costa Rican National Program of Educational Informatics (2007). San Jose: Omar Dengo Foundation.*

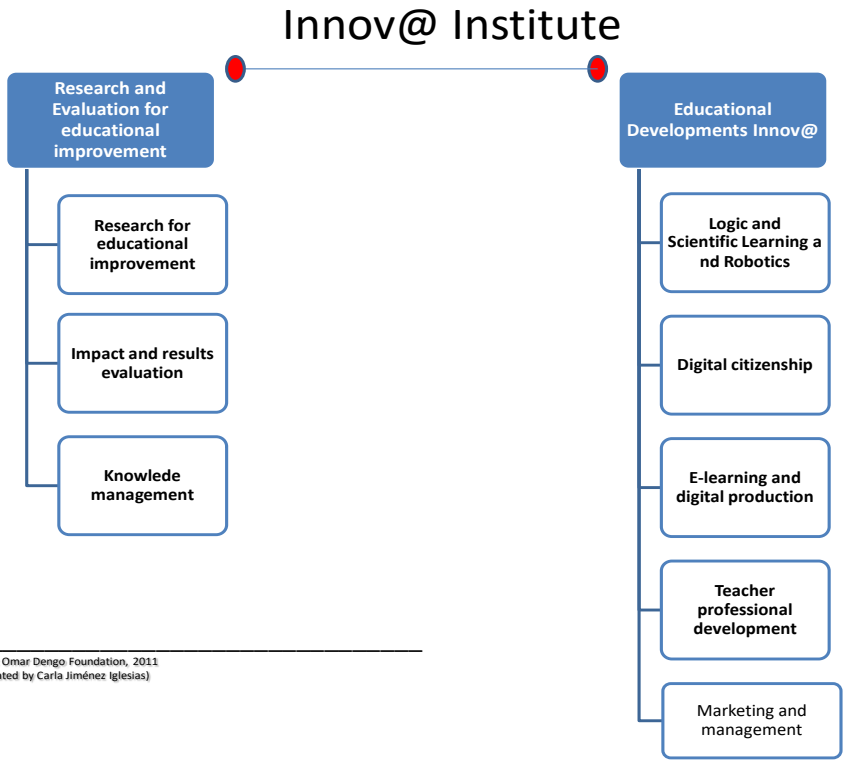
Establishing a new and separate foundation, it was believed, could help issues to be resolved and related decisions made more swiftly, and allow external funds and contributions from non-governmental sources to be received more promptly. With a strong and diverse founding group of intellectuals, university professors, economists and private business representatives, the idea for the establishment of the Omar Dengo Foundation was quickly accepted. At that time, most initiatives to introduce with technology in schools were targeted at secondary schools. In a break with traditional practice, ODF decided to begin at the primary school level. (Much later, ODF was asked by the Ministry of Public Education to take leadership of educational technology initiatives in secondary schools as well.) Besides the founding members and according to the laws that regulate Costa Rican not-for-profit organizations, a public official has to be part of the Foundation's board (currently a representative from the Executive Branch sits on the Board), as well as a representative from the Municipality's local government where the Foundation is based. Historically, other members of the Board have concurrently been active in government positions, representing different political parties.

The Omar Dengo Foundation was established with initial funding provided for the implementation of the National Program of Educational Informatics. That same year (1987), the Foundation's contribution to the education system and to the national development was recognized with an Executive Decree, which declared that the Omar Dengo Foundation was a 'public interest organization', making it possible for public institutions to transfer public funds to the Omar Dengo Foundation and providing free taxation for goods and services. This Executive Decree was an important signal of official support for the Foundation's activities and provided an impetus for public institutions to collaborate with the Omar Dengo Foundation, given the tax advantages and simplified financial transfer procedures that the decree made possible.

Omar Dengo Foundation Structure



Source: Omar Dengo Foundation, 2011 (translated by Carla Jiménez Iglesias)



Source: Omar Dengo Foundation, 2011
(translated by Carla Jiménez Iglesias)

b. PRONIE & ODF: Implementation and context

The country of Costa Rica, and the institution of the Omar Dengo Foundation, are considered to be pioneers in the use of educational technologies in developing countries in the Western hemisphere. Another notable example is Chile's *Enlaces* program, an initiative that began pilot operations five years after ODF was created and which quickly grew to become an often-cited and -studied model for how to introduce ICTs into a country's education system in a systematic way using a phased approach. Although the implementation strategies for these two countries were different in many respects, they became important destinations for international researchers and policymakers interested in doing something similar in their own countries, and can be seen as paving the way for other ambitious initiatives, like Uruguay's Plan Ceibal, that were born in the first years of the 21st century.

Three major contextual elements are identified by Omar Dengo Foundations' first executive director, Clotilde Fonseca, as main reasons for the Foundations' birth: the shift to an 'information society'; the 'crisis' of the Costa Rican educational system; and the larger political and developmental context across Central America at that time. By the end of the 1980s and the beginning of 1990s, the mainly agricultural and production models predominant in Costa Rica began to give way to new models that would strengthen the development of skills, creativity and innovation in new ways. At the time of Omar Dengo Foundation's creation, there was a professed need to prepare the country to transition to a 'modern economy' and the introduction of technology into the classroom was seen as a propeller to shift the Costa Rican society into an information society.[6] The National Program of Educational Informatics was seen as a powerful instrument for innovation, creativity and change to bring the educational system of its perceived crisis at the time. Another determining factor in the creation of the project were highly favorable United States policies for international development in the context of the precarious peace in other Central American countries. Costa Rica was receiving substantial financial support from the United States (over $1m a day over a period of four years – a very large amount of money for an economy the size of Costa Rica's at the time),[7] and resulting investments to help support the education of Costa Rican youth education was hoped to be an example for the wider region. That said, there were doubts within both the international community and main sectors of Costa Rican society about the appropriateness of supporting a 'technology project for children' given many other pressing national developmental needs.

The United States Agency for International Development (USAID) provided the necessary funds for the launching of the program and provided an endowment to assure the sustainability of the program in its initial phases. USAID funding initially went mainly to purchase computer equipment. In the second year of the program, changes were made to have part of the budget cover operation costs as well, and this helped to strengthened ODF's management capacities.

> *Now it seems to be the most usual thing in the world to place technology in learning centers. But then, it was practically a revolutionary project. When ODF intended to train teachers in the use of multimedia technologies, previous to changing the technological platform in 1997, and it required this kind of equipment in order to execute the training, we discovered that there were only 100 multimedia machines in the country, when ODF was importing 6,000 machines to be installed in public schools and high schools to be used by children and youth.*
>
> *- Clotilde Fonseca, ODF Founding Member and longtime Executive Director*

[6] *Interview with Claudia Fonseca (1991)*
[7] *Bujanda, M. E. & Castro, R. (2007). Costa Rican National Program of Educational Informatics (2007). San Jose: Omar Dengo Foundation.*

Main linkages between ODF and the Ministry of Public Education

Two key cooperation agreement frameworks were signed by ODF and the Ministry of Public Education. The first cooperation agreement in 1989 provided key guidance regulating the relationships of the two institutions with each other. With the consolidation, expansion and the rapid development of technology in education in Costa Rica in subsequent years, there was a need to review the new technological and logistics environment. As a result, a new, expanded cooperation agreement was signed in 2002 (later extended to 2010[8]) detailing a more expansive set of activities, as well as administrative and financial support.

The Ministry of Public Education had important changes in its institutional structure regarding ICT, and the Omar Dengo Foundation had to adjust to these new institutional realities as a result. Originally, the coordination of ICT activities was hosted in the National Didactic Center; since 2008, most of the ICT-related activities have been concentrated in the new Technological Resources Division. This division has four departments: (1) Research, Development and Implementation; (2) Electronic Information and Documentation; (3) Technological Resources Management and Production; and (4) School Libraries and Learning and Resource Centers. Two other groups helped share the responsibility for coordinating ICT and education-related activities within the ministry: the Curricular Development Division and the Education Innovation Area.

According to the leadership at MPE, the Technological Resources Division ICT in education activities had a different scope than ODF's activities. In addition to cooperating on PRONIE, both organizations worked on partnership initiatives such as PROMECE, which was focused on rural education; ATC21s, which focused on 21st Century skills; Labor@, which promoted entrepreneurship skills through the use of virtual management simulations; and CADE, a citizenship education program implemented in schools taking part in the National Program of Educational Informatics.

Institutional cooperation for PRONIE

There have been close historical working ties within the Ministry and the Foundation working with PRONIE. The shared responsibility for the program between ODF and the MPE guaranteed its sustainability and careful growth in coverage. Since its beginning, the Ministry of Public Education paid for the salaries of the teachers and advisors participating in the project. Part of the Omar Dengo Foundation's staff worked on specific projects like teacher training and professional development, robotics and research and evaluation. The number of people within both organizations assigned to work on activities covered under PRONIE grew greatly over the year. Staffing numbers inside the Foundation were very telling of the project's impact in both institutions: in 1988 a total of 30 staff members were working at ODF (specifically in PRONIE), together with 12 counterparts in the Ministry. By 2011, this number had grown to 178 people at ODF and 107 people in the MPE. At that time, the annual contribution from the national education budget for PRONIE management, including appropriate office space for PRONIE to operate and connectivity costs for all participating educational institutions, was around US$21 million.

Each year, the Foundation presented its annual operations plan for PRONIE to the Ministry. This request was then included in the MPE general budget request, which ess eventually debated and approved by the National Controllers Office by the end of September. The resulting financial support from the national budget was key in PRONIE's growth, and helped considerably to strengthen the Omar Dengo Foundation.

[8] *Fundación Omar Dengo Convenio Marco de Cooperación Entre el Ministerio de Educación Publica y la Fundación Omar Dengo. Programa Nacional de Informática Educativa MEP-FOD (2002).*

The Innov@ Institute at the Omar Dengo Foundation served as a supportive service platform for PRONIE. At the Institute, students, teachers; educational authorities, private sector leaders and national and international experts participated in learning and knowledge exchange activities.

PRONIE's reach and impact

By December 2011, over 1,145 educational institutions were benefiting from the Program (923 primary schools with a total of 343.590 students and 222 secondary schools with a total of 128.520 students), for a total PRONIE MPE-ODF coverage of 63.2%.[9] 57 educational institutions were part of PRONIE. Compared with early numbers, the impressive growth of the Program in 1988 is clear.

Omar Dengo Foundation's partnerships

In addition to its close linkage with the Ministry for Public Education, the Omar Dengo Foundation worked hard at maintaining solid partnerships with different stakeholders to extend the impact programs. The Foundation has had long standing relationships with *international donors* such as the Inter-American Development Bank (IADB), Organization of American States (OAS), The World Bank and United Nations Development Program (UNDP). Other agencies, like United States Agency for International Development (USAID), International Development Research Center IDRC CANADA, Swiss Agency for Development and Cooperation (SDC), International Development Research Centre (IDRC) were strong allies in the first years. Partnerships with *private companies* like IBM, Intel, Microsoft, Motorola, CISCO Systems and Sun Microsystems have made possible for most initiatives to exceed their initial objectives and expand their reach. Supporting the growth of its programs, the Omar Dengo Foundation collaborated with many prestigious *academic and research institutions* both at a national level and internationally. Agreements and alliances were established with Costa Rican institutions like the Universidad de Costa Rica, Universidad Nacional and Universidad Estatal a Distancia, as well as with U.S.-based institutions like MIT, Stevens Institute of Technology, Buck Institute for Education, Miami Dade Community College and Harvard University. The involvement of *local communities* was a key component of all ODF projects, and its involvement in PRONIE was no exception. Local partners groups were expected to cooperate with the necessary infrastructure for the Program to function in their academic centers. Communities typically went to great lengths to collect the necessary resources to maintain these centers over time, which helped foster a strong commitment to the best use and good care of the facilities and equipment.

Laws and legislation

The existence of a set of key laws and pieces of enabling legislation was important to help provide a mandate for ODF's work, especially in support of PRONIE, and to sustain this work over time. Costa Rica has, in many areas (including the use of educational technologies), established institutional frameworks based on special regulations and policy arrangements that aim to ensure continuity and consistency of policies.

In 1987, the Executive Decree N°17731-J-H of 1987 declared the Omar Dengo Foundation as a *public interest organization*. This made it possible for public institutions to transfer public funds to the Omar Dengo Foundation and provided free taxation for goods and services. Notably, the Omar Dengo Foundation also benefited from its inclusion under the Suitability for Handling of Public Funds (Law N° 7755), which certified its appropriate use of public funds and the quality of the results and efficiency achieved through its administration.

Public resources transferred to the Omar Dengo Foundation as part of its role as administrator and implementer of PRONIE were subject to various auditing processes, including an internal audit from the Ministry of Public Education, a second audit by the General Controllers Office,

[9] *Coverage statistical report, PRONIE MPE ODF. (2010).*

and an additional audit process conducted by a private firm. Other audits took place to ensure that additional controls are in place as a result of ODF's work funded by other partners and donors.

In 2001, Costa Rica's Congress decreed the *Declaration of Public Utility of the National Program of Educational Informatics* (Law N°8207), which made it possible for public institutions to transfer public funds and collaborate with technical and logistical resources as part of the National Program of Educational Informatics. In 2002, with Executive Decree N°30303-MEP/ Superiors' Council of Education agreement No. 14-2002, the ODF was recognized with a decree as the entity in charge of the National Program of Educational Informatics, and responsible for executing the national policies in educational informatics for I, II and III Cycles of the Basic General Public Education System. This meant that the Omar Dengo Foundation had executed the Program of Educational Informatics for pre-school and cycles I and II at public elementary schools (Grades K-6) since 1988 and the Program of Educational Informatics for cycle III at public high schools (Grades 7-9) since 2002, in coordination with the Ministry of Public Education, and in conformity with what was established by the Superior Council of Education. The Superior Council's agreement established the obligation of the Ministry of Public Education to provide ODF the required funding for PRONIE.

Other important policies and plans

Besides the legal decrees and laws that aided PRONIE and ODF in its growth and strengthening, Costa Rica has had a long history with the introduction of technology in schools and has had different attempts at translating these good intentions in specific policies and normative and institutional frameworks.

In 1994 the Superior Council for Education referred to the inclusion of ICT in education in the document "Educational Policy towards the 21st century"[10] and highlighted the responsibility of its application and follow up by the Ministry of Public Education.

In 2010, the Superior Education Council approved the document Policy for the Educational Use of Digital Technologies,[11] that functions as the national policy framework in the area of ICT and Education. This document highlighted that PRONIE and all initiatives incorporated into the system, including the educational use of mobile digital technologies, should be formulated and implemented in full consistency with the goals, criteria and results, agreed by the Ministry of Public Education and the Superior Education Council.

Since 1994, National Development Plans included goals related to ICT in Education as well as National plans for Telecommunications and those for the Ministry of Science and Technology.[12] There were clear efforts to articulate the ICT and education policy environment. The government in office published a Social Digital Agreement (2011)[13] in an attempt to provide leadership at a larger scale. In this document, the government laid out a plan for Intelligent Community Centers 2.0, with the objective of 'breaching the digital gap', the development of digital and work skills and offering broadband access to a larger percentage of the population. Different ODF initiatives like Explor@ and Poet@ were part of the related work strategy, demonstrating how intrinsic ODF's work was, not only for plans and policies in the education sector, but at a larger national scale as well.

[10] *Ministerio de Educación Pública. (1994). Política Educativa hacia el siglo XXI.*
[11] *Política para el aprovechamiento educativo de las tecnologías digitales. (2010).*
[12] *Bujanda, M. E., Quiros, D. et al. (2001). Avance de resultados sobre indicadores de aprovechamiento de tecnologías digitales en la educación primaria y secundaria en Costa Rica (2011). Estudio de KERIS. Ponencia presentada en el II Congreso Internacional de Investigación Educativa 2011 en la Universidad de Costa Rica.*
[13] *Presidencia de la República de Costa Rica. (2011). Acuerdo Social digital, presentación.*

As part of the Social Digital Agreement, starting 2011 the Ministry began partnering with a new stakeholder in the technology and education field, the Quiroz & Tanzi Foundation, a not-for-profit organization established in 2011 for the "Conectándonos" program. This project's objective was to give out 25,000 laptops to students and teachers and the necessary connectivity infrastructure to deploy a '1-to-1 computing' model.

With the change of leadership in ODF, there was a renovated urge to strengthen research efforts and to communicate project achievements more efficiently to be able to provide policymakers with the necessary evidence to take informed decisions on ICT and education-related affairs. The Omar Dengo Foundation's solid trajectory in the field of ICT and education provided them with a unique position and expertise to be able to measure changes and suggest future directions in the development and improvement of student learning. Going forward, the organization leadership is aware there is no 'one size fits all' solution for all schools and is exploring new learning models, in coordination with the Ministry of Public Education, to move Costa Rican technology and education sector forward in the upcoming years.

Omar Dengo Foundation Timeline: Key events and milestones

1987 Omar Dengo Foundation legally created (June 19).
1987 Clotilde Fonseca appointed first Executive Director.
1987 Creation of the National Program of Educational Informatics MPE-ODF.
1987 Executive Decree N°17731-J-H: ODF declared a public interest organization.
1989 Cooperation agreement between Ministry of Public Education and ODF.
1989 Suitability for the Handling of Public Funds granted to ODF.
1997 Agreement addendum between MPE and ODF (establishes PRONIE financing will be a conjoint responsibility between MPE and ODF). ODF starts receiving state resources on a regular basis to finance equipment purchase, logistics and administrative activities necessary to expand the coverage of educational computer labs.
2000 Motorola donates property valued at US$500,000 for new ODF facilities.
2001 Declaratory of Public Utility. By means of Law N°8207, the Legislative Assembly of Costa Rica decreed the Declaration of Public Utility of the National Program of Educational Informatics MPE-ODF. (December 20)
2002 (17 April) By means of Executive Decree N°30303-MEP, it was established that the National Program of Educational Informatics undertakes the actions and educational efforts carried out in this field in public schools, including pre-school and the three cycles of the Basic General Public Education System (Grades K-9) and that the Omar Dengo Foundation is responsible for the direction of this national program, in coordination with the Ministry of Public Education (MPE) and in conformity with what is established by the Superior Council of Education in its session 14-2002 (March 19, 2002).
2002 New cooperation agreement signed between MPE and ODF.
2007 ODF moves to new facilities.
2010 Leda Muñoz is appointed as new Executive Director.
2010 Renewal of cooperation agreement between MPE and ODF.
2010 Superior Council of Education approves "Policy for the educational use of digital technologies"- that functions as the national policy framework in ICT and Education.

c. Conclusion and lessons learned

Aided by its close relationship with the Ministry of Public Education, the Omar Dengo Foundation has played a critical role in the development of the use of educational technologies in Costa Rica. While some key elements are perhaps unique to the Costa Rican context, there are some key lessons that could be of relevance to institutions in other countries with similar mandates. These include:

Continued collaboration and coordination between the external organization (in this case ODF) and the Ministry of Public Education is crucial, but not easy. The Omar Dengo Foundation has proven successful in the balancing act of making the MPE's priorities their own, while at the same time pursuing new avenues of innovation together with international agencies and private sector partners. It has also been skillful in establishing high level linkages between new Ministers of Education and new Executive Directors at ODF leading the ICT and education work in institutions, carrying out a delicate balancing act between sometimes competing mandates and interests of the political and education spheres.

Maintaining financial autonomy is key for an ICT and Education agency. In addition to its work under PRONIE, which is funded via the national budget, the Omar Dengo Foundation has been able to maintain a certain degree of financial autonomy and invest in new initiatives and programs as a result of its use of international cooperation funds including the initial endowment fund establish with USAID funds. This financial autonomy has played an important role in supporting and enabling the Foundations' long term financial stability and independence.

Development of a complementary and coordinated ICT and education activity offer is critical. ODF has managed to successfully collaborate with MPE in the formal school setting while at the same time innovating in 'frontier' areas like robotics, after school programs and adult education. ODF has become an ally of the Ministry, by providing the appropriate testing, research and evaluation of innovative initiatives that can be later adopted by the formal education system (providing a complementary offer in ICT and education).

Care should be taken when navigating political changes. The Omar Dengo Foundation's activities have become a "national" project and have successfully navigated through political party changes in office and have kept strong support from different sectors of society. Omar Dengo Foundations' autonomy has protected its programs from different political cycles that public sector programs are subject to. Although the strong linkages between the Ministry of Public Education and the ODF have experienced some periods of weakened support due to changing political parties sitting in office. Because its solid and successful project tracks record, it has proven to become less vulnerable to changes in political leadership.

Attention should be paid to the challenge of incorporating emerging actors and stakeholders. In the changing ICT and Education landscape there is a challenge to incorporate emerging actors and stakeholders given the strong historical linkages (and perception of such linkages) between the government and one particular organization. The relationship between the ODF and the Ministry is strong and should remain as solid as new organizations and private sector stakeholders regain more territory in the landscape of ICT and Education, un-coordinated or duplicated efforts threaten to weaken the equilibrium formed between ODF and MPE. According to the Superior Education Council PRONIE and all initiatives in the education system that promote the use of digital technologies must be formulated and implemented in full consistency with the goals, criteria and results established by the Ministry of Public Education and the Superior Education Council.

Changes in legislation that facilitate government support to an ICT and Education agency or program send a strong support message and could be key to their growth and sustainability. The changes in legislation and the special contextual elements that were present

for the Omar Dengo Foundation creation and growth might not be replicable in other countries. Nevertheless the combination of all the factors prove to be an interesting set of inputs that have helped the Omar Dengo Foundation gain the space it currently holds as a solid, renowned ICT and Education agency and an important ally to the Ministry of Public Education in Costa Rica. The changes in legislation that allow the Omar Dengo Foundation to receive public funds and have tax exemption are a responsibility and the Foundation has successfully lobbied to maintain this privilege. Even though the Omar Dengo Foundation carries out other programs and initiatives, the responsibility leading the National Program of Educational Informatics has an important impact on the organizational growth and budget.

Sources

Key ICT and education related laws and regulations *(by year)*

Decreto Ejecutivo 1773. (1987) Declaración de interés público a la FOD ormática Educativa bajo la rectoría de la Fundación Omar Dengo.

Articles of Incorporation Charter ODF. (1987).

Autorización de Tributación Directa para la deducción de impuestos sobre las donaciones recibidas (1999)

(2001 actualización) *Ley fundamental de la Educación*.

(2002) *Acuerdo del Consejo Superior de Educación para el Establecimiento del Programa Nacional de Inf.*

Fundación Omar Dengo Convenio Marco de Cooperación Entre el Ministerio de Educación Publica y la Fundación Omar Dengo. Programa Nacional de Informática Educativa MEP-FOD (2002)

Ley 8207(2002). Declaración de Utilidad Pública del Programa de Informática Educativa.

Consejo Superior de Educación ACTA No. 05-2006.

Consejo Superior de Educacion ACTA No. 54-2003.

Decreto Nº 36451-MEP sobre la creación de la Dirección de Recursos Tecnológicos en Educación.

DECRETO 30303-MEP (2002). *Sobre programa Nacional de Informática Educativa.*

Calificación de idoneidad de la División de Fiscalización Operativa y Evaluativa, Área de Servicios Municipales (2004)

Presidencia de la República de Costa Rica. (2011). *Acuerdo Social digital, presentación*.

Key Ministry of Public Education documents *(by year)*

Ministerio de Educación Pública. (1994). *Política Educativa hacia el siglo XXI.*

Ministerio de Educación Pública. (2009). *Política Nacional en aplicación de las Tecnologías de la Información y la Comunicación a la Educación*.

Ministerio de Educación Pública (2010) *Política para el aprovechamiento educativo de las tecnologías digitales*.

Organigramas del MEP. (2011).

Ministerio de Educación Pública..(2012). *Informe de labores 2010-2011*.

Key Omar Dengo Foundation public documents

Anfossi, A. (2007). “Computer (ICT), Grundschule, Kindergarten und Neue Lernkultur.” in: Mitzlaff, D. (ed.) *Internationales Handbuch*. Schneider-Verlag-Hohengehren, Baltmannsweiler, 2007.

Anfossi, A. & Quesada Alvarado, A. V. (2001). *Diseñando ambientes digitales pata recrear oportunidades de aprendizaje. Una experiencia para la formación de educadores*.

Anfossi Gómez, A. & Quesada Alvarado, A.V. (2002). "Diseñando ambientes digitales para recrear oportunidades de aprendizaje. Una experiencia para la formación de educadores." in: Moraes, M. C. (ed.) *Educação a Distância. Fundamentos e Práticas*. Campinas, SP, Brasil: Universidade Estadual de Campinas, UNICAMP / Núcleo de Informática Aplicada a Educación, NIED.

Bujanda, M. E. (2006). *Digital learning. Sustaining Collective thinking. Two decades of technology enhanced learning environments*.

Bujanda, M. E. (2006). "Sustaining Collective Thinking. Two decades of technology enhanced learning environments." in: *Digital Learning*, Vol. II, Issue 2, February 2006, p. 15-18.

Bujanda, M. E. & Castro, R. (2007). *Costa Rican National Program of Educational Informatics (2007)*. San Jose: Omar Dengo Foundation.

Bujanda, M. E., Quiros, D. et al. (2001). *Avance de resultados sobre indicadores de aprovechamiento de tecnologías digitales en la educación primaria y secundaria en Costa Rica (2011). Estudio de KERIS*. Ponencia presentada en el II Congreso Internacional de Investigación Educativa 2011 en la Universidad de Costa Rica.

Fonseca, C. & Bujanda, M. E. (2010). "Promoting Children's Capacities for Active and Deliberative Citizenship with Digital Technologies: The CADE Project in Costa Rica." in *The ANNALS of the American Academy of Political and Social Science*, December 22, 2010, vol. 633, no. 1, p. 243-262.

Fundación Omar Dengo. (2006). *Fundación Omar Dengo Educación y tecnologías digitales. Cómo valorar su impacto social y sus contribuciones a la equidad Fundación Omar Dengo. – 1a. ed.* San José: Fundación Omar Dengo.

Omar Dengo Foundation. (2007). *Multistakeholder Partnerships and Digital Technologies for Development in Latin America and the Caribbean: Three case studies. Acceso Foundation, ChasquiNet Foundation.* San José, Costa Rica: Ediciones Innov@, IDRC.

Key Omar Dengo Foundation internal documents

Agreement between Omar Dengo Foundation and Ministry of Public Education: Framework for cooperation. (2002).

ODF Human Resources Division record information for ODF staff in PRONIE. (2011).

Coverage statistical report, PRONIE MPE ODF. (2010).

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

10

Lessons from Thailand (Schoolnet Thailand)

Saowaruj Rattanakhhamfu

in this chapter …

Executive summary

Thailand's national initiative on ICT usage in schools was launched in 1995 by the country's National Electronics and Computer Technology Center (NECTEC) under the pilot project known as the Thailand School Communication Network (more commonly referred to as 'SchoolNet'). The main objectives of SchoolNet were to network schools inside and outside Bangkok; to connect them to the Internet; and to promote the use of the Internet for teaching and learning in schools. After operating for eight years, the project was transferred from NECTEC to the Ministry of Education (MOE) and served as the foundation for the country's national education network.

Experience from SchoolNet Thailand provides useful lessons related to what can be achieved by small groups with vision and passion; how to operate without dedicated budget allocations from government in the start-up phase; the important role of support from widely respected and influential people outside the particular line ministries in starting something new; how to transition from a small and dynamic pilot initiative into a large government bureaucracy; and the importance of cooperation among related agencies across ministries.

a. Introduction: Background and context

Information and communication technologies (ICT), and especially the Internet, have recently played an important role in the development of education in many countries around the world. In the 1990s, there was a notable 'digital divide' in access to ICTs in schools across Thailand, especially between schools in Bangkok and those in rural areas. Students in rural areas did not have access to the Internet. As part of larger efforts to reduce various gaps across the education system, efforts to promote equitable access to the Internet gained increasing prominence.

Thailand's national information technology (IT) policy called for the promotion of ICT use in education and human resource development to increase the country's national competitiveness. To be aligned with the policy, in 1995 the National Electronics and Computer Technology Center (NECTEC), under the National Science and Technology Development Agency (NSTDA) of Ministry of Science, Technology and Environment (MOSTE), launched a new pilot project: the Thailand School Communication Network. More commonly known as 'Schoolnet', this initiative sought to promote Internet connectivity in schools so that teachers and students could access and utilize the Internet in support of their teaching and learning practices.

There were four main areas of activity under the SchoolNet project. *First*, Schoolnet connected schools to the Internet and promoted Internet usage through the development of free operating software known as Linux School Internet Server (Linux-SIS). *Second*, the development ICT skills among personnel in educational institutes was supported. During the early stages of Schoolnet, human resource development was considered to be of critical importance, and NECTEC supported various efforts to for staff to develop related skills, through efforts such as its cooperation with Rajabhat Institutes to provide training courses. *Third*, digital learning resources were developed. At that time, there were few such resources available in Thai. Teachers were encouraged and supported to develop and share educational content through the network. A new digital library was created to serve as a knowledge resource, providing material in ten academic subject areas. NECTEC also developed the Digital Library Toolkit to help teachers to create their own websites. *Fourth*, NECTEC developed the website of SchoolNet to be the focal point for schools to share information, data, news, opinions and to provide solutions for technical problems in order to facilitate knowledge exchange across the network.

According to UNDP's *Human Development Report 2001* and APEC's *New Economy Report 2001*, SchoolNet was considered as best practice in promoting ICT in education. In spite of the limited budget from the government, SchoolNet provided internet access to 5,000 schools nationwide during 1995-2003.

In 2003, responsibility for SchoolNet was transferred to the Ministry of Education (MOE) as part of the effort to develop the national education network (known as EdNet), merging and expanding SchoolNet with the national university network (UniNet) and MOE education management network (MoENet). EdNet aimed to provide internet access to 34,000 educational institutes nationwide at all levels, including schools.

b. The development of SchoolNet Thailand

In alignment with Thailand's eighth national economic and social development plan (1997-2001) and the country's first national ICT policy (IT 2000), SchoolNet was launched in 1995 by NECTEC to be a pilot project for promoting the ICT usage in education. This project aimed to upgrade the education level of Thai students through access to self-learning resources from various knowledge sources around the world and to become a communication tool enabling the exchange of knowledge among teachers and students. The development of SchoolNet can be classified into four general stages.

First stage (1995-1997): Introduction of IT in schools

In 1995, the Thai Social/Scientific Academic Research Network (ThaiSARN), a project under NECTEC, expanded the Internet connection it provided from higher education to secondary education in order to promote the use of the Internet in secondary schools. Initially, ten secondary schools were targeted. Later, and in alignment with the national IT policy (IT2000) approved in 1996, the scale of Internet use in secondary schools in Thailand was expanded. The name of the project was changed to SchoolNet, with the target of 50 participating schools in 1996, and 120 schools nationwide in 1997. Under this project, an Internet server was set up under the name of "k12.nectec.or.th" (or "k12"). Each school was allocated two Internet accounts and five MB data storage. In addition, training courses about Internet usage and web page creation were provided to teachers. Schools could connect to the Internet by using a dial-up modem, connecting to 39 phone lines (later increased to 120 phone lines). No budget was allocated by government to support these activities and, given that a number of target schools also had no computers, NECTEC asked for support from the private sector to donate hardware (such as computers and modems) and operating system software to schools, especially in remote areas.

In this period, SchoolNet faced three major implementation challenges. *First*, provincial schools had to pay a high cost for the long distance call to connect them to the Internet server, which was located in Bangkok. *Second*, some schools did not have computers, modems, and phone lines. *Third*, most educational content on the Internet was in English, and the English language ability of most Thai teachers and students was quite limited.

Second stage (1998-2000): SchoolNet@1509

In the second stage, the target number of participating schools in SchoolNet was increased to 1,500 nationwide. Importantly, the national IT committee (NITC) appointed the Sub-Committee Coordinating Working Team for Internet use in education as a mechanism to build cooperation among three major ministries: the Ministry of Transport (MOT) to provide internet service with reasonable cost to schools by Telephone Organization of Thailand (TOT) and Communication Authorization of Thailand (CAT); the Ministry of Education (MOE) to select qualified schools and to provide training on basic internet usage; and the Ministry of Science, Technology and Environment (MOSTE) to promote Internet use in education and to prepare guidelines for the use of the Internet in schools. Under MOSTE, CAT was responsible for providing Internet connectivity. SchoolNet got support from TOT for domestic Internet bandwidth and CAT for International internet bandwidth. Participating schools from across the country could connect to the Internet by dialing the phone number '1509', paying only the very small cost of three baht per connection.

Three main achievements marked this second phase of activity. *First*, schools nationwide could connect to the Internet network without paying for long distance calls. Consequently, students and teachers in schools outside Bangkok could access the Internet for the first time. *Second*, the Digital Library was developed to provide knowledge and useful learning materials in Thai.

Third, Linux-SIS, a free packaged software application, was developed to serve as the Internet/Intranet server for schools.

Third stage (2001-2002): Expansion

In this period, Schoolnet grew significantly to reach 5,000 schools at the including primary, secondary and vocational levels. In addition, SchoolNet shifted its role from network development to content development, especially digital learning resources in Thai, as the increase of Internet service providers (ISPs) meant that connectivity was widely available at much lower costs.

Fourth stage (2002-2003): Transition from NECTEC to MOE

The SchoolNet pilot project was formally transferred to the Ministry of Education (MOE) during this stage. Under the MOE, the Bureau of Information Technology of the Office of Permanent Secretary was responsible for managing this project. There were four groups directly in charge of project operation and implementation: the planning and policy group, responsible for training; the network and technology group, responsible for network and hardware; the system development group, responsible for providing software such as Computer Assisted Instruction (CAI) and database management software.; and the information group, responsible for data about schools.

During this period, network coverage expanded to 38,000 schools nationwide. Later, the project's name was officially changed to the Education Network Service (EdNet).

Key players in SchoolNet Thailand

Cooperation among a number of related agencies was of critical importance to the development of SchoolNet. In particular, as the secretariat office of the national IT committee (NITC) under the umbrella of NITC, NECTEC cooperated with TOT to get support for domestic Internet bandwidth, with CAT for support of international internet bandwidth, and with the MOE to select qualified participating schools and provide training. Under NITC, there was Sub-Committee Coordinating Working Team for Internet usage in education. Its major tasks were classified into three dimensions: network, content and human resource development. For the network task, the working team members included NECTEC, CAT and TOT; content coordinated by MOSTE; and human resource development activities were handled by both MOE and MOSTE, with MOSTE responsible for public relations and identifying agencies to receive, while the MOE was responsible for cooperation with Rajabhat Institutes to provide trainers. Some problems with collaboration ensued as, in practice, MOSTE and MOE worked separately and uncoordinatedly in many cases. NECTEC therefore took on an unofficial role in searching for educational supervisors and teachers to be volunteers to support the core tasks, such as providing solutions about basic network and Internet usage problems.

figure 1. Structure of joint working teams

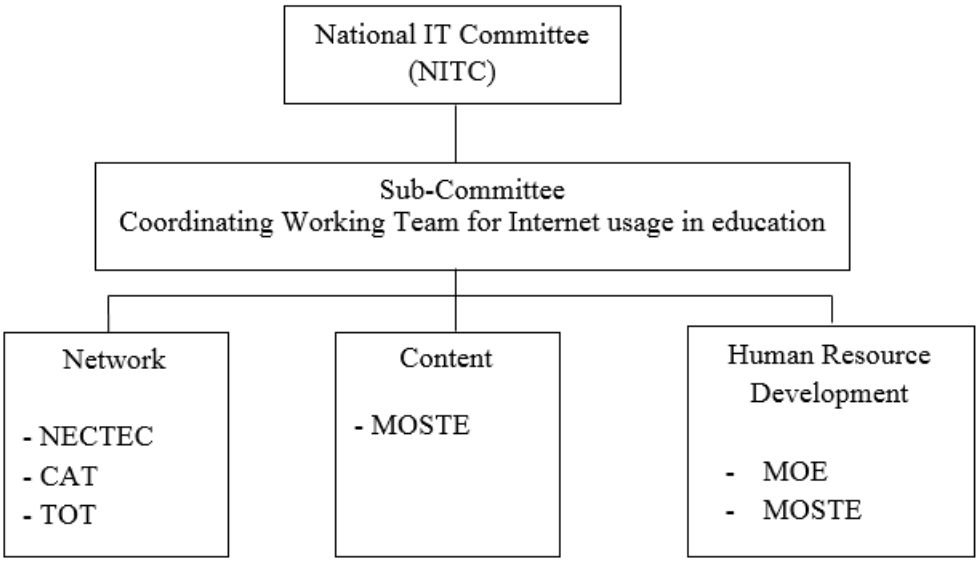


table 1. Expenses in the implementation of SchoolNet

Fiscal year	Private sector (Baht)	TOT/CAT (Baht)	NECTEC (Baht)
1996	2,880,000	-	1,195,450
1997	1,030,000	-	4,857,800
1998	-	32,200,000	26,380,000
1999	1,254,811	32,200,000	2,380,000
2000	-	82,517,950	2,380,000
2001	-	82,517,950	66,600,000
2002	-	82,517,950	4,585,321
2003	-	82,517,950	3,816,130
Total (1996-2003)	**5,164,811**	**394,471,800**	**112,194,701**
Total (1996-2003)	**511,831,312**		

c. Challenges in the implementation of SchoolNet Thailand

SchoolNet faced six major implementation challenges:

1. *The MOE did not formulate a clear policy on ICT in education.*

As a result, school administrators did not realize, and were not aware of, the importance of ICT use in education. Consequently, when teachers faced problems, such as having no modem or computer, high phone costs, and no direct phone line to connect the internet, they did not get help or support from principals to help solve such problems. NECTEC stepped in and tried to solve such problems by asking for assistance from various other groups, brokering hardware donations from the private sector and network support from CAT and TOT. With the passage of the National Education Act of 1999, things improved considerably, as Chapter 9 under this Act focused on technology for education. This helped to build the awareness of using ICT in education for executives in MOE and schools.

2. *Network infrastructure was not accessible equitably in different areas of Thailand.*

In the beginning of the project (1995-1997), ICT usage was very costly. At that time, there were few Internet Service Providers (ISPs), most of which were located in major provinces. Those wishing to connect to the Internet from schools in small provinces or remote areas had to pay the high cost of long distance call. This led to the development of a 'digital divide' between schools in major provinces and rural areas.

3. *Some schools had difficulty connecting to the Internet through phone lines.*

Some schools were in remote areas so they did not have phone lines. Others -- especially small schools -- had only 1-2 phone lines dedicated for use by the school administration. This meant that they did not have a direct phone line to connect to the Internet; they often experienced frequent disruptions in their Internet connections as well.

4. *Content on the Internet was of limited practical use in education.*

During the first era of Internet use in Thailand, most content was in English, and thus it was difficult for teachers to use this content in their teaching. Later, more content was developed in Thai, but most of this was created for entertainment purposes, not for education. As a result, teaching and learning content meant to be used for educational purposes was very limited.

5. *Teachers lacked the skills and experience to use ICT in education.*

Most teachers did not have the necessary skills to be able to use the Internet, let alone use ICt in support of their pedagogical practices. Some teachers had a very high workload, so they thought that they did not have time to learn how to use new technologies. Some teachers had difficulties in understanding English – the predominant language of the Internet at that time – which further complicated their efforts to use the Internet. Sometimes teachers simply were not aware of what was available on the Internet, and so were note motivated to use the new technologies provided to them.

6. *Resource management in schools did not maximize the efficiency of computer and network usage.*

Network administration in schools was often not sophisticated enough to maximize available bandwidth. There was no integration between computer usage and learning in core academic subjects, and limited cooperation among teachers to manage computer labs or computers to be

used for learning in computer classes and in other subjects. Some schools, it should be noted, did not have enough budget to purchase computers and other related equipment.

SchoolNet tried to solve these sorts of problems in a number of ways. To solve the network problem related to the high cost of a long distance call, SchoolNet got support from Her Royal Highness Princess Sirindhorn to allow for the merging of the SchoolNet with the Kanchanpisek Network (an online mass-educational project) so that a large-scale nationwide IP network called SchoolNet@1509 could be established. This provided one telephone number ('1509') which users nationwide could use to access the network at low cost. To deal with the problem of limited content to be used for learning in schools, SchoolNet developed prototype digital learning content as part of a "Digital Library" and a Digital Library Toolkit, which helped teachers with basic ICT knowledge create and distribute their own contents on the network. NECTEC developed Linux-SIS as free software which could help to manage local school networks, and distributed this software by CD-ROM, together with related training manuals and courses.

To help build awareness of the benefits of ICT use in education, SchoolNet organized a number of outreach activities, including regional seminars and exhibitions; training courses for teachers and student; rewards for outstanding schools, administrators and teachers who promoted ICT use in schools; and online initiatives to demonstrate various applications of ICT use in education.

Timeline: Key events and milestones of Schoolnet Thailand

1995	Launched the project of internet in secondary schools; 10 schools participated.
1996	The national ICT policy (IT2000) approved.
1996	Extended the project of internet in secondary schools to reach 50 schools and named it "SchoolNet".
1997	Extended the number of participating schools to 120.
1998	Support from the Royal Highness Princess Sirindhorn to use the Kanchanapisek Network established a large-scale nationwide IP network called SchoolNet@1509.
2001	Increased available phone lines to 1,650 and the number of participating schools to 4,000 schools.
2001	Recognized as Best Practice for ICT usage as a tool to reduce the education gap and digital divide in the UNDP *Human Development Report 2001* and *APEC New Economy Report 2001*
2003	SchoolNet transferred to be the Ministry of Education (MOE).
2003-7	Extended the number of participating schools to 38,000.

d. Conclusion and lessons learned

A number of key lessons can be learned from the development of SchoolNet Thailand.

The vision of leaders of the project team at NECTEC was a key factor in the birth of SchoolNet. NECTEC executives were keenly interested in technology and realized the potential benefits of ICT use in education. In addition, passion and personal commitment among operating staff can be an important striver of action and success, especially in the early days. Most NECTEC executives were university professors and were passionate about education. Their interest in connecting schools was an extension of this passion. Consequently, they were eager to launch the pilot project to provide Internet connectivity to secondary schools across Thailand.

As the secretariat of the national IT committee, NECTEC operated the project by seeking cooperation from related agencies, such as TOT, CAT and MOE. At that time, NECTEC also oversaw the existing project of Thai Social/Scientific Academic Research Network (ThaiSARN), which was Internet network for higher education. The experience of operating ThaiSARN project helped NECTEC to expand the Internet connection network from higher education to secondary education. In addition to executives, NECTEC staffs were capable and eager to operate the project successfully, in spite of very limited budget and personnel.

The creation and implementation of SchoolNet without an allocated budget from the government during 1996-2000 demonstrates that a lack of dedicated funds need not imperil a project of this sort, provided that people are able to be creative. SchoolNet did not get supporting budget from the government until 2001, because the budget bureau considered that it was not the main responsibility of NECTEC to promote the ICT usage in schools. Accordingly, NECTEC had to find its own ways to support the projects. The organization structure of NECTEC and its internal budgeting practices were flexible enough to give space for staff to allocate and manage the internal budget and resource to operate SchoolNet. To minimize costs, the network resources for the project were shared with the Kanchanapisek network and the ThaiSARN network. In addition, NECTEC got financial support from other groups, such as the private sector for equipment and TOT and CAT for the network.

High level support from a widely respected and influential people outside the particular responsible line ministries (MOE and MOT) was a key to success. The support of Princess Sirindhorn was particularly notable and important in attracting partners to the initiative (like TOT and CAT), as well as helping to instill a sense of pride among key staff working on the project.

In the early stages, the absence of related government policies provided space for groups to pilot new initiatives and try new things. NECTEC had done a connectivity project in higher education, and then decided that it would do something similar for schools. Although it had no mandate to do this, there was nothing preventing it from doing this either. As a national agency for education development, the MOE was not involved in the beginning, largely because there was no governing government policy. In addition, when Schoolnet Thailand was conceived and rolled out, the MICT did not exist (it was established in 2002) or was only in its early stages of operation. This meant that the conception and early implementation of SchoolNet was largely a result of decisions by NECTEC itself.

The transition from a small and dynamic pilot initiative housed within a small institution into a large government bureaucracy (like the MOE) can be difficult and needs to be managed carefully. Once a governing government policy was in place, the functions of Schoolnet were transferred from NECTEC to the MOE. The MOE did not set up a separate dedicated structure to mirror what had been established within NECTEC. Transferring of “soft lessons”, focusing on content and developing human capacity, might not occur naturally, especially where responsibilities were transferred, but staff were not. Having a program

overseen and implemented by a small group like those working on the Schoolnet project at NECTEC meant that there was focus. This focus, however, can be difficult to maintain when responsibilities are transferred to a large governmental ministry, which has a multitude of other priorities, and whose staff may not have the same types of backgrounds and expertise and/or who may have other responsibilities as well.

To expand and 'scale up' a project of this sort, cooperation among related agencies is necessary. To enable this in Thailand, the joint working committee for ICT in education was set up, consisting of representatives from MOT, MOE, and MOSTE. Timing can be of critical importance here: If this is established too late, it may be difficult to create the necessary level of partnership for an effort like this to be developed and sustained over time.

Sources

Juthai. (2013). *Special interview with Charnsak Leungtrairat, the head of technology and network group of the Ministry of Education, Thailand*.

National Electronics and Computer Technology Center (NECTEC). (2005). *Assessing Impact of SchoolNet*.

Paisal Kiattananan & Thaweesak Koanantakool. (1998). *SchoolNet Thailand: An information infrastructure for the future of Thailand*. Bangkok: Minustry of Science, Technology and Environment.

Siriporn Pansawat. (undated). *5,000 pilot schools: SchoolNet from NECTEC to Ministry of Education*.

UNESCO. (2004). *SchoolNetworking: lessons learned*. Bangkok: UNESCO-Bangkok.

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

11

Lessons from the Philippines

Benjamin Vergel De Dios

in this chapter …

Executive summary

Beginning in 1996, the Department of Education (DepEd) started to implement the first large scale ICT/education initiative in the Philippines. This effort was later strengthened and expanded to become the DepEd Computerization Program and DepEd Internet Connectivity Program (DCP/DICP). This was a huge undertaking for DepEd, both to oversee and to implement. Fortunately, many groups were willing to help – other government agencies, international and non-government organizations, private sector, local government units and higher education institutions. That said, coordinating the large scale implementation of ICT/education initiatives by many organizations alongside DepEd's projects proved to be a challenge, especially in an absence of a clear national vision or direction and with no related national standards to meet. Diverse and unclear responsibility for tracking individual projects and initiatives, as well as related donations and support from partners and key stakeholder groups, made it difficult to share information and expertise, coordinate public-private partnerships, and replicate and scale up successful projects.

Many countries have created a distinct agency to coordinate and implement ICT/education. In the early stages of the introduction of ICTs in education in the Philippines, the government largely resisted this idea, although a number of related oversight and implementation models were proposed. Absent such an organization and/or related formal institutional structure, education policymakers, stakeholders and practitioner groups explored other options.

An examination of the Philippine experience circa 2012, where no national ICT/education agency existed but where many of the typical functions of such an agency related to coordination and oversight were in demand, offers several lessons related to options and lessons for countries that choose not to coordinate their national ICT/education efforts through a central agency or institution.

a. Introduction: Context and background

Issues related to ICT use in education in the Philippines are best understood within the larger context of the development of the IT sector in the country more broadly. In 1997, the National Information Technology Center (NITC) of the Philippines developed a master plan called "I.T. Action Agenda for the 21st Century". The goals were:

> *"By the turn of the 21st century, the Philippines will have laid the infrastructure for every business, every agency of the government, every school, and every home in the Philippines to have access to information technology…. By the year 2005, I.T. use will be pervasive in daily life. Philippine companies will be producing competitive I.T. products for world markets…. Within the first decade of the 21st century, the Philippines will be a Knowledge Center in Asia: a leader in I.T. education, in I.T. assisted training, and in the application of information and knowledge to business, professional services and the arts"[1].*

To achieve these targets, the private sector recommended to the government to create a Department of ICT (DICT), a body with more power and authority than the NITC, to aid with policy development and the implementation of related projects and activities. However, a new law was required to do this. While politicians and lawmakers debated on the merits of having a separate department[2] for ICT, the government made interim arrangements. Most notably: In 1994, Executive Order (EO) 190 created the NITC. In 2000, EO 264 created the Information Technology & Electronic Commerce Council (ITECC), replacing the NITC. And in, in 2004, EO 269 created the CICT, replacing the ITECC

Since that time, CICT groomed itself to eventually become the DICT. However, in June 2011, the government (under new administration) issued Executive Order 47, transferring CICT to the Department of Science and Technology (DOST) and re-naming it as ICT Office (ICTO) . This move caught many groups, especially the local IT industry, by surprise. One of the local newspapers wrote: "Stakeholders in the Business Process Outsourcing (BPO) and Information, Communication Technology are disappointed by the recent implementation of Executive Order 47, saying it will cause a setback in the ICT sector in the country".[3] BPO is an important industry in the Philippines. It contributed to US$ 9 billion to the economy and directly employing 500,000 people in 2012 – and was projected to grow rapidly.[4] To express its concern over the apparent demotion of CICT, the IT-BPO sector issued the following statement:

> "We were therefore surprised when we learned of Executive Order 47 … We were disappointed that EO 47 was issues without the benefit of extensive stakeholder consultation, as we believe that this would have been highly beneficial to the development and execution of public policy on the key ICT sector … Finally, we believe that the ICT sector is so critical to enhancing our national competitiveness and accelerating economic development that it merits even greater focus from the government, and the creation of a full department of government. Accordingly, we are continuing our long-standing support for the Department on ICT (DICT) … We believe that further elevating the government's prioritization of the ICT sector through the creation of a DICT will increase the ability of ICT to ensure the success not just of the IT-BPO industry but of the entire nation".[5]

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[1] National Information Technology Council. (1997). IT 21 Philippines: Asia's Knowledge Center (IT Action Agenda for the 21st Century). Manila: National Information Technology Council.
[2] In the Philippines, government ministries are called "Departments", e.g. Department of Education = Ministry of Education in other countries.
[3] "BPO stakeholders lament on EO 47 implementation", The Philippine Star, July 9, 2011.
[4] Business Processing Organization Philippines (BPA/P). (October 2010). IT-BPO Road Map 2011-2016 Driving to Global Leadership.
[5] Statement by IT-BPO Industry Associations on Executive Order 47 and the Department of ICT Bill, July 8, 2011.

Hope was revived in February 2012 when lawmakers finally approved the DICT bill. At that point, people were waiting to see whether or not the President would sign the formal creation of the DICT, or would veto it. As of June 2012, news reports came out indicating that the government was "lukewarm to the DICT bill".[6]

If the government showed reluctance to establish DICT, did this mean that the idea of a separate ICT/education agency for the Philippines – an institution commonly found in many other countries around the world and desired by many key actors in the Philippines -- would be a non-starter? Considering this question, the government (reasonably) asked: Why add another layer of bureaucracy to the country's education sector when there were already three education agencies with an explicit mandate to help manage the education sector in the country?

Background

In 2012, three government agencies managed the education sector in the Philippines: the Department of Education (DepEd) had responsibility for basic (i.e. primary and secondary) education; the Technical Education and Skills Development Authority (TESDA) had responsibility for skills training; and the Commission on Higher Education (CHED) was responsible for universities and colleges. Among these three, DepEd had pursued ICT-related initiatives most vigorously and visibly. This paper focuses on the relevance of a potential Philippine national ICT/education agency as it might relate to DepEd, given that many of the educational technology initiatives in the Philippines have historically targeted public primary and secondary schools.

ICT in education in the Philippines: Key Government Actors

The *Department of Education (DepEd)* implemented the biggest ICT/education initiative in the Philippines, part of its overall mandate to manage the delivery of basic education and 46,000 public primary and secondary schools.

The *Department of Trade and Industry (DTI)* was second biggest donor of computers to public secondary schools, supporting its efforts to ensure that students became computer-literate and ready for work.

The *Commission on Information and Communications Technology (CICT)* was the government's focal agency for ICT; it implemented the "i-Schools" project for public secondary schools and "e-Skwela", which delivered ICT-based non-formal education.

The *Department of Science and Technology (DOST)* served as the government focal agency for all ICT concerns; it absorbed the former CICT under a new group called the "ICT Office".

According to DepEd statistics, as of 2012, only 51% of public primary schools and 88% of public secondary schools (whose initial computerization was prioritized) had computers.[7] However, not all schools with computers had the same level of access. Schools with large student populations had particular challenges. Table 2 details the number of schools in the Philippines according to pupil-computer ratios. Only one percent (1%) of primary schools had 20 or less students sharing one computer, while the situation in secondary schools was a little bit better (35%). In other words: Many schools had computers, but not in sufficient numbers for students to have reasonable time to use them. Due to scheduling difficulties, most students only had a one-hour computer class per week, despite the DepEd Secretary mentioning in a contemporaneous speech that the ideal ratio would be to provide one computer for every eight students.

[6] *"Palace lukewarm to DICT bill, says legislator," Inquirer.net, June 15, 2012.*
[7] *See the Annex to this paper for related data.*

In addition, only 12% of the public schools had Internet access, with the situation better in secondary schools (40%) than in primary schools (16%). There were two main reasons for schools not being able to connect to the Internet. The first one was reasonable: Infrastructure was not yet in place, especially in rural and remote areas. More than 6,500 schools (14%) had no connection to electric power lines. The second reason was bureaucratic, related to administrative and financial rules that governed schools that made the procurement and ongoing maintenance of connectivity difficult.

b. Institutions and initiatives

In 2012, the Philippines had an enthusiastic crowd of institutions implementing ICT/education initiatives of various sorts. What motivated them? Generally, it was the common desire to help the education sector, and a common belief that ICT represented a necessary investment for the future of the country. These institutions believed that something needed to be done to improve the current situation in most public schools, and that government institutions could not do it alone – especially when it came to the use of ICT.

In June 2012, USAID commissioned an internal study to conduct a national ICT/education survey, in order to create an inventory of completed and on-going projects in place since 2000. While it was acknowledged that there were still many undocumented ICT/education initiatives, especially those spearheaded by the local government units (LGUs), state universities and colleges (SUCs), non-governmental organizations (NGOs), and the private sector, the report highlighted the following notable actors and efforts:

The Department of Education (DepEd) ran the biggest ICT/education initiative in the Philippines. The 'school computerization' program began in some places as early as 1996, but its implementation was not consistent. This effort was later strengthened and expanded into what was known as the "DepEd Computerization Program/ DepEd Internet Connectivity Program (DCP/DICP)." (Despite this strengthening and expansion, it should be noted that the programs' entire budget never amounted to more than 1% of DepEd's annual budget.)

Public primary schools received an "e-classroom" package from DCP/DICP containing a computer with six terminals, an interactive whiteboard, a projector and necessary related peripherals. The pedagogical design was to encourage group collaboration: The teacher controlled the main computer and then directed groups of students to use the six terminals. The interactive whiteboard and projector were used for class presentation and discussion.

Public secondary schools received a "computer laboratory" package from DCP/DICP. A school with less than 2,000 students got the standard package of 11 computers, 11 power supplies, one wireless broadband router, one printer and a set of software. Given that secondary schools served widely varying student populations, DepEd set the following guidelines: schools with 2,000 to 4,999 students would receive 50 terminals; schools with 5,000 to 9,000 students would receive 100 terminals; and schools with more that more than 9,000 students would receive 150 terminals.[8]

The ICT Unit of DepEd handled the entire operation of DCP/DICP. A small office with less than ten people, it was responsible for the entire process beginning with submission of budget, selection of schools, preparation of bidding documents, meeting with bidders, awarding of contracts, procurement and deployment of computers. A group of around 200 DepEd ICT Coordinators acted as support at the sub-national level.

DepEd was also engaged another type of ICT initiative that was not widely reported, or recognized as DCP/DICP: the use of ICT to improve management and governance of the basic education sub-sector. By 2012, DepEd deployed approximately 20 such information systems in areas like human resources; school-level data; asset management of facilities and equipment; and digital learning resources.

[8] *Department of Education. (June 10, 2010). DO 78, s. 2010: Guidelines on the Implementation of the DepEd Computerization Program (DCP).*

In 2009, DepEd started a process to develop an ICT/education master plan, called the "ICT4E Strategic Plan"[9], and undertook extensive consultations with regional education officers and schools. However, the draft document was put on hold when the new government took over in 2010.

The Department of Trade and Industry (DTI) implemented the "Personal Computers for Public Schools" (PCPS) project from 2001-2009. DTI's interest in this project was to "develop the information technology (IT) skills of Filipino youth as the country's future knowledge workers by providing computer laboratory packages to public high schools".[10] DTI provided 60,300 computers to 4,914 public secondary schools; this represented 66% of the total number of public secondary schools under DepEd. DTI also trained 52,728 teachers on basic computer operation and troubleshooting, as well as techniques and methodologies on integrating productivity tools in the classroom. Funding for this project came from the Government of Japan through its Non-Project Grant Assistance Counter-Value Funds (NPGA-CVF).

The Commission on Information and Communications Technology (CICT) served as the "primary policy, planning, coordinating, implementing, regulating and administrative entity of the executive branch of government that will promote, develop and regulate integrated and strategic ICT systems and reliable and cost-efficient facilities and services" prior to its transfer to the Department of Science and Technology (DOST).[11] CICT implemented two ICT/education initiatives: iSchools and eSkwela. iSchools provided approximately 1,000 secondary schools with a computer lab package (with a preference for the use of free and open source software), free one-year Internet connection and training for teachers. Implemented in 95 sites, mostly in community learning centers (CLCs), the award-winning[12] eSkwela developed interactive e-learning modules using DepEd alternative learning materials to attract more out-of-school youth to go back and finish their secondary education.

The Department of Science and Technology (DOST) piloted the use of tablet computers in select public schools using science and math learning resources it had developed. DOST, with the cooperation of DepEd, led another initiative called the "Cloud Top" project. It designed thin-client computers to fit the needs and conditions of Philippine public school classrooms, which typically were not air conditioned and were access to reliable, sufficient power was not always at hand. It used cloud technology to distribute learning contents to schools and help teachers facilitate blended learning to students.[13]

Local Government Units (LGUs) were also important players. Education in the Philippines in 2012 was one of the social services decentralized to the LGUs. Although DepEd still administratively managed the public school system, the 1991 Local Government Code mandated LGUs to create local school boards and have their own "special education fund" (SEF), a one percent (1%) levy collected together with real property taxes paid to the local government . For big and rich municipalities, their SEF represented a significant amount for schools.[14] Through this funding mechanism, many LGUs were able to provide computers to

[9] *Department of Education. (2009). Five-Year Information and Communication Technology for Education Strategic Plan (DepED ICT4E Strategic Plan). Manila: Department of Education.*
[10] *See updates on PCPS project on the DTI website:* www.dti.gov.ph/dti/index.php?p=443
[11] *See CICT's website:* www.cict.gov.ph/content/view/113/131/index.html
[12] *In 2008, eSkwela received a Certificate of Commendation from UNESCO Bangkok's Innovative Practices Award, and got an Honorable Mention from the 2010 UNESCO King Hamad bin Isa Khalifa Prize for the Use of ICT in Education.*
[13] *PH to roll out e-learning project based on cloud. February 06, 2012. science.ph.* http://www.science.ph/full_story.php?type=News&key=2778:ph-to-roll-out-e-learning-project-based-on-cloud
[14] *Robredo, J. (undated). "Reinventing Local School Boards in the Philippines",* http://naga.gov.ph/cityhall/SCHOOL_BOARD.pdf

public schools and, in some cases, even to provide financial support to teachers to attend ICT training.

State Universities and Colleges (SUCs) have traditionally supported many local initiatives for schools in their localities as part of their extension service function. In many cases, SUCs became preferred partners for large-scale ICT/education initiatives. Geographically distributed throughout the country, they formed a good network to implement ICT/education projects in the provinces. For example, CICT chose SUCs to implement iSchools and eSkwela. Microsoft and Intel also used the SUCs to be part of their network to train teachers.

The Foundation for Information Technology Education and Development (FIT-ED) was created by former government policymakers and prominent business leaders in 2009 to "increase I.T. awareness in the Philippines and contribute to the effort to enable Philippine society for the Information Age".[15] FIT-ED initiated the *Pilipinas SchoolNet* to promote the effective use of ICT tools in teaching and learning. This was later renamed to "ed.Venture" after Coca-Cola Export Corporation provided financial support. Fifteen public schools received computer laboratories, including technical support and training for teachers and school leaders. In partnership with DepEd, FIT-ED organized "National Congress on ICT in Basic Education" in December 2004, September 2006 and September 2008. This event greatly increased the awareness of many public school teachers on the possibilities of ICT in teaching and learning. FIT-ED was also instrumental in drafting the "National Framework for ICTs in Basic Education",[16] which was not completed and implemented due to the change of government administration in 2010.

GILAS (Gearing-up Internet Literacy and Access to Students – the acronym is also a word in Tagalog that, roughly speaking, denotes a 'smart dynamism") aimed was to connect all public secondary schools in the Philippines . A multi-sectoral consortium composed of corporations, non-profit organizations and government agencies raised a total donation of Php 366 million (USD 8.5 million) to support and implement the project. From 2005 to 2011, GILAS provided Internet access to 3,306 public secondary schools (some of which received computer laboratories) and trained 13,538 teachers and 542 principals.

Intel and Microsoft had been the major players in training Filipino teachers to become confident users of technology inside the classroom. While no definite figures are available, it is estimated that Microsoft's "Partners in Learning" and Intel's "Intel Teach", trained 200,000 to 300,000 teachers in the Philippines between 2003 and 2012.

Knowledge Channel Foundation, an NGO established in 1999, was the country's first and only educational cable channel . Through the help of sponsors, Knowledge Channel developed educational television programs based on the official DepEd curriculum and made them available in public school classrooms. Participating schools received a cable TV connection, training for teachers to effective facilitate television-based school lessons, and continuous technical support.

Procter and Gamble (P&G) committed in 2011 to a long-term engagement to the education sector by promising to donate one million computers to public schools as part of its broader corporate social responsibility (CSR) efforts. Through its "eStudyante" program, implemented in partnership with an NGO called eKindling, P&G hoped to inspire other companies to join the campaign.

SEAMEO-INNOTECH (South East Asian Ministers of Education Organization -- Regional Center for Educational Innovations and Technology) implemented two ICT/education initiatives that

[15] *See the FIT-ED website, http://*www.fit-ed.org
[16] *Department of Education / FIT-ED. (2004). National Framework Plan for ICTs in Basic Education (2005-2010): Harnessing ICTs for Quality Basic Education for All. Manila: Department of Education / FIT-ED.*

both won international accolades. Text2Teach,[17] which won the Asian Corporate Responsibility Award, allowed teachers to send text messages to request digitally recorded, multimedia-based teaching resources, which were broadcast to a television inside the classroom. ICeXCELS, which received a Certificate of Commendation from UNESCO Bangkok's 2008 Innovative Practices Award,[18] was an e-learning module for school administrators to enhance their leadership and management skills.

Bilateral donors and international organizations like AusAid, USAID and JICA also supported a number of ICT activities in DepEd. AusAID funded the development of information systems, including the Enhanced Basic Education Information System (eBEIS), which allowed public schools to submit education data online; and the Learning Resource Management and Development System (LRMDS), an online portal for teachers to access digital teaching and learning materials. The Government of Japan's Non-Project Grant Assistance Counter-value Funds (NPGA-CVF) supported DTI's PCPS project, which was implemented from 2001-2009. In June 2012, USAID commissioned FIT-ED to conduct a national ICT survey on ICT/education.

[17] *More information on Text2Teach project available via:* www.seameo-innotech.org/programsandprojects/projects/on-going-projects/t2t

[18] *See UNESCO Bangkok announcement here:* http://www.unescobkk.org/education/ict/ict-in-education-projects/innovative-practices/innovative-practices-awards/winning-entries/icexcels-instructional-and-curricular-excellence-in-school-leadership-and-management/

c. Issues and challenges

While many of the ICT/education initiatives in the Philippines were welcomed by DepEd and various stakeholder communities, by 2012 there were concerns that they were not well aligned and not working towards a common goal. Indeed, many of them suffered issues and stumbling blocks stemming from poor communication and coordination, which fell into five general categories: no general direction to follow; no national standards to meet; no comprehensive inventory of projects and donations; successful initiatives were not replicated or scaled-up; and public-private partnership models related to ICT/education were unclear.

General direction

Implementing partners and stakeholder groups looked to DepEd to provide general policy guidance and direction on topics related to basic education – including ICT/education. Schools desired direction so that they could be sure that their actions were consistent with national policy. Donors wanted to ensure that their efforts with consistent with DepEd priorities. Other government agencies, private sector companies, local government units, NGOs and higher education institutions needed to know general direction to ensure their actions could relate or respond to the needs of the education sector.

This need for such direction in many countries – especially across Asia -- is often addressed through the development of an ICT/education 'master plan'. Sometimes, in lieu of the master plan document, the national ICT/education agency provides de facto policy direction. The Philippines, however, had no approved master plan, nor a national agency which could communicate direction and guidance on ICT/education issues. DepEd twice developed an ICT/education master plan: first in 2004, when DepEd and FIT-ED collaborated to write the *National Framework Plan for ICTs in Basic Education (2005-2010)*,[19] and also in 2009, when DepEd, with the support of British Council and AusAid, prepared the *ICT4E Strategic Plan*.[20] However, both documents were never formally endorsed and approved due to changes in leadership in DepEd.

While changes in administration and turnover of officials are a characteristic of most governments, in the Philippines there were particularly acute challenges related to how to ensure that previously developed master plans were not disregarded, especially as they had been the result of rigorous consultation and participation of a wide number of partner and stakeholder groups.

In the absence of official guidance, or an official institution charged with leading helping to coordinate related efforts, some organizations (private sector, industry, NGOs, donors) used one or both documents as general reference or guidance documents, in whole or in part. Other groups were unaware of the existence of such documents. Without such a master plan, or explicit policy guidance, there was always a risk that groups will move forward independently in ways that didn't serve the broader goals of the education sector, especially if it is convenient for the organizations to do so. In part, this is what happened in the Philippines. For example, CICT promoted in its projects the use of open source software in public secondary schools while DepEd distributed computers using proprietary software. The result: Many groups wondered about policies related to the use of open source software. Another example was the use of television in the classroom. Initiatives like the Knowledge Channel and Text2Teach used television programs based on the official curriculum, but there was no official position

[19] *Department of Education / FIT-ED. (2004). National Framework Plan for ICTs in Basic Education (2005-2010): Harnessing ICTs for Quality Basic Education for All. Manila: Department of Education / FIT-ED.*

[20] *Department of Education. (2009). Five-Year Information and Communication Technology for Education Strategic Plan (DepED ICT4E Strategic Plan). Manila: Department of Education.*

communicated about whether or not these initiatives were consistent with DepEd's school computerization program.

Across Asia, many ICT/education master plans signal to donors important priorities to support, helping to avoid duplication of efforts and ensuring an equitable distribution of resources -- especially where needs are greatest and action needs to be taken quickly -- by highlighting particular needs and challenges among specific beneficiary groups and in specific geographic locations. Such official guidance – which was absent in the Philippines in 2012 – could have helped avoid the concentration of ICT/education projects in urban areas, which not only contributed to an inequality of access, but which also contributed to the growth of a digital divide between schools.

National standards

Without a national ICT competency framework for both teachers and students, a document common in many other countries with large scale ICT/education initiatives, organizations funding, designing, implementing and evaluating ICT/education initiatives in the Philippines were not aligned in their approaches to supporting the use of ICT by teachers and students. The absence of a national ICT competency standard for students made it difficult to measure or assess what students should learn and master in school related to the use of ICT. Teacher education institutions (TEIs) taught ICT integration differently because there were no national ICT competency framework or standards for teachers. While numerous institutions (DepEd, Microsoft, Intel, CICT, DTI, FIT-ED and GILAS) provided in-service ICT training to the teachers, such efforts were typically not aligned with each other because there were no national ICT competency standards for teachers to help guide such efforts.

Project inventory

The effective coordination and management of educational technology initiatives taking place in schools in the Philippines in 2012 suffered because there was no comprehensive inventory of ICT/education projects. In many countries, a national ICT/education agency was responsible for tracking such efforts. Some groups established contacts with DepEd, especially during the early stages of their projects, but did not provide regular updates. Still others went directly went to schools, bypassing DepEd altogether, resulting in a situation where no one, not even DepEd, knew what sort of ICT projects and initiatives existed in schools.

As a result, some problems emerged. For example: When GILAS started providing Internet to public secondary schools, it was not fully realized that DepEd would need to pay for the connection fees after the first year. Without the necessary budget, many schools discontinued their Internet subscription. In teacher training, Microsoft and Intel provided support to many schools. However, there was no regular monitoring and reporting of training activities conducted. When Procter and Gamble announced its plan to provide one million PCs to public schools, DepEd was alarmed because it was unclear what sort of related coordination would be needed, by whom, and along what timeline. These cases highlighted the risks of not having the right or complete information, which led to unequal of distribution of resources among schools in some cases, and to duplication of efforts in others.

Scaling-up of successful projects

Despite a variety of efforts by various actors – some of which had received international recognition for their success and innovation -- it was noticeable in 2012 that none of the various ICT/education initiatives had been fully replicated or scaled up across the entire education system. Many ICT/education projects in the Philippines were, in fact, initiated as 'pilot projects' to 'show the way'". The hope was that, if a project 'succeeded', DepEd would continue and expand it, integrating it into its regular activities. In 2012, this wasn't happening. Many analyses

sought to explain why this was so, including: a lack of DepEd 'ownership' of projects started and overseen by other organizations; a 'not invented here' syndrome, where a pilot project initiated by one organization was unlikely to be adopted and supported by another; a lack of a group to coordinate and facilitate the evaluation and scaling up of projects by different actors; as well as general challenges related to a lack of resources.

Public-Private (and other) Partnerships

In 2012 DepEd recognized that public resources alone could not meet the needs of the country's 46,000 public schools. Indeed, it had supported an "Adopt-a-School" program that recognized and provided tax incentives to groups and individuals who gave donations to schools. Related to ICT/education initiatives, the Secretariat of Adopt-a-School recommended better organization of the private sector and other partners (e.g. LGUs and NGOs), similar to the consortium exemplified by the GILAS approach. Donors and private sector companies interested in supported ICT/education efforts lamented the difficulty of establishing new working relationships and understanding new priority areas for support every time there was a new administration or set of officials. Public-private sector partnership, of course, can become confusing when corporate social responsibility activities become intertwined with profit-making business activities, something that regularly occurs around the world when ICT use in education is concerned. Such concerns made many public officials in the Philippines wary of offers of "assistance" from private sector groups, confused about whether such generosity was genuinely meant to help address educational needs, or simply to promote various technologies or technology-related services.

Timeline: Highlights of ICT/education in the Philippines

1994	National Information Technology Council (NITC) created.
1996	DepEd started computerization of public schools.
1997	NITC prepared I.T. Action Agenda for the 21st Century. Foundation for Information Technology Education and Development (FIT-ED) established.
1999	Knowledge Channel Foundation, Inc. established.
2000	Information Technology and Electronic Commerce Council (ITECC) replaced the National Information Technology Council (NITC).
2001	DTI started PCs for Public Schools (PCPS) Program.
2003	Microsoft and Intel started education programs in the Philippines, among them Partners in Learning (PIL) and Intel Teach.
2004	FIT-ED organized 1st National ICT in Basic Education Congress. FIT-ED drafted National Framework for ICTs in Basic Education. Commission on Information and Communications Technology (CICT) replaced ITECC and became the government's focal agency for ICT.
2005	GILAS consortium formed to connect all public secondary schools to the Internet.
2006	FIT-ED organized 2nd National ICT in Basic Education Congress. CICT launched two projects for education: iSchools and eSkwela. Text2Teach won the Asian Corporate Social Responsibility Award.
2008	FIT-ED organized 3rd National ICT in Basic Education Congress. CICT's e-Skwela and SEAMEO-INNOTECH's ICeXCELS project received Certification of Commendation from UNESCO Bangkok's Innovative Practices Awards.
2009	DepEd drafted ICT4E Strategic Plan.
2010	CICT's e-Skwela received Honorable Mention from UNESCO's King Hamad bin Isa Khalifa Prize.
2011	CICT abolished and ICT Office created under DOST. GILAS ended operation.
2012	Lawmakers approved draft bill creating Department of ICT (DICT) .

d. Options for policymakers in the absence of a national ICT/education agency

In order to direct, oversee, fund, implement and/or evaluate large scale ICT/education initiatives, many countries have created separate, dedicated ICT/education agencies. However, not all governments have done so; in 2012, the Philippines was one of those countries. This did not imply that the government did not support ICT/education, nor was it (necessarily) a marker of government dysfunction. Rather, it was, in part, the result of a desire to utilize existing institutions and not to create and support a new bureaucratic structure within or supported by government, which could potentially have serious budgetary implications in the future.

With a national ICT/education agency 'off the table' in the Philippines in 2012, education policymakers and a number of partner organizations sought to explore other options to address existing issues, while at the same time ensuring that actors at all levels – DepEd and national agencies, local government, private sector companies, NGOs, foundations and civil society groups, as well as individual schools – could move forward. To improve coordination of institutions and implementation of ICT/education initiatives, policymakers from the Philippines had a number of potential options to consider, individually or collectively, including: convening a national coordinating council; strengthening the existing office in charge of ICT inside the Department of Education; forging closer coordination with other agencies; developing an ICT/education master plan; and supporting the transformation of an organization outside government to serve as the equivalent of a national ICT/education agency.

Convene a National Coordinating Council. A 'national coordinating council' could, it was hoped, open lines of communication between DepEd and partner institutions, breaking down institutional barriers by providing a venue where institutions could raise issues, share information and find opportunities for collaboration. Such a coordinating council existed in other sectors in the Philippines (e.g. the government had issued a series of Executive Orders to establish the National Information Technology Council (NITC) and the Information Technology and Electronic Commerce Council (ITECC); in both councils, representatives from both government and private sector collaborated), but had not existed for this purpose in the education sector. Could an 'edtech coordinating council' be established in the Philippines?

Strengthen the existing ICT Unit in DepEd. Absent a national educational technology agency, one option was to strengthen the existing ICT unit within DepEd, which at the time was short staffed and had limited authority to perform other important functions. Transforming an individual component unit within an existing bureaucracy presented significant challenges, however, and the unit was already overtasked in its efforts to focus on the effective implementation of DCP/DICP. Taking on additional responsibilities would entail additional funding, staffing and leadership support in order to perform functions such as, e.g., capturing and disseminating innovations and best practices from across the entire education system (and not just from within DCP/DICP) and piloting and evaluating new practices and ideas, which could then be recommended to be 'scaled up'; taking a larger strategic and leadership role in related policy planning processes; as well as implementing various existing DepEd efforts related to ICT/education. Where could support for strengthening the existing ICT unit in DepEd come from, and who would spend the political capital to make it happen?

Coordinate with a (new) Department of ICT. After many years of debate, Philippine lawmakers approved a bill in 2012 to allow the creation of a new Department of ICT (DICT), something that the country's IT-BPO industry had long sought. While the fate of new department was unclear,[21]

[21] *In fact, a new Philippines Department of ICT (DICT), would not be formed until July 2016.*

education policymakers and groups supporting and implementing ICT/education initiatives were confronted with new potential challenges – and opportunities: How could efforts be coordinated with a new government department? Would such a department play a lead role in providing policy oversight and direction for all government-supported ICT efforts (potentially diminishing the power and mandate of DepEd when it came to ICT/education issues)? Would the new department emerge as a new 'power center', further complicating an already fractured policy and implementation landscape? What might be a desired division of labor and roles between a new DICT and DepEd when it came to support for ICT/education in the Philippines?

Develop, and approve, a (new) ICT/Education Master Plan. By 2012, the Philippines had developed two national ICT/education plans, neither of which had been formally approved by government. That said, the need for related policy direction and implementation coordination had not diminished, but no agency or group presented itself to lead the process to develop a new master plan. There was a danger that DepEd and other key stakeholder groups like TESDA and CHED developed their own visions and plans on their own -- especially if they were not compatible with each other. The three agencies also (it was assumed, not without reason) needed to agree on a common ICT competency framework for students, as well as for teachers. That said, given its mandate, DepEd could proceed and develop an ICT/education master plan for only for basic education, inviting key stakeholders already supporting ICT/education efforts in primary and secondary schools (including DTI, DOST, LGUs, SUCs, private sector companies, NGOs, local communities and parents) to join a related development process, and build from there. But DepEd had more than enough on its plate already managing basic education. Given that such a process had already failed twice, what was the likelihood for success the third time around?

Recognize, support and help transform an external organization into the equivalent of a national ICT/education agency. By virtue of its name, its lead role in helping to organize a number of 'national congresses on ICT in basic education', and its coordination role in helping to draft a National Framework for ICTs in Basic Education (which was never officially endorsed or adopted by government, although DepEd was involved in its development), the Pilipinas Schoolnet was recognized internationally in some circles as the de facto national ICT/education agency for the Philippines – or at least the closest thing to it. That said, as a specific project of the Foundation for Information Technology Education and Development (FIT-ED), it had no official mandate from government to serve this function. Notably, its funding was project-based – targeted support from the Coca-Cola Export Corporation led to its transformation into the "ed.Venture' project, which complicated the pathway and potential for it to be further transformed and restructured to serve as the equivalent of a national ICT/education agency. There were no other existing institutions outside government well placed to assume this role either.

There was also, of course, an additional option: *Maintain the status quo and do nothing*. After all, a lot had happened, and was happening, related to ICT use in education across the country, despite the absence of any official governing policy or masterplan; the lack of a national ICT/education agency; the absence of key related standards related to ICT competencies for teachers and students; and the lack of the sort of national coordinating councils which functioned in other sectors in the Philippines. Policymakers could decide not to make a choice here. But would choosing not to decide be a wise choice?

e. Conclusions and moving forward

An examination of the state of coordination related to ICT/education efforts in the Philippines in 2012 highlights many challenges that can exist in the absence of a dedicated related national body, agency or coordination mechanism. Policymakers in other countries may find three related lessons from the Philippine experience to be of relevance:

ICT/education planning and implementation benefit from coordination and a holistic approach. A national ICT/education agency can help with this. In countries where there is only one key government ministry, department or agency responsible for education, responsibility for policy and planning related to ICT/education is usually pretty clear (although, in practice, there may be competition between government agencies, e.g. between a ministry of education and a ministry of ICT). That said, for the Philippines, where there were multiple government organizations responsible for various aspects of public (and private) education, it proved difficult to develop a single plan, agree on common standards and frameworks, and speak on behalf to the government to partners in the private sector, civil society and international donor agencies.

National ICT/education vision and standards can help align activities of various actors – especially in the absence of related policy guidance or a national coordinating agency. The Philippine experience demonstrates that without a clear national vision and related masterplan and standards, various stakeholder and implementing groups may well develop their own policies and plans and proceed accordingly.

Government must strike a healthy balance between encouraging institutions to support ICT/education efforts while helping to ensure a general coherence between such efforts. In 2012, there were many institutions willing to help the Philippine Department of Education (DepEd) in efforts to support ICT use in education in schools across the country. That said, where such offers of assistance are not well coordinated, 'partnerships' of various sorts to support ICT/education efforts failed to realize their full potential. A national ICT/education can help with such coordination.

Functions without form in the Philippines

The situation in the Philippines in 2012 provides insight into how unorganized and/or very loosely organized groups of institutions with complementary – and sometimes even competing – activities can, partially and incompletely, help provide some of the functions traditionally associated with national ICT/education agencies, even in the absence of explicit direction and coordination from the ministry of education. Individual groups developed their own policies, plans and standards, sometimes in alignment with, and sometimes in opposition to, each other – and sometimes without the knowledge of government. Related information sharing occurred between various actors, but it was partial and incomplete. Such a situation was usually far from ideal, as complications arose related to planning and coordination, with individual groups acting largely in their own interests, and because there were not clear channels of collective communication between the private sector and civil society with related governmental bodies. Even where such a dedicated agency is not desired or possible, given a country's context, many of the common functions of performed by such an institution are nevertheless needed to maximize the potential benefits of efforts to support the use of ICT in education across a country's education system.

Annex: Data

All figures courtesy of the Philippines Department of Education.

***table 1*. Public schools with computers**

Type	Number of Schools	Schools with Computers	Percent
Primary	38,501	19,482	51%
Secondary	7,470	6,544	88%
Total	45,971	26,026	57%

source: DepEd (2012)

table 2. Pupil-computer ratio in public schools

Pupil-Computer Ratio	Number of Primary Schools	Percent of Primary Schools	Number of Secondary Schools	Percent of Secondary Schools
20 and below	225	1%	2,634	35%
21-40	1,202	3%	2,157	29%
41-60	4,413	11%	955	13%
61-80	3,336	9%	338	5%
81-100	2,029	5%	145	2%
101 and above	8,277	21%	315	4%

source: DepEd (2012)

table 3. Public schools with internet

Type	Number of Schools	Schools with Internet	Percent	Schools without Electricity	Percent
Primary	38,501	2,610	7%	6,267	16%
Secondary	7,470	2,969	40%	297	40%
Total	45,971	5,579	12%	6,564	14%

source: DepEd (2012)

Sources

"BPO stakeholders lament on EO 47 implementation", *The Philippine Star*, July 9, 2011.

Business Processing Organization Philippines (BPA/P). (October 2010). *IT-BPO Road Map 2011-2016 Driving to Global Leadership*.

Department of Education / FIT-ED. (2004). *National Framework Plan for ICTs in Basic Education (2005-2010): Harnessing ICTs for Quality Basic Education for All*. Manila: Department of Education / FIT-ED.

Department of Education. (2009). *Five-Year Information and Communication Technology for Education Strategic Plan (DepED ICT4E Strategic Plan)*. Manila: Department of Education.

---. (June 10, 2010). DO 78, s. 2010: *Guidelines on the Implementation of the DepEd Computerization Program (DCP)*.

Government of the Philippines. *Executive Order No. 47, s. 2011*. (Signed on June 23, 2011).

---. *Executive Order No. 190: Approving and Adopting the National Information Technology Plan 2000 and Establishing the National Information Technology Council*.

---. *Executive Order No. 264: Establishing the Information Technology and Electronic Commerce Council (ITECC) from the Merger of the National Information Technology Council (NITC) and the Electronic Commerce Promotion Council (ECPC).*

National Information Technology Council. (1997). *IT 21 Philippines: Asia's Knowledge Center (IT Action Agenda for the 21st Century)*. Manila: National Information Technology Council.

"Palace lukewarm to DICT bill, says legislator," *Inquirer.net*, June 15, 2012.

"PH to roll out e-learning project based on cloud", science.ph, February 06, 2012.

Robredo, J. (undated). *Reinventing Local School Boards in the Philippines.* http://naga.gov.ph/cityhall/SCHOOL_BOARD.pdf

Statement by IT-BPO Industry Associations on Executive Order 47 and the Department of ICT Bill, July 8, 2011.

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

12

Lessons from Australia (EdNA)

Gerald White and Lesley Parker

in this chapter …

Executive summary

Education Network Australia (EdNA) operated for fifteen years (1995-2010), providing a national education and training portal for quality resources, technology standards and educational community spaces. It was initiated in 1995, at a time when the World Wide Web was new and a number of significant international and national reports had been written about harnessing the benefits of digital technologies for education and training.

This paper examines the origins and development of EdNA as a national collaboration of education authorities and as an online portal. It begins with an overview of the Australian context. It then goes on to outline the Australian context within which EdNA grew, the processes put in place to achieve its goals and the progress of EdNA as an ICT education initiative. A brief analysis of key internal and external factors and of policy outcomes then follows, before some concluding comments that highlight the dynamic nature and complexity of integrating ICT in education at a system-wide level.

a. The Australian context & origins of EdNA

Education and training in Australia is organised as a federated model, with the national Commonwealth government and individual governments in each of six States and two Territories. Each of the latter eight jurisdictions (which will be referred to as States in this paper), has a mandate for education and training and receives funding from the Commonwealth Government to achieve this mandate. State education in schools caters for approximately 66% of all school students (Australian Government, 2011, p. 4). In addition to state managed schools, the Commonwealth government directly funds non-government schools that are organised as Catholic (20%) and Independent schools (14%). Independent schools commonly have religious affiliations although a number of non-denominational and secular schools are included. Overall, Australia has 3.5 million school students.

Training in Australia occurs in the senior secondary school years or in a post-school training college. Each State manages Technical and Further Education (TAFE) training colleges and oversees a number of private training colleges. In addition, Australia has 38 universities and a range of institutions that conduct accredited university courses.

EdNA (Education Network Australia) was a collaboration of all of Australia's education and training sectors, operating under a joint Commonwealth/State funding agreement and including participation from the States, the Commonwealth and universities. Representatives from all of these jurisdiction formed the EdNA Reference Committee (ERC) [later called the Australian ICT Education Committee (AICTEC) (http://www.acitec.edu.au)], which reported to the annual meeting of all Australian education and training government ministers, providing advice on major policy issues associated with the use of computer networks in the delivery of education. In addition, a national education and a training technology agency (Education.au limited) provided the governance and operational management for the EdNA collaboration and the development of the EdNA online education portal.

Origins of EdNA

There were numerous technology reports sponsored or undertaken by the Commonwealth Government in the early 1990s. These reports focused on higher education, the types of technologies being used and their applications in education, the convergence of technologies. These national reports recommended directions for change in education and training, and gave impetus to the need for strong education participation in in the development of sophisticated education network services.

In 1993, the Australian council of education and training Ministers (MCEETYA) established the Open Learning Technology Corporation (OLTC) as a company owned by the Australian Ministers of education and training. OLTC's role was to encourage and support high quality, cost effective open learning on a national basis, providing a focal point for collaborative activities and general promotion. By 1995, the Ministers had agreed to establish an Australian education network (to be called Education Network Australia or EdNA) and processes to determine the content needs, the network services and the reception infrastructure were initiated.

It was anticipated that EdNA would benefit Australian education and training in a number of ways. These included affordable tariffs for network users, a publishing platform for Australian education, software development and distance and open learning techniques, national collaboration on curriculum frameworks and a culture of innovation in the production and distribution of educational material mainly for domestic use with spin-offs for export markets. Also attractive was the combined purchasing power of a national organisation to provide computers in order to access the network.

EdNA also enabled state education authorities, together with the Commonwealth government, to cooperate in a number of ways, such as thinking through, collectively, new education policy issues arising from the emerging digital technologies, utilising common resources and ideas, and learning from one another in the new environment created by the World Wide Web. Further, they could address concerns regarding the protection of young people from undesirable content and persons using the internet while at the same time encouraging the development and use of responsible, effective, high quality educational resources.

EdNA was to become a cross sectoral online service for use in school education, training and university education. It was designed as a collaborative national effort, in the hope that the participating stakeholders, as a collective, would avoid duplication of effort and gain more than if they operated separately. The idea of adding value to online educational resources through accessing, sharing and developing further networked linkages was uppermost in the minds of the stakeholders. However, there also remained a strong fear that sectors of education which were already making use of computers in education had the potential to form islands of non-connectivity and duplication. In practice, an operational framework for the leadership and management of EdNA was designed to avoid this outcome.

Processes

By the end of 1995, the task of putting in place some of the building blocks to establish the information service was underway. National consultations for EdNA were undertaken by a small expert working group whose task was to consider participation in the network and the issues that would need to be addressed. In addition, the full definition of the business requirements for a national education network were the focus of the ERC, which, as an inclusive stakeholder reference group, was intended to ensure that the description of the network business requirements developed by the Commonwealth properly reflected education systems' needs.

In mid-1996, the OLTC was restructured to focus solely on the governance, strategic directions and management of EdNA and the ERC was established to provide advice to Ministers on major policy issues associated with the use of the computer networks in the delivery of education. Agreement was reached on a joint Commonwealth/State cash flow required for establishment costs of EdNA in its first three years of operation. Specifically, a sum of over $635,000 was allocated by the Commonwealth to the ongoing maintenance and upgrading of EdNA and the States also agreed to collectively contribute the same amount annually on a pro-rata population basis. In 1998, the funding for the governance and management of EdNA was increased from the original $1.27m to $1.58m and the management of EdNA was moved from the Commonwealth to a new national agency which was named *Education.au Limited*. The collaborative funding by the national and State Governments continued until EdNA's demise in 2010.

The EdNA Reference Committee (ERC) remained fundamental to the effective leadership and management of EdNA. It continued to be led by the Commonwealth and it continued to guide the overarching development of EdNA's development. Consistent with a collaborative model of operations, ERC was supported by three national advisory bodies: one each from schools, training and higher education. Each provided a grounding influence on the development of EdNA through their direct consultations with their respective sector.

One of the major and lasting efforts of the ERC that guided the development of the collaborative EdNA was the set of principles for inclusion of content on the online service. These principles, known as content standards, agreed in 1997, were a major element in laying the foundation for the nationally agreed understanding of collaboration between national and State governments

and the education sectors even though they were conceived to guide content inclusion. There were twelve principles which included the following key selection:

- *Australian perspective*: EdNA serves Australian education. Its organisation, services and standards will reflect this Australian perspective. EdNA a will actively seek and promote Australian content that meets the standards.
- *Collaboration*: The principle of collaboration was determined by MCEETYA in 1996 and constitutes a formal policy for EdNA. Collaboration occurs in a range of specific forums as well as through broader consultation.
- *Comprehensiveness*: The services and links on EdNA aim to be sufficiently comprehensive to cater for the full range of Australian education and training.
- *Networking*: EdNA is a social networked service and it therefore develops and uses tools and administrative processes that support networking. This requires distributed or decentralised processes within a documented framework.
- *National benefit*: EdNA is a national network of the education community in Australia and is resourced and supported by all Australian governments. EdNA therefore provides a publicity channel for educational material of national significance. It will be more than the sum of its parts as it seeks to leverage products and services for national benefit.
- *Public domain*: EdNA is publicly funded and will operate in the public domain.

These principles were also fundamental to the operations of Education.au Limited as the national agency managing EdNA. In framing a constitution for Education.au Limited, the education stakeholders emphasised the importance of collaboration as the purpose of the agency and its required method of operating. The Board of Education.au Limited consisted of sector-nominated members together with a Commonwealth Government nominee, a number of experts in finance, business and legal affairs, and a chair appointed by the Commonwealth. The operations of Education.au Limited and the implementation of EdNA were led by a Chief Executive Officer with the advice from an expert leadership team.

b. Development and implementation of EdNA as an ICT in education initiative

The launch of EdNA in November, 1997 was followed by a frenetic period in which online communities proliferated and were encouraged by Education.au Limited. The following account traces the progress of EdNA under six headings: initiation; collaboration; EdNA growth; establishing online communities; interactive collaboration; and personalisation.

Initiation

EdNA was the first database-driven educational website in Australia, built around the concept of a browsable and searchable directory of online resources. One of the first collaborative tasks of the ERC and its advisory groups was to nationally agree on the directory of information categories for each of the three education sectors, so that an online directory service could be built.

The ongoing work to agree the education information categories came from a view that access to the stored information would be by browsing the hierarchical categories of information in the relevant (schools, training, university) education sector. Within a year, browsing appeared to be insufficient and a search function was developed for the EdNA Directory Service. The development of search functions, such as a 'simple' search and an 'advanced' search, led to the realisation that metadata, that is, standardised keywords in a purposeful structure, would be needed to retrieve digital resources easily. The schools group developed guidelines for EdNA about content standards for schools, gathering and managing content, publishing standards, directory services and quality assurance. During this initial development period of EdNA, the importance of ensuring the interoperability of the EdNA services with those online services being developed by the States cannot be underestimated. In time, this work was expanded to include the requirements of the training and higher education sectors resulting in the EdNA Metadata Standard based on the internationally accepted Dublin Core Metadata initiative. The draft version 0.3 EdNA Metadata Standard was adopted by the Commonwealth Government in 1997 and the version 1.0 approved by the stakeholders in 1998. The EdNA Metadata Standard had been developed as a minimalist set of elements to ensure interoperability with other networked systems

Metadata became an essential tool for efficiently finding online resources using search functions. As intended, it also enabled the EdNA service to become interoperable with State online services. In 1997, the Commonwealth department of education became a member of the IMS Project, a global body developing online standards, including metadata, for educational internet services. The Australian metadata and technical efforts were maintained and strengthened through engagement in the global IMS forum, which lead to alliances with other standards bodies such as SCORM, SAKAI and SIF. The engagement with the IMS Project helped to keep EdNA services technically up to date as well as to provide technical interoperability protocols for national and State online services.

The experience of developing an Australian metadata set, such as the EdNA Metadata, from the ground up was a complex task and proved to be time consuming, starting in 1995 and finally being approved by the ERC in 2000. However, the pursuit of globally accepted technical standards and their adaptation to the local context, and adoption in Australian education and training enabled efficient linking and sharing of resources, as well as development of wide ranging services for online professional education communities.

Collaboration

As indicated earlier, collaboration and cooperation were embedded in the constitution of Education.au Limited and in the key principles developed for the operation of EdNA. Specifically, Education.au Limited was required to foster and facilitate cooperation and collaboration with Education Bodies in the use of education communications and the internet. In addition, the Constitution mandated that Education.au Limited initiate collaborative activities in maintaining its relationships with education departments throughout Australia. While stakeholder representation on the Board and its various committees did not necessarily carry with it, all documentation included concepts such as networking, coordination, cooperation and collaboration. Over time, one question that arose, and which is explored later in this paper, concerned the distinction between these ways of operating.

The national stakeholder group ERC played a central role in the development of EdNA. Each step in developing the EdNA service was summarised and considered by the schools sub-group, and the training sub-group. The national stakeholder group included members of both the schools and training sub-groups plus other national officials, a number of nominees from higher education and a member from Education.au Limited.

In addition, a full-time project officers for schools and one for training met regularly with Education.au Limited and a dedicated EdNA staff team from the Commonwealth education department for the first two years to ensure cross sectoral communication between the schools and training sectors, and Education.au Limited. The sectoral project officers met frequently in a number of modes including face to face as well as meetings using group and individual emails, telephone, especially teleconferencing, and occasionally using commercial videoconferencing services. The use of diverse communication e.g. telephone, conferencing, and online services for collaborative planning and operational aspects of implementing EdNA became commonplace. In fact, one of the earliest efforts using online collaboration was in 1998 when a web-based conferencing system was introduced to manage consultation about the progress EdNA projects. The use of this system was mainly for information and services projects whereas overarching projects continued to use face to face meetings, teleconferences and email.

The need to communicate frequently on a national basis also led to the frequent use of email group distribution services as part of the EdNA Directory Service. Email distribution groups were used prolifically to advance ideas, canvass opinions and notify decisions about developing and implementing EdNA. However, email services, although useful for distributing information were not seen to be ideal for decision making because of their asynchronous nature and inconsistent response periods. Emails also arrived out of order which caused some consternation, at times, for the sectoral project officers. However, the email distribution groups were the first of the interactive services widely available from the EdNA information directory service and were used prolifically. The email distribution groups were the beginnings of the online collaboration among EdNA participants.

EdNA growth

When Education.au Limited took responsibility for EdNA in early 1998, it introduced a national education and training news service for each of the education sectors plus a noticeboard of national education events and celebrations. In this period of development, 1997 to 1998, collaboration of State and Commonwealth government education and training officials with the agency about content and harvesting links was frequent and frenetic. Project officers for the Advisory Committees met physically and communicated regularly online with officers from the Commonwealth and Education.au Limited to plan and advise on EdNA projects. Decisions arising from collaborative efforts were confirmed at meetings of the relevant schools and training sub-groups who reported to the ERC which determined the annual directions for EdNA. Agreement by the ERC was a condition of funding from the Commonwealth to secure the annual

funding for EdNA and the projects that were agreed to be implemented by the national agency in the coming year.

By 2002, EdNA had become a 'meta-network' of Australian educational practitioners having access to thousands of online resources. Additionally, through its discussions, noticeboards and forums, it consciously fostered a range of online education professional communities.

Establishing online communities

The use of the group distribution of email led to the emergence of a number of online professional education communities outside of the operational and decision making groups responsible for the developmental plans for EdNA. For example, school librarians, mathematics teachers, language teachers, trainers and many more began to manage their professional association's business and communication online. By 2008, the school sector had the largest number of email distribution lists.

However, also by 2008, many distribution lists had moved to other and newer interactive community services available on EdNA, such as forums and groups (although news syndication services continued to grow). For example, between 2004 and 2008 the number of EdNA Groups grew by 972% and the number of participants in Groups grew by 492% although not all educational communities encouraged by the EdNA project used the EdNA online services.

The access to EdNA increased steadily in the early years of the new century: the number of visits to EdNA between November, 2000, and February, 2003, rose from 75,000 visits to 200,000 visits and the number of page views increased from about 600,000 in November, 2000, to 1.6 million page views in February, 2003. Further, during the same period, the number of EdNA projects also increased as the States developed their own local services using EdNA applications.

Then in 2003, after a lengthy two-year national consultation period with States, EdNA was redesigned and launched as a global aggregator of quality educational resources with an integrated suite of collaborative web services. One of the main new features of the new EdNA suite of services was the innovative distributed search architecture which enabled EdNA to search multiple databases in real time. This meant that EdNA was able to search digital library collections, websites and repositories where reciprocal agreements for access to information and common metadata standards had been established. The effect of this was that EdNA users could search large databases of information through one EdNA entry point.

This new feature further increased usage of EdNA due to the wider access to quality educational resources from global databases. In addition, as the capacity for States to download and embed shared EdNA applications and services increased, so did EdNA's usage increase. Shared EdNA applications embedded by the States in their own web based services included search and browse, forums, chat services, noticeboards and news feeds or content syndication. These shared information services were partly responsible for a rapid take up of the EdNA services between 2003 and 2004. This was an indication that collaboration was beneficial to EdNA's development through collaborative advisory groups and also in the formation of online education communities.

Interactive collaboration

In time, the sector Advisory Groups and AICTEC (formerly ERC) developed briefs wider than EdNA Online, although EdNA remained an important part of their regular agendas. AICTEC, for example, engaged with national ICT in education and training policy issues across the three education sectors: schools, training and universities. Issues such as broadband, technical standards, copyright and infrastructure gained considerable national focus and attention to EdNA became a monitoring role. The training sector and schools sector renamed their

committees in 2001 and removed EdNA from the names of their committees. The intention of both was to focus more on ICT policies nationally and as act forums for new sectoral and common initiatives.

This series of changes had a two-fold effect. The first was the widening of interest in ICT issues in education and training, and the second a changed focus from singly focused meetings and detailed accountability for the development of EdNA to a monitoring role by the sectors through the newly restructured national AICTEC. As a consequence, Education.au Limited, in 2001, established its own EdNA Online Advisory Committee (EORC). The purpose of EORC was to ensure ongoing consultation about the direction and development of EdNA with the sectors and the States. The change from having three major committees involved in the development of EdNA to a single and EdNA focused body reduced the amount of time for the managers of EdNA to consult about the directions and management of the service. Consultations became more streamlined enabling speedier decisions about the future development plans for EdNA. In this new governance environment, there emerged EdNA's first significant online web based collaborative service called EdNA Groups which was trialed in late 2004 and made publicly available in early 2005.

EdNA Groups was the beginning of a suite of collaborative web based online services enabling education participants to share and interact using text, audio, graphics, photographs, movies, links, and more recently online real-time discussions including online conferencing, that is, web 2.0 applications. By December 2007, there were over 1300 groups with nearly 17,000 members who were logged as 117,568 unique visitors making 308,792 visits and viewing 7,529,886 pages. The use of the interactive EdNA Groups service by education sectors was interesting because the training sector operated 420 groups whereas the schooling sector operated 351 groups, which was the opposite of the use of email distribution lists where schools dominated. The take-up of interactive EdNA Groups can be seen to be quite rapid signaling that such a service was seen as useful and valued by educators and trainers.

Personalisation

The collaborative professional community in which educators were engaging can be more starkly demonstrated by viewing the steady take up of the personalised services. These services, although they were first piloted in 2006, were launched in February 2008. They enabled sharing of personal profiles and social networking. In 2006, EdNA released a host of Web 2.0 interactive communication functions including blogs, audio feeds, wikis and personalised services such as personal searches, together with a rich base of easily accessible information resources. A new service, called MyEdna, enabled users to personalise their use of EdNA and to construct and save their own education profiles. Then in January 2008, personalisation was taken a step further with the launch of 'me.edu.au' personalised services for professional networking and sharing common online interests through the use of online personal profiles.

The national education and training online web service of EdNA had moved from being a single source comprehensive global resource based and collaboration online web service for education and training professionals, in the first instance, to become a personalised web service enabling the formation of communities of professionals with access to high quality educational resources and services. The rapid growth of education communities with the EdNA Groups services and then the growth of the 'me.edu.au' personalisation services was an indication that teachers and education professionals valued collaborative and personalised services.

Consultation occurred through national ideas workshops, State consultations, online engagement and discussion with users, trialing of new services by users and some consultation with AICTEC. What was noticeable throughout this period was the high level of engagement of EdNA users in online collaboration and online testing of new EdNA services. Collaboration

among the stakeholders, on the other hand, would appear to have moved its focus from EdNA towards the development more broadly of national policies and procedures.

The evidence suggested that Education.au Limited had become a trusted and innovative body supported in governance by a strong Board. It had also developed a very high level of education online business strategies and technical skills that could be harnessed by the States as they built their own online services. This period became the most innovative for new EdNA services, the most streamlined for national consultations and also enabled faster development and delivery of EdNA online services.

c. Analysis

Internal factors

Education.au Limited expended considerable effort maintaining regular high level contact with Ministers, senior education officials and the Commonwealth government through visitations, meetings, and the provision of news and information services. International alliances for the purpose of sharing information and disseminating new online innovations were formed with a number of national ICT agencies in other countries. In fact, senior education officials from the UK visited Australia to understand the EdNA collaboration and used that model to inform the development of the UK national ICT agency which was based on a number of aspects of the Australian model e.g. portal services and governance structures.

Internally within Education.au Limited a range of specialists were employed to develop the EdNA services. They included expert librarians, education and training experts, strategy planners, technical experts and online web developers. The relationship between the education people who understood education and training culture and the technical experts who understood online development was robust and vigorous. Many of the new ideas were implemented through intermediaries such as business analysts and strategic planners.

One area of considerable difficulty was in the funding area. Approval of the plans for the development of EdNA for the coming year based on the extensive national consultations was needed for approval from the national government for operational and business funding. Funding was often delayed by the national government because of their internal changes which raised the level of risk for the development and implementation of EdNA. This situation was not understood by the education and training stakeholders and delays became a cause of some friction with stakeholders from time to time. The internal cohesion, goodwill and collegial support among staff of the national agency diminished the risk to some degree. However, for such circumstances the agency did have to develop some financial reserves which reduced the overall pool of funds for the development of EdNA.

External factors

The professional communities that collaborated for the benefit of EdNA have occurred in both physical and virtual spaces. The characteristics of collaboration (shared leadership, goals, processes, decision making, change, intelligence, flexibility, communication and diversity in thinking and an appropriate level of technical competence) were clearly evident during the initiation phase of EdNA. Commonwealth leadership brought the States and education sectors together for a common purpose to share resources using EdNA and to develop policies for the implementation of EdNA. Consultations about the vision for EdNA occurred with the States, plans were developed and adjusted through feedback from education system stakeholders and decision making was collective.

The development of the directory service of resources, and search and browse functions continued the collaboration to develop EdNA that had been established by the Commonwealth. At this time the Advisory Groups for each sector became active and made significant contributions to the overall development and management of EdNA, although, contributions were stronger from the school sector than the training or higher education sectors. However, as the development of EdNA became more routine and as Education.au Limited took on greater responsibility for consulting with the States about the future development of EdNA and as the States looked to a wider national agenda for ICT, then collaboration about EdNA moved to become cooperation (exchanging information, altering activities and sharing resources) and finally, coordination (exchanging information, altering activities).

Over time, the coordination mode of operation led by Education.au Limited became the norm for the development of EdNA. Education.au Limited used national think tanks, consultations with the States, feedback on plans for the development of EdNA and an internal Education.au Limited committee to make recommendations to the Board for passage to the Commonwealth for the approval of funding. This complex process of coordination continued throughout the development of the new shared information services in 2004, EdNA groups in 2005 and me.edu.au in 2008. However, with the advent of EdNA Groups, online collaboration for the further development and refinement of EdNA initiatives emerged as an important factor because it engaged such a wide audience of users. During the development of me.edu.au over 4,000 EdNA users made contributions or were engaged in providing feedback for further developing the service. The online collaborators operated within a clear framework to harness the collective intelligence of a range of diverse ideas through flexible and open communication.

Collaboration with stakeholders decreased as the processes moved towards coordination from 2001, whereas collaboration with users increased through the use of the Web 2.0 type EdNA Groups facilities in 2005. What is noticeable is the degree of innovation that occurred throughout the coordination period. By way of contrast, collaboration occurred among stakeholders when the issues were new, interesting, and posed common education challenges and collaboration occurred online among users when they were able to contribute to the trialing and development of the EdNA service. In fact, when the level of influence occurred at the national and Ministerial level then collaboration among stakeholders was strong. However, when the level of influence moved to the level of Education.au Limited, then the processes for involvement in the development and management of EdNA moved from collaboration to cooperation then to coordination.

Interestingly, collaboration was not evident in the projects within the EdNA initiative that did not proceed. A telecommunications project, for example, did not have a common purpose among the Commonwealth and States; the Higher Education Committee did not have a common agreed purpose; the training sector in developing an alternative service did not have shared goals, processes or decision making with EdNA and a commercial materials initiative, although initiated collaboratively, when implemented did not have shared goals and processes because the States wished to compete for commercial gain.

What can be noted from the above is that collaboration can operate at the most senior level or among online users when new and challenging issues that are predicted to have a wide impact are harnessed through strong leadership. What was also clear was that collaboration is engaging but does require considerable time to take into account all of the necessary feedback, ideas and contributions as well as a high level of negotiation and diplomacy. Collaboration was also demanding and exhausting even though it did harness a diversity of thinking by engaging the States as stakeholders. In addition, collaboration did appear to create an expectation of a continued mode or a value of how to work together. Overall, collaboration did not appear to be a mode of operation that could be sustained over long periods of time, as can be seen from the EdNA initiative, due to its demanding and exhaustive processes although the persistence of the value of collaboration may have been an advantage as new developments arose.

Policy outcomes

The case study of EdNA, its likelihood of success, its adoption by users and the collaboration that occurred has highlighted the confusion of the application of the terms collaboration, cooperation and coordination. When EdNA was initiated in 1995, the term collaboration was used to describe the process of working together when in fact, during EdNA's most innovative period, from 2002 to 2009, the development of EdNA operated through coordination lead by Education.au Limited. The collaborative period was useful for the establishment of EdNA and lasted until 2000, a five year period, when the national groups sought a wider agenda in

educational technology and moved to a mode of cooperation until 2002 and from then on coordination until the demise of EdNA in 2010.

The cross sectoral nature of the EdNA initiative was important because of the wide diffusion of EdNA as well as the harnessing of diverse thinking and expert skills sets. Based on the observations of the establishment of EdNA, national ICT in education projects require cross-sectoral, inclusive collaboration with strong high level leadership and would appear to mature in five years. However, to suggest that collaboration be maintained for five years does not take into account the antecedents of the likelihood of success. These include the relative advantage of the innovation, the compatibility with existing culture and systems, the capacity to trial the innovation, the observability, the complexity, the support available, and the extent of modification or reinvention of the innovation.

Three issues for planning educational policy arise from this observation. The *first* is that, to establish a national educational initiative, especially in the use of ICT, then collaboration through strong, high level leadership would result in a greater likelihood of success. *Second*, it appears to be critical for national initiatives to be inclusive and responsive. The EdNA initiative included all three levels of education (schools, training and higher education) as well as the three sectors of schooling (State, Catholic and Independent). The EdNA collaboration had an inclusive nature with shared leadership, goals, decision making and communication, harnessing relevant skills, intelligence and thinking. *Third*, however, those responsible for funding need to recognise that, collaboration and cooperation while beneficial to outcomes, are expensive ways of operating, and need to be resourced and funded accordingly.

d. Conclusions

This paper has provided a brief overview of selected aspects of the initiation and development of Education Network Australia (EdNA). Space precluded the exploration of many more issues such as, for example, teacher professional development and pedagogical support. The dynamic nature and complexity of harnessing digital technologies for the benefit of learners and teachers make this an exciting and challenging area in which to work and research. This complexity is nowhere more evident than in the final years of EdNA.

By 2007, for example, the priorities for education and training in Australia had changed, as had the context within which learners and teachers were operating. The dominance of Google as a search engine and other popular web based and social networking cloud services had entered into the mix of useful digital educational services. These may have had an effect on the use of EdNA by educators, although unlike EdNA resources, they had not been checked for quality and relevance to education.

In addition, the focus of national collaborative efforts had shifted towards the development of national curricula and national teaching standards. The existing national curriculum body and Education.au Limited were merged to form a new entity called Education Services Australia (ESA). The role of ESA was to service the national curriculum and professional learning for teaching standards. EdNA was shut down as an online service in 2011, although two of EdNA's online community functions were transferred to another online service (which closed a year later). There are now a range of state services available for Australian educators and even more public and free online services operating in the cloud, all of which can have some use in education and learning.

EdNA as a collaboration and as an online service had served the purposes of building a national online knowledge base and skill set in education, and this contributed towards the capacity of the states to move forward confidently. A set of technical standards were in place and online communities of educators had formed, although with the closing of EdNA, these were dispersed. Regrettably, much of the research, the documents, the presentations and the reports that emerged during the fifteen years of EdNA's development and operation were not archived and have now been lost to posterity. However, there is much to learn about archiving electronic resources and non-commercially published digital materials and resources. The preservation and storage of national digital education resources may be an area for future national collaborative endeavour.

Annex:
Timeline: Summary of EdNA key events

The following table lists the key events in the governance, collaboration, formation, planning, development, innovation, management and demise of EdNA.

Date	Key event	Responsible body	EdNA outcome
1980-1989	Computers in schools as stand alones	Individual schools with some education system support	Computers regarded as peripheral
1989	World Wide Web first devised	CERN Switzerland	Graphical interface
1991-1996	Reports	Commonwealth Government department of education and training	National concern about harnessing communications technology for education
1993	Open Learning Technology Corporation (OLTC)	Ministerial Council for education and training	First national effort to harness communications technology for education – brokerage and clearinghouse
1994	Networking Australia's Future: Final Report - recommendations for education and training	National department of communications, broadband report	National education department considers possibilities for sharing resources
1995 (April)	Announcement of a national education network	Minister Crean, Federal Government minister of education	Australian Education Network announced
1995 (May)	Agreement by States	National Ministerial Council	States to participate in EdNA
1995	Formation of national Dept of Education EdNA Taskforce	National education department	EdNA development begins
1995	OLTC to be expanded and restructured to govern EdNA	National Ministerial Council	Consultations with States about EdNA directions for development
1995	Network Business Requirements Reference Group (NBRRG) formed	National Ministerial Council	EdNA business requirements
1995	Reception Infrastructure Reference Committee	National Ministerial Council	Reception infrastructure (computers) panel contract
1996	EdNA Reference Committee (ERC) started	National Ministerial Council	Consultations with States about EdNA formalised
1997	OLTC restructured to manage EdNA	National Ministerial Council	National agency is refocussed
1997 (November)	EdNA launched	National education dept	EdNA Online service goes public
1997	EdNA Metadata Standard v 0.03 agreed	National Ministerial Council	First technical interoperability agreement
1997	National education department becomes a member of the IMS standards body in the US	ERC, National education department	Adopt and adapt international standards
1998	OLTC becomes Education.au Limited	Education.au Limited Board	New image and identity

1998	EdNA hardware management transferred to Education.au Limited	National education department and Education.au Limited	Signed June, delivered August
1998	EdNA Metadata Standard v 1.0 approved	ERC	Adopted by States, sectors and Commonwealth
2000	Online forums Introduced	Education.au Limited	Online communities diversify from Listservs
2001	States able to download and use EdNA apps	Education.au Limited	Embed EdNA in local services
2001	ERC changes to Australian ICT in Education Committee (AICTEC)	AICTEC	Broader strategic national role
2002	Education.au Limited forms internal EdNA Online Reference Group formed	Education.au Limited Board	Representative consultation about EdNA's progress and annual plans for development.
2003	EdNA Federated search	Education.au Limited	Access to large databases in real time Capacity for users to customise their usage
	MyEdNA customised service		Personalised online services
2003	EdNA Groups initiated from Forums	Education.au Limited	Web 2.0 based
2004	EdNA shared Information Services introduced	Education.au Limited	Consolidation of news and distribution services with new services
2004	EdNA Groups trialled	Education.au Limited	Success
2005	EdNA Groups launched	Education.au Limited	Rapid take up and formation of online communities
2006	EdNA personalised services initiated	Education.au Limited	Starts as 'My' EdNA with limited services
2008	EdNA personalised services launched	Education.au Limited	Launched as 'me.edu.au'. Rapid take up and formation of online communities based on interests
2009	Minister's Council announces national curriculum and technology agencies to merge	Education.au Limited (technology) and Curriculum Corporation (content)	Two national education coordinating agencies to become one national body
2010	Newly formed company to be called Education Services Australia (ESA)	ESA	One national agency for both content and technology
2011	EdNA website shut down - EdNA listservs and EdNA groups transferred to ESA	ESA	
2012	EdNA listservs and EdNA groups shut down	ESA	All EdNA services completely shut down December 2012. National technology agency completely closed.

Annex: Organograms

Three organograms are included in this annex. The first is the national collaboration to which Education.au Limited and its work on EdNA was responsible. The second is the internal governance and management of Education.au Limited in its oversight of EdNA. The third is the audience, relationships, services and data flows for EdNA Online.

diagram 1: **National collaboration**

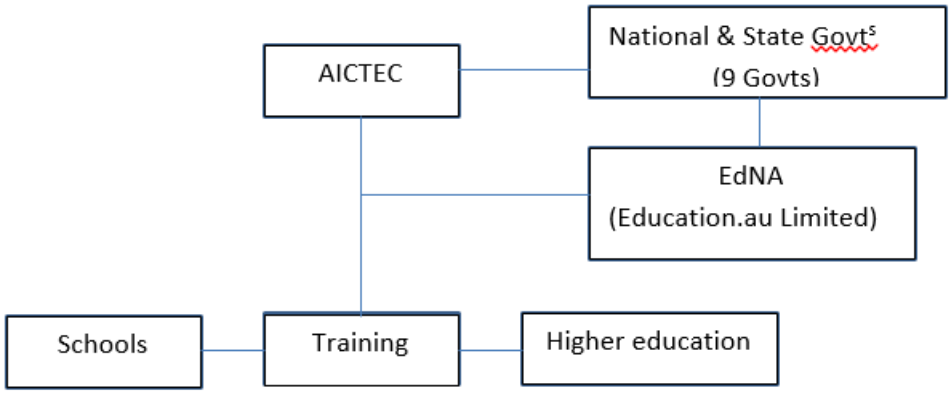


diagram 2: **Education.au Limited management of EdNA**

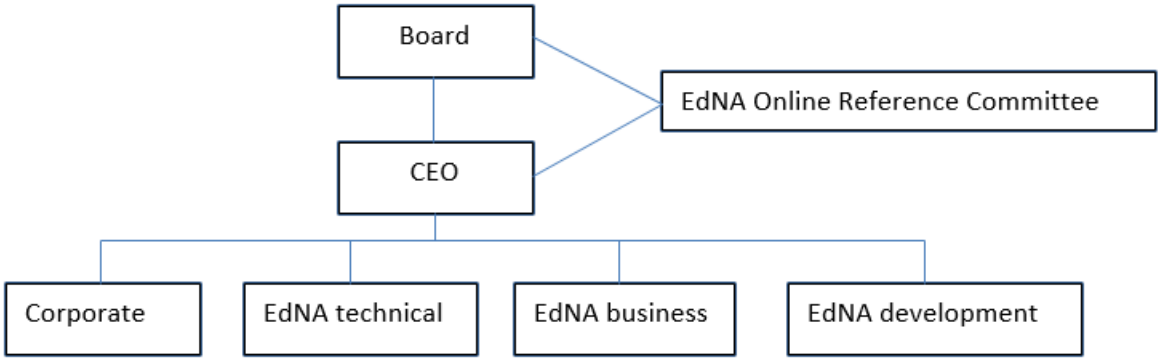
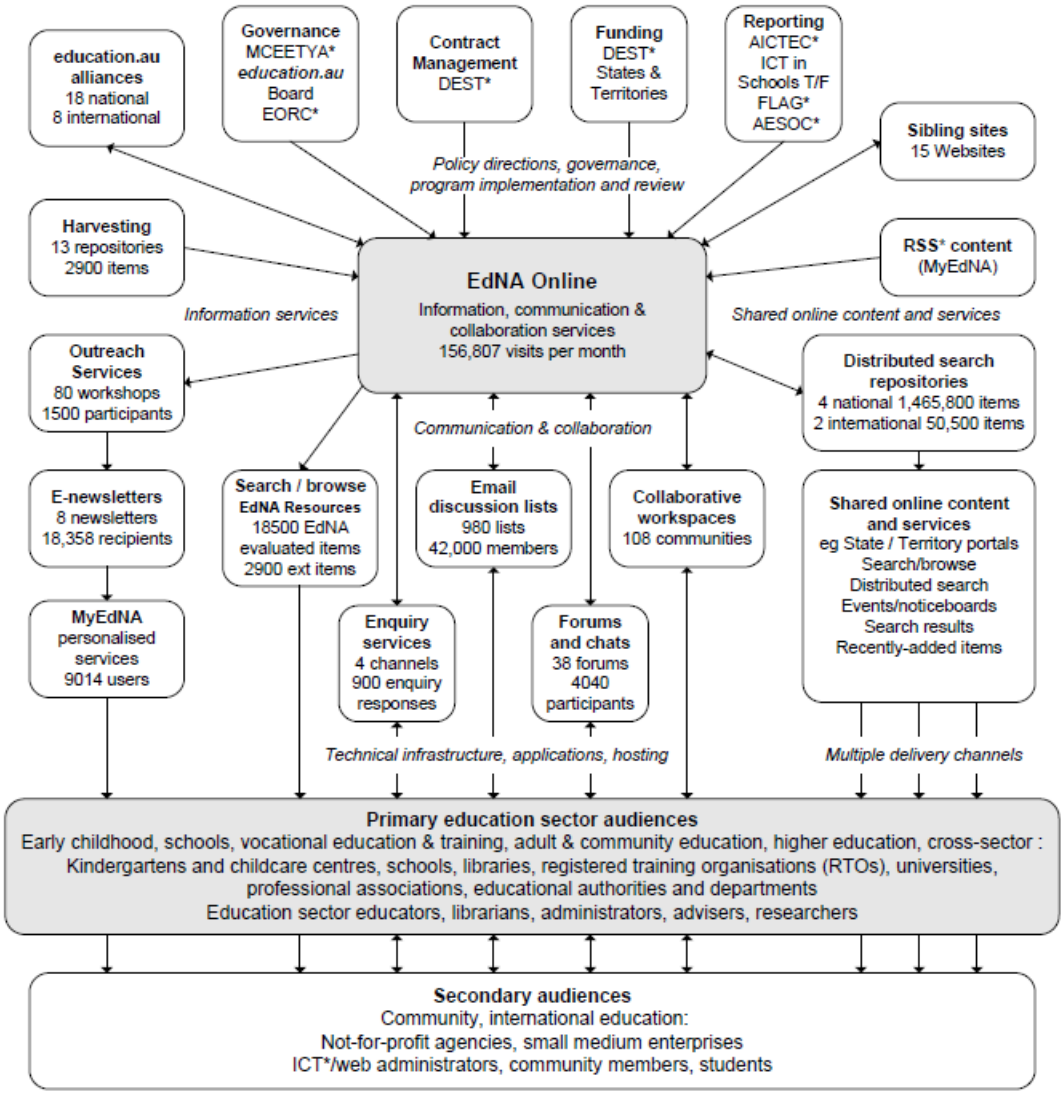


diagram 3: **EdNA Online relationships and data flows**

The above information has been taken from an internal document, *Demand and Value Assessment: EdNA Online Evaluation for the period October 2003 to September 2004*.

EdNA Online audience, relationships, services and data flows for the evaluation period October 2003 – September 2004 are summarised in the following diagram:



Key

MCEETYA:	Ministerial Council for Education, Employment, Training and Youth Affairs
EORC:	EdNA Online Reference Committee
DEST:	Australian Department of Education, Science and Technology
AICTEC	Australian ICT in Education Committee
AESOC	Australian Education Systems Officials Committee
FLAG	Flexible Learning Advisory Group
RTO:	Registered Training Organisation
ICT:	Information and Communication Technology
RSS:	RDF Site Summary

The above information has been taken from an internal document, *Demand and Value Assessment: EdNA Online Evaluation for the period October 2003 to September 2004*.

Sources

This paper draws heavily on the following resource:

White, G. (2010). *Diffusion of ICT in education and the role of collaboration: a study of EdNA. PhD Thesis*. Curtin University: Perth.

In addition, the following publication was quite useful:

Australian Government. (2011). *Review of Funding for Schooling*. Canberra: Australian Government.

BUILDING AND SUSTAINING NATIONAL EDUCATIONAL TECHNOLOGY AGENCIES

13

Other notable institutions from around the world

Michael Trucano

in this chapter …
Short descriptions of institutions in 14 countries

Executive summary

A number of additional national education technology agencies (and their functional equivalents) are worthy of further study. This chapter lists many of them:

Canada: Schoolnet Canada

Colombia: CIER Centro

Estonia: Tiger Leap Foundation

European Schoolnet

India: IT@School; Rajasthan Education Initiative; Schoolnet India

Ireland: National Centre for Technology in Education (NCTE)

Jamaica: e-Learning Jamaica

Japan: National Institute of Multimedia Education (NIME)

Jordan: Jordan Education Initiative (JEI)

Kenya: Kenya Institute of Curriculum Development (KICD)

Netherlands: Kennisnet

South Africa: SchoolNet SA

Uganda: Schoolnet Uganda

United States: Consortium for School Networking (CoSN); State Educational Technology Directors Association (SETDA); Digital Promise; Maine International Center for Digital Learning (MICDL)

Building and sustaining national educational technology agencies: Lessons, models and case studies from around the world attempts to document lessons from the histories of a number of leading examples of 'national educational technology agencies', or their functional equivalents. Policy makers and decision makers -- as well as those who advise them -- wishing to explore other sets of experiences might also wish to consider the following additional cases, models and examples. Some of these institutions may not technically meet some of the criteria to qualify as a “national educational technology agency’, but they serve some of the functions commonly attributed to such organizations.

While some of these institutions no longer exist – and some of those that do continue to function don’t function with the same prominence they one had – lessons from their histories may nonetheless be relevant to policy makers, especially those considering, or planning for, the creation or restructuring of a country’s national educational technology agency. From an institutional and governance perspective, all are worthy of further study.

Schoolnet Canada began in 1993 by a collection of the federal government, provincial and territorial authorities, educational institutions and private sector companies to connect schools and libraries to the Internet in the 1990s. It was a project of Industry Canada, the department of the Government of Canada (now known as Innovation, Science and Economic Development Canada, or ISED) with a mandate of fostering a growing, competitive, knowledge-based Canadian economy.

China's National Center for Educational (NCET) is an organization under the Chinese Ministry of Education which has an extensive mandate to support basic and vocational education in a variety of ways, including providing digital teaching and learning resources and to support a variety of information systems, as well as the local authorities and technical staff who, in a variety of ways, support such efforts.

Managed by the National University of **Colombia**, **CIER Centro** (Centro de innovación educativa regional zona centro) designs of digital teaching and learning resources, provides related training and professional development support and engages in research related to the use of ICTs in education. It coordinates a series of regional centers and was formed as an outgrowth of the National System for Innovations, an initiative led by the Ministry of National Education in Colombia.

Estonia’s Tiger Leap Foundation, a non-profit organization funded by the Estonian Ministry of Education and sponsors, has been the country’s main vehicle to improve the quality of education through application of ICT. Since its founding in 1997, it has helped connect all schools to the Internet, train teachers, and provide digital learning resources in Estonian, in addition to operating the Estonian Schoolnet website.

European Schoolnet, a Brussels-based not-for-profit organization founded in 1997, serves as a network for thirty ministries of education across Europe focusing on the effective use of new technologies in education. With a few notable exceptions, most European countries do not have a dedicated national education technology agency of the form that commonly exists elsewhere in the world; most efforts are handled by a department or unit with the respective ministries of education. Unique from a global perspective, European Schoolnet connects these groups together on a regional basis.

It is perhaps no surprise that a country as large and diverse as **India** does not have a national education technology agency. A number of Indian institutions and initiatives have served functions somewhat similar to such institutions in other countries -- or have been mistakenly thought to do so. The **IT@School** project in the Indian state of Kerala, founded as a result of the work of a related task force in 2000 and overseen by that state's general education department, has in many ways been a role model for many similar efforts across India (and other parts of the world). The **Rajasthan Education Initiative** was born out of the work of the UN ICT Task force in the early 200Os to explore the creation of an effort similar to the Jordan Education Initiative. **Schoolnet India**, which because of its name was for many years referred to (erroneously) as something resembling the country’s national education technology agency, began in 1997 as a subsidiary of the social infrastructure arm of IL&FS Group, India's largest infrastructure leasing and financing services company.

Ireland's National Centre for Technology in Education (NCTE) was a government agency which helped facilitate and coordinate numerous activities related to the use of ICTs across the country's schools. Established in 1998, it ended in 2012, at which point many of its functions and activities were absorbed into the country's Professional Development Service for Teachers (PDST).

e-Learning Jamaica is a limited liability company that serves as an agency of the Ministry of Science, Energy and Technology (MSET). Founded in 2005 and funded by the country's Universal Service Fund, it helps facilitate a variety of educational technology efforts, in collaboration with the Ministry of Education.

Japan's National Institute of Multimedia Education (NIME) was established in 1978 to explore activities and research related to the use of broadcast media technologies in higher education. The roughest analogue the country has had to a national education technology agency, it was disbanded in 2009, with staff and some responsibilities transferred to the Center of ICT and Distance Education at the Open University of Japan.

The well-known **Jordan Education Initiative (JEI)** began in 2003 as a public-private partnership to support the introduction of ICTs in education in Jordan, under the umbrella of the World Economic Forum and funded and supported by a variety of organizations and companies, inside and outside of Jordan, in collaboration with the Ministry of IT and Ministry of Education. In 2008, the JEI became a not-for profit organization affiliated to the Queen Rania Foundation for Education and Development.

The **Kenya Institute of Curriculum Development (KICD)**, the successor organization to the Kenya Institute of education (KIE), is a semi-autonomous agency established in 2013 under the direction of the Ministry of Education responsible for research and development related to curricula and curricular support materials. As a result of its many activities and responsibilities related to the digital teaching and learning resources, it functions in many ways as an equivalent of a national education technology agency, in addition to its core functions related to curricula more broadly.

Kennisnet is a public (semi-governmental) organization in the **Netherlands** funded by the Ministry of Education, Culture and Science with responsibilities for a variety of ICT and education activities, including providing a national ICT infrastructure, digital learning resources, teacher training and support, and more general advisory support and thought leadership.

Portugal's Foundation for Mobile Communications (FCM, Fundación para las Comunicaciones Móviles de Portugal) coordinated and monitored a set of linked initiatives which rolled out ICTs in education across Portugal beginning in 2007, the consequence of the country's National Technology Plan for Education. FCM helped facilitate a large public-private partnership, in coordination with the Ministry of Education and the Ministry of Public Works, Transportation, and Communications.

South Africa's SchoolNet SA was born in 1997 as a successor to, and national coordinator of, a number of related regional organizations across South Africa, with support from the Centre for Educational Technology and Distance Education in South Africa's Department of Education and several corporate partners. After support from Canada's IDRC ended in 2001, it became a non-profit organization; its work continues today, with a focus on teacher professional development and capacity building activities for government officials, working with a number of corporate partners and contracting with national and provincial government departments.

Schoolnet Uganda began in 1997 as an off-shoot of the World Bank's World Links of Development program, supporting initial efforts in the country to introduce ICTs in schools. Much of its activities were eventually absorbed into the Ministry of Education.

Given the highly decentralization nature of its education system, it is perhaps no surprise that there is no national education technology agency in the **United States**. However, there are a number of organizations that perform functions often associated with success agencies and which are recognized internationally as the closest equivalent institution. Founded in 1992, the **Consortium for School Networking (CoSN)** is a

member-based association and advocacy group based in Washington, DC for school system technology leaders that promotes partnerships and awareness of emerging technologies amongst technology decision-makers in K-12 education. The **State Educational Technology Directors Association (SETDA)** is a not-for-profit membership association for state education agency leaders launched in 2001. **Digital Promise** is an independent, bipartisan nonprofit organization authorized by Congress in 2008 as the National Center for Research in Advanced Information and Digital Technologies. At a state level, the **Maine International Center for Digital Learning (MICDL)** is a non-profit organization of school reform and professional development facilitators who collaborate with researchers and school-based educators that was an outgrowth of a pioneering effort to provide laptops to students in that state.