ICT in Education
Policy, Infrastructure and ODA Status
in Selected ASEAN Countries

UNESCO Asia Pacific Regional Bureau for Education
APEID/ICT in Education

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Acronyms and abbreviations

30EDP - 30-Year Long-Term Education Development Plan

ADB - Asian Development Bank

APACALL - Asia-Pacific Association for Computer-Assisted Language Learning

AusAid - Australian Agency for International Development

BasIC - Baseline ICT Standards Assessment System

BEP - Basic Education Programme

BERMUTU - Better Education through Reformed Management and Universal Teacher Upgrading Project

BRTI - Indonesian Telecommunications Regulatory Authority

BSE - Buku Sekolah Elektronik

BSNP - National Education Standards Agency

BSNP - National Education Standards Agency

CALL - Computer Assisted Language Learning

CoL - Collaborative Learning

CWSAP - Cyber Wellness Student Ambassador Programme

DeTIKNas - Indonesian National ICT Council

DLFe - Distance Learning Foundation e-learning project

DTVE - Department of Technical and Vocational Education

EEQP - Enhancing Education Quality Project

ELOP - English Language Oracy Portal

EMIS - Education Management Information System

EMIS - Education Management Information System

e-NTF - e-National Task Force

EPSA - E-Learning for the Public Sector

ESDF - Education Sector Development Framework

ESP - Education Strategy Plan

ESP - Experimentation@Schools

ESV - Education Strategic Vision

ESWG - Education Strategy Working Group

ETD - Educational Technology Division

ETDs - State Educational Technology Divisions

FDI - Foreign Direct Investment

GLDN - Global Development Learning Network Project

GLoCALL - Globalization and Localization in Computer Assisted Language Learning

HP - Hewlett Packard

ICST - Institute of Computer Science and Technology

ICT - Information Communication Technology

ICTL - ICT Literacy Curriculum

ICTS - Information Technology Central Services

IDA - International Development Association

IDM - Interactive and Digital Media

IDRC - International Development Research Centre

IHL - Institutes of Higher Learning

iHTs - Interactive Heritage Trails

iN2015 - An Intelligent Nation 2015

INHERENT - Indonesia Higher Education Network

IP - Intellectual Property

IPST - Institute for the Promotion of Teaching Science and Technology

iSHARE - Inter-cluster Sharing of Resources

ITB - Bandung Institute of Technology

ITS - Institute of Technology Sepuluh Nopember

JarDikNas - National Education Network

JICA - Japan International Cooperation Agency

JTWG - Joint Technical Working Group

KPIs - Key performance indicators

LANIC - Lao National Internet Committee

LCMS - Learning Content Management Systems

LOTM - Learning on the Move

LPET - Learning Partnership in Educational Technology

MCF - Myanmar Computer Federation

MCIT - Ministry of Communication and Information Technology

MCIT - Ministry of Communications, Information and Technology

MCSDC - Myanmar Computer Science Development Council

MDeC - Multimedia Development Corporation

MDT - Media Design and Technologies for Learning

MICT - Ministry of Information and Communication Technology

MICTE - Master Plan on ICT in Education

MICTE - MOE Master Plan on ICT in Education

MIS - Management and Information System

MOES - Ministry of Education and Sports

MOET - Ministry of Education and Training

MoEYS - Ministry of Education, Youth and Sport

MOIC - Ministry of Information and Culture

MoNE - Ministry of National Education of Indonesia

MOST - Ministry of Science and Technology

MPT - Ministry of Post and Telecommunication

MSTRD - Department of Myanmar Scientific and Technological Research Department

NAST - National Authority for Science and Technology

NECTEC - National Electronics and Computer Technology Centre

NEP - NGO Education Partnership

NICTMP - National ICT Master Plan

NIE - National Institute of Education

NLD - National League for Democracy

NMES - Networked Multimedia Education System

NPTA - National Post and Telecom Authority

OBEC - Office of the Basic Education Commission

ODA - Development Assistance Committee

OEC - Office of the Education Council

OSOCL - One School One Computer Laboratory

PISA - Programme for International Student Assessment

PPSMI - Teaching of Mathematics and Science in English

Propel-T/CSCL - Technology/Computer Supported Collaborative Learning

R&D - Research and Development

SDMA - Schools Digital Media Awards

SEED - Strategies for Effective Engagement and Development

SNPs - National Education Standards

SPM - Malaysia Certificate of Education

SRCs - School Resource Centres

SSQS - Smart School Qualification Standards

STEM - Science, Technology, Engineering, and Mathematics

STPM - Malaysia Higher School Certificate

TACs - Teacher Activity Centers

Telkom - Telekomunikasi Indonesia

TIMSS - International Mathematics and Science Study

TOT - Telephone Organization of Thailand

TTCs - Teacher Training Centres

TVE - Televisi Edukasi

UNITAR - United Nations Institute for Training and Research

UNU-IIST - United Nations University International Institute for Software Technology

USAID - United States Agency for International Development

VIT - Vandalay Institute of Technology

VLE - Virtual Learning Environment

VSS - Vocational Secondary Schools

WAN-City - Wide Area Network City

WRO - World Robotic Olympiad

WTO - World Trade Organization

YIT - Yangon Institute of Technology

Introduction

Information and communications technology (ICT) plays a critical role in enabling inclusive and sustainable human development by providing people not only with access to information and services but also with opportunities to participate and contribute to the knowledge economy. During the recent World Summit on Information Society (WSIS) Forum 2013, the United Nations Group on Information Society (UNGIS) reiterated UN's thrust "to take full advantage of ICTs in addressing the development challenges of the 21st century and to recognize them as cross-cutting enablers for the achievement of … sustainable development."[1]

In support of these efforts, UNESCO Asia Pacific Regional Bureau for Education (UNESCO Bangkok) encourages member states in the region to capitalize on ICT's transformative potentials in the area of education by strategically and effectively using ICTs to improve governance, access to resources, capability building, and quality of learning. UNESCO Bangkok has been in the forefront of ICT in Education programmes and activities in the region, providing member states with technical assistance in the areas of policy guidance, information exchange, research, and teacher training.

It is in this context that UNESCO Bangkok presents the study on "ICT in Education Policy, Infrastructure, and ODA Status in the Selected ASEAN Countries", graciously funded by the Korea Institute of Science and Technology (KIST). It examines the status of ICT in Education in eight Southeast Asian countries, namely Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand, and Vietnam. The study focuses on these countries' ICT in Education policies and programmes, infrastructure, official development assistance (ODA) status, and readiness for new and advanced learning technologies (such as learning with robots). Note that the study was completed in June 2013, updates beyond this point are not reflected in the report.

Findings show variances in the priority areas and development levels of ICT in Education among the countries, mainly due to their unique national contexts. The study showcases a combination of (a) well-established models that are oriented towards ICT-pedagogy integration and (b) entry-level endeavors that prioritize access to education via ICT infrastructure and connectivity – with disparities very much evident in the areas of ICT-related human capacity building, school programmes, and support. In addition, data indicate that majority of the ODA allocated for education has been used to support access to quality primary education and the advancement of tertiary education. Only a few ODA donors, notably ADB, World Bank, and JICA, have directly targeted ICT in Education projects in the ASEAN region in recent years.

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[1] United Nations Group on Information Society (UNGIS) Joint Statement on the Post-2015 Development Agenda, World Summit on Information Society (WSIS) 2013. URL: http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/wsis/ungis_joint_statement_wsis_2013.pdf Accessed: August 2013

This study provides UNESCO Bangkok with useful information to guide potential areas of engagement and collaboration with the countries reviewed. It likewise offers useful insights on these countries' ICT in Education plans, strategies, lessons, challenges, good practices, and success factors that other member states can use as valuable references in developing or enhancing their respective ICT in Education plans and programmes. Further, this study may serve as a guide in the development of strategies for the effective allocation of ODA to new ICT in education initiatives.

Finally, the UNESCO Bangkok ICT in Education Team wishes to express its sincere gratitude to the lead researcher of the study, Mr. Seth Leighton, for this substantial effort. The team would also like to acknowledge the invaluable support extended by the members of the Expert Advisory Committee from the eight countries who assisted UNESCO Bangkok in reviewing, validating, and finalizing the study.

September 2013
UNESCO Bangkok
ICT in Education Team

Acknowledgments

PART A:

ICT in Education Policies, Infrastructure and ODA

in Cambodia, Lao PDR, Myanmar, Thailand and Viet Nam

Cambodia
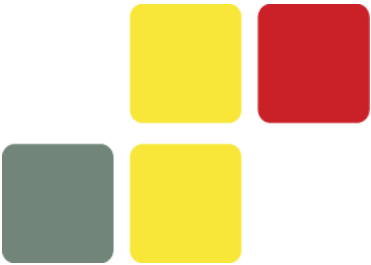
The Kingdom of Cambodia has been slowly rebuilding in recent times following more than 25 years of political and social turmoil. The latest elections were peaceful, enabling the government to focus on the massive task of development. Cambodia is heavily reliant on foreign assistance, with nearly half of the government budget coming from donor funds. With a young population, it will be essential to target international aid and foreign investment towards education and infrastructure building if this aid is to promote Cambodia's development.

Policy environment

The Ministry of Education, Youth and Sport
The Ministry of Education, Youth and Sport (MoEYS)[1] is tasked with developing the high quality and ethical human resources necessary for a knowledge-based society in Cambodia. The MoEYS is responsible for education policy at all levels of formal and informal schooling, and serves as the lead governmental actor for the collection and analysis of data as well as for undertaking improvement projects in the education sector. The Office of ICT in Education of the Department of Information and ASEAN Affairs is responsible for organizing and monitoring ICT development activities and coordinating with development partners. Given Cambodia's high rate of poverty, the majority of MoEYS work is reliant on external funding sources.

The Open Institute
The Open Institute[2] is a not-for-profit non-governmental organization that has played a key role in furthering the use of ICT in the Cambodia education system, often acting as one of the MoEYS's implementing partners. The Open Institute is supported by the Spanish Agency for International Cooperation (AECI), Capacity Building Germany (InWEnt) and UNESCO.

The Education Strategy Working Group and Joint Technical Working Group
Established in 1999, the Education Strategy Working Group (ESWG) comprises a wide range of donor agencies[3] as well as the NGO Education Partnership (NEP).[4] Chaired by UNESCO, this group meets monthly to coordinate aid and development in the education sector and responds to requests for assistance from MoEYS. The Joint Technical Working Group (JTWG), co-chaired by UNESCO and a MoEYS

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[1] MOEYS. http://www.moeys.gov.kh/en/home.html (Accessed 2012)
[2] The Open Institute. http://www.open.org.kh/en/about (Accessed 2010)
[3] Donors include: ADB, AusAID, Belgium Co-operation Agency, COHCHR, Canada, France, Germany, the European Commission, JICA, SIDA, UNESCO, UNICEF, UNDP, UNFPA, WFP, USAID, and the World Bank.
[4] With 108 member NGOs working in education in Cambodia, NEP promotes collaboration between NGOs, the Kingdom of Cambodia, and the development community. http://www.nepcambodia.org/ (Accessed 2012)

representative, was established as an additional avenue for communication and collaboration between development partners, government and civil society representatives. The ESWG and JTWG channel technical and financial support to the members of the NEP, and have made crucial contributions to the development of nationwide education policy and strategic plans.[5]

Policies related to ICT in Education

The Education Strategy Plan 2009-2013

The Education Strategy Plan (ESP) was designed by MoEYS "to ensure linkages between education policies and strategies with development programmes" that will lead to realization of the "National Education for All Plan" by 2015.[6]

Table 1. ESP priority areas (Cambodia)

Policy area	Measures
Ensuring equitable access to education services	Building and completing primary schools, increasing operational budgets, increasing the supply of teachers, expanding access to early childhood education, expanding access for the disabled and minority groups, providing houses to teachers and building dormitories.
Improving the quality and efficiency of education services	Increasing the provision of instructional materials, libraries and laboratories, developing curricula, increasing learning hours, providing scholarships, enhancing capacities, strengthening codes of conduct, improving school environments, expanding vocational orientation, increasing school inspections.
Institutional and capacity development for educational staff for decentralization	Re-structuring working procedures, developing legislative instruments, training education officers in technical skills.

While the integration of ICT into the education system is not a direct goal of the ESP, technology plays a role in several programmes and sub-programmes. Only one sub-programme directly addresses the development of ICT usage, with the objective of ensuring the appropriateness of and standardization of information and technology used by the MoEYS.

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[5] Hirosato Y. and Kitamura Y. (eds). 2009. *The Political Economy of Educational Reforms and Capacity Development in Southeast Asia*. Springer Science and Business Media. p. 122
[6] MOEYS. 2008a. *Education Strategy Plan*.
http://planipolis.iiep.unesco.org/upload/Cambodia/Cambodia_Education_Strategic_Plan_2009-2013.pdf

ICT-related measures inside other ESP programmes include:

- Initiating ICT subjects in the curriculum as part of TVE and Life Skills programmes.
- Revising ICT documents in the teacher training curriculum and providing ICT skills training for all teacher trainers and secondary-school teachers.
- Procuring ICT tools for use in teacher training colleges.
- Improving the application of information technology to modernize and decentralize the administration and inspection system.
- Improving aid management in the education sector through strengthening its Aid Management Information System (AMIS)

ICT in Education Master Plan 2009-2013

Designed in 2007 as part of the Open Schools Programme, this Master Plan built on previous policies developed by MoEYS.[7] The goals of the Master Plan are to:

- Increase access to basic education, tertiary education and life-long learning, both formal and non-formal, by using ICT as an alternative education delivery media.
- Improve the relevance and effectiveness of basic education by harnessing the potential of ICT as a major tool to enhance the quality of teaching and learning.
- Develop the ICT-based professional skills needed by graduates for employment in a knowledge-based society and to ensure that Cambodia can compete and cooperate in an increasingly interconnected world.
- Increase the effectiveness and efficiency of the Ministry and school management.

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[7] MOEYS. 2008b. Master Plan for ICT in Education.
http://planipolis.iiep.unesco.org/upload/Cambodia/Cambodia_MasterPlanICT.pdf

Table 2. Master Plan areas of improvement (Cambodia)

Area	Selected indicators (by 2013 or earlier)
General education	ICT-based skills training will take place in grades 10 to 12 at all schools with computers All schools with computers will have trained 90% of their upper-secondary school teachers on ICT-based professional skills.
Higher education	100% students completing their foundation year at university from HEIs have acquired ICT-based professional skills. At least 25 universities have had their staff trained on the creation, operation and management of e-learning programmes. Research and training materials from Cambodian universities are online. 5% of universities in Cambodia will offer open distance learning courses.
Teacher training	All TTCs are equipped to develop electronic training materials. 100% of pre-service teachers have acquired ICT-based professional skills. Teacher upgrading courses use video support in 50% of the science subjects.
Non-formal and informal education	Video-based materials are available for supporting science curriculum of the grade 12 equivalency exam. 50% of training classes for income-generating skills use video as a support. Six m-learning vans are deployed and operate in six border provinces.
Ministry administration and ICT in education support	Existing partnerships grow in scope while new ones come into place. Information management systems are online and staff trained in database use. All District Offices of Education use computers to assist their daily work, manage education data and enter the integrated information system.

The Master Plan is a sterling example of both the strengths and limitations of ICT in education planning in the context of severe poverty. The benchmarks and standards are well developed, with responsibilities clearly distributed among the various stakeholders. The indicators are specific, (largely) measurable, potentially attainable, relevant and time-based. The plan mixes idealistic long-term objectives with more realistic short-term goals.

That said, the Master Plan is limited by the realities of Cambodia. ICT is not the only need in the education sector, and education is not the only sector urgently requiring funding. As the public sector lacks the funding to support itself, all programmes are reliant on development assistance. Multi-year and multi-phase plans are difficult to carry out in such circumstances.

ICT in Education infrastructure

Cambodia is a "textbook example of wireless technology boosting telecommunications development",[8] becoming the first country in the world with more mobile than fixed-

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[8] ITU. 2002. Khmer Internet: Cambodia Case Study. http://www.itu.int/ITU-D/ict/cs/cambodia/material/KHM%20CS.pdf

line subscribers in 1993. Cambodia has long had the dubious distinction, however, of having South East Asia's lowest level of Internet penetration, as well as the region's highest Internet prices.

Though still low compared to the overall population, the overall level of Internet subscribers has risen drastically in the past decade, from 7,671 in 2004 to 173,675 in 2010.[9] Total penetration in 2010 was still only 1.26 percent of the population, however.[10] The development of infrastructure was recently given a boost by the expansion of fibre optic networks from 750 to 20,300 kilometres.[11] Much of this expansion was carried out by the Vietnamese telecom giant Viettel.

Metfone Internet in school and scholarship programme
Under the brand name of Metfone, in 2009 Viettel Cambodia signed a Memorandum of Understanding to provide free Internet connections and related equipment to all public schools, education centres, universities, colleges and MoEYS's offices. With a total of 2,000 connections, the total cost of services and equipment donated was over 5 million USD. The first two phases of the programme provided computers and Internet connections to over 800 schools as well the majority of municipal, provincial, and district departments of MoEYS. The programme is scheduled to be completed by 2015.[12]

Ezecom "EzeCampus" programme
In June of 2010 the first step in the EzeCampus programme was announced. In cooperation with the Ministry of Education EZECOM installed a fibre optic connection in the top universities of Phnom Penh, giving the students at these universities access to high speed Internet. Furthermore EZECOM gave students from all of the universities access to discounts for home packages. This first step gave an estimated 65,000 students access to high speed Internet. In August 2012 the second step was initiated, in which Internet service and computer equipment were provided to 50 general secondary education schools and teacher training institutions in the country. EZECOM also provided the basis for a distance learning platform, increasing access to education

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[9] Chakrya Moa. 2011. "ICT Development in Cambodia. Challenges—Strategies—Future". Japan-Cambodia Joint Symposium on Information Systems and Communication Technology. 6-8 Jan. 2011, Phonm Penh, Cambodia. www.rupp.edu.kh/conference/jca**ict**/Symposium6Jan2011.pdf

[10] ITU. 2011. Percentage of Individuals using the Internet. http://www.itu.int/ITU-D/ict/statistics/material/excel/2010/IndividualsUsingInternet_00-10.xls

[11] This expansion has been divided among Telecom Cambodia (1,200km), the Cambodia Fiber Optic Cable Network (4,100km), and Viettel Cambodia (15,000km).

[12] Viettel. 2009. "Viettel offers free internet for schools in Cambodia". http://www.viettel.com.vn/62-72-2-919-Viettel-offers-free-internet-for-schools-in-Cambodia.html

nationwide. This donation, in the form of free Internet services and network instalments, is worth hundreds of thousands of US dollars.

Official development assistance

Cambodia receives significant donor support, receiving nearly 1 billion USD yearly in official development assistance (ODA) and private flows. Aid flows for education are substantial, though primarily concerned with supporting access to primary education and the development of tertiary education. The Cambodian government has welcomed foreign investment, acceding to the World Trade Organization (WTO) in 2004. Full foreign ownership is allowed in most sectors.[13] If advancements in education continue, the young workforce is likely to attract further investment.

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[13] IHS Global Insight. 2012. Country Reports: Cambodia http://myinsight.ihsglobalinsight.com (Paid database)

Table 3. Country information (Cambodia)[14]

	2009	2010	2011
Population (million)	13.98	14.14	14.31
GNI per capita (Atlas USD)	700.00	750.00	830.00
Net ODA (USD million)	721.43	733.73	792.25
Bilateral share (gross ODA)	64.98%	68.33%	62.28%
Net ODA / GNI	7.27%	6.88%	6.44%
Net Private flows (USD	243.71	252.21	124.19

Table 4. Top 10 donors (2010-2011 average) (Cambodia) [15]

Overall (USD millions)		Education Sector (USD millions)	
Japan	141.41	World Bank	20.356
ADB Special Funds	99.10	World Food Program	11.027
United States	80.93	European Union	8.8285
Australia	62.73	ADB	8.616
Global Fund	59.92	Japan	7.472
Korea	49.78	Republic of Korea	5.21
Germany	45.25	Australia	4.8415
IDA	42.26	USA	2.93
EU Institutions	39.93	Sweden	2.9845
France	27.03	UNICEF	0.707

Table 5. ODA by sector (2010-2011 average) (Cambodia)
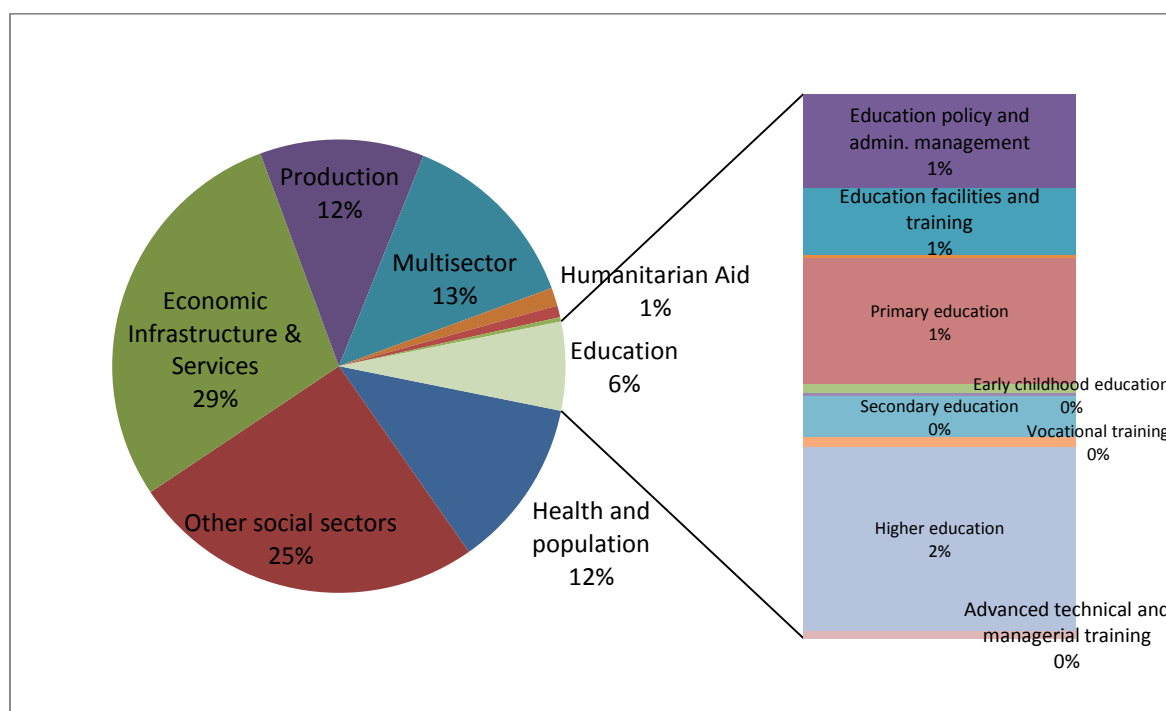
Source: OECD Statistical Databases

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[14] World Bank, UNESCAP, and OECD statistical databases.
[15] OECD statistical databases. Additional data supplied by Department of Planning. MoEYS Council of the Development of Cambodia. ODA Database http://cdc.khmer.biz/ (Accessed 10 January 2012)

ODA programmes and projects for ICT in Education

Asian Development Bank

Between 1998 and 2010, the Asian Development Bank (ADB) provided 134.6 million USD in loans and grants to education in Cambodia, focusing on access to secondary education, consolidating vocational training efforts, and providing capacity building for decentralized education.

ICT-related projects received relatively little funding. In 2006, 800,000 USD went to a project to create ICT-training opportunities within learning centres specifically for secondary school girls. [16] Funding was also given for 24 science and computer laboratories in each province.[17]

Effective since September 2008, the Enhancing Education Quality Project (EEQP) supports the Government's efforts to strengthen the quality of school education by carefully targeting support for (i) education system management and development, (ii) professional development of teachers, and (iii) strengthening secondary education.[18] The total budget of the project is 33.38 million USD, of which the ADB's contribution is 27.10 million USD and the contribution by the Royal Government of Cambodia is 6.28 million USD.

World Bank

In 2011, funding was provided for Cambodian higher education institutions (HEIs) as a portion of a 23 million USD project to improve higher education quality and capacity, to research and implement the use of technology to improve pedagogy, and develop electronic curriculum materials.[19]

UNESCO

Along with substantial policy assistance provided through the ESWG and JTWG, UNESCO has contributed to the development of technical and vocational education (TVE) in Cambodia. TVE assistance for ICT applications has included the procurement of computers, Internet connections and suitable software, as well as training sessions

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[16]ADB. 2008. Project Summary. http://pid.adb.org/pid/TaView.htm?projNo=39036&seqNo=01&typeCd=2

[17] Ibid

[18] MoEYS. 2012. Project Summary. http://moeys.gov.kh/en/eeqp/project-information.html

[19] World Bank. 2012. Project Summary. Available at
http://web.worldbank.org/external/projects/main?menuPK=228424&pagePK=64283627&piPK=73230&theSitePK=40941&Projectid=P106605

for TVE trainers in building ICT skills. UNESCO has also included Cambodia within its SchoolNet programme, which connects eight countries in the Asia-Pacific region.[20]

Intel Teach Programme

UNESCO and Intel have collaborated to deliver the "Next Generation of Teachers" project across the Asia Pacific region. The project positions pre-service teachers to effectively integrate ICT into teaching and learning and has reached more than six million teachers in over 40 countries.

The Intel® Teach programme was launched in Cambodia in 2009 in collaboration with The Open Institute, the National Institute of Education and the MoEYS. The Intel Teach Getting Started course was delivered to 322 in-service teachers in 2010, 848 in 2011 and 275 in the first half of 2012, a total of 1,445 teachers (of the country's 10,160 high school teachers). Trainings in process were set to reach 1,048 trainees by the end of 2012, raising the total to 2,245 by the end of the year, or 22 percent of all high school teachers.

The Flemish Association for Development Cooperation and Technical Assistance

The Flemish Association for Development Cooperation and Technical Assistance (VVOB)[21] has undertaken a variety of projects in the education sector of Cambodia, mostly targeting capacity development of provincial and regional teacher training centres (TTCs). The focus is on learner-centred methods, in which ICT is integrated as a supportive strategy. Open Resource Centres were set up in 2006 at TTCs in Siem Reap and Kampong Cham, offering teachers and students the means to develop digital teaching materials. The VVOB also provided technical assistance to the MoEYS for realizing several components of its ICT in Education Master Plan (Objectives 2.4 and 3.1).

The VVOB has supported the development of numerous digital resources in the Khmer language and in line with the pre-service teacher training curricula. This includes over 200 multimedia resources for science and life skills teaching, and over 200 videos on science experiments and learner-centred method case studies. Also, an online portal for sharing educational resources was developed and ownership was transferred to MoEYS in 2012. To support the Teacher Development Master Plan of MoEYS, the VVOB provided ICT equipment, including 120 computers and laptops, 30 LCD projectors and 24 TV-DVD sets to all provincial and regional TTCs. This was

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[20] UNESCO Bangkok. SchoolNet project description Available atwww.unescobkk.org/en/education/ict/ict-in-education-projects/teaching-and-learning/unesco-schoolnet-project/project-description/

[21] VVOB Cambodia. Available at http://www.vvob.be/cambodia/content/ict-education

accompanied by numerous workshops on the use of ICT in education, and coaching to 150 teacher trainers.

Busan Metropolitan City Office of Education of the Republic of Korea
In 2005, the Ministry of Education and Sport and the Busan Metropolitan City Office of Education of the Republic of Korea signed a Memorandum of Understanding on an ICT training programme and computer provision to high schools in Phnom Penh. Between 2005 and 2013, the Busan Metropolitan City Office of Education took 140 Cambodian high school teachers to Busan for ICT training programmes. The Busan Metropolitan City Office of Education also provided 740 desktop computers to equip 16 high schools and set up a mobile computer lab at the central level, containing 30 laptop computers.

Japan International Cooperation Agency
The Japan International Cooperation Agency (JICA) has undertaken several development projects in Cambodia, including substantial work on health, water management, governance, transportation and economic policy.[22] JICA has played a major role in aiding the Cambodian government to develop capacity in utilizing ICT for management, with substantial progress made in e-government and e-learning initiatives.

The Open Institute
Along with policy support, the Open Institute has developed several programmes. One such programme is the Khmer Software Initiative (KhmerOS),[23] which is based on the principle that widespread use of technology is dependent on the availability of technology in the native language of the particular country. KhmerOS translates free and open source applications, including word processing, spreadsheets, presentation tools, e-mail clients, Internet browsers and graphic manipulation tools.

Another Open Institute initiative, the Open Schools programme, has conducted teacher training sessions at all TTCs and all high schools with computers, utilizing the Khmer-language software developed by KhmerOS. The initiative has also produced Khmer keyboards and textbooks, each of which was freely licensed to local vendors.[24]

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[22] JICA. 2012. Activities in Cambodia. http://www.jica.go.jp/cambodia/english/activities/index.html
[23] The Open Institute. http://www.open.org.kh/en/about (Accessed 2010)
[24] The Open Institute. 2010. KhmerOS: Cambodian project selected as one the two best development project that uses Information Technology. http://www.open.org.kh/en/khmeros_finalist_en

The "River of Knowledge" is another project, which has produced over 250 videos on science experiments, teacher training and principal leadership.[25] The Open Institute also provides training for schools to build e-learning programmes, serves as a platform for several online courses, and provides an online forum and training sessions targeted at empowering women.

In 2009 the MoEYS decided to integrate an ICT subject into the official curricula for grades 11 and 12. The ICT subject for grade 11 focuses on professional skills that make use of computers, including communication and administrative assistance skills. For grade 12, the ICT subject aims to further develop these skills, using new tools, and will also expose students to various employment opportunities related to ICT, in which they could develop a career, helping them make an informed choice. Both curricula were developed with technical support from the Open Institute, including a textbook for grade 11, which is being taught to teachers for deployment to schools in October 2013.

United States Agency for International Development
The United States Agency for International Development (USAID) has made major investments in Cambodia's basic education sector, with approximately 30 million USD committed during the period 2002 to 2014.[26] USAID has also been Cambodia's largest investor in ICT at the school level, with approximately 2.42 million USD invested to date in ICT hardware, room renovation and technical support. The vast majority of this assistance has been for hardware, leading to the installation of fixed computer labs in 144 secondary schools, which comprise approximately 35 percent of all secondary schools with grades 7 to 12. These investments have enabled the MoEYS to meet a policy goal of ensuring student access to ICT facilities in at least one-third of upper secondary schools in each province by 2014. By 2013 this goal had been reached (or exceeded) in 11 provinces where USAID had made ICT investments.

Through its development partners World Education and Kampuchean Action for Primary Education (KAPE) and in collaboration with the MoEYS, USAID has also developed technological solutions for major constraints to ICT access in Cambodia's schools, including energy costs, equipment costs and maintenance.

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[25] The Open Institute. 2011. Present State of the River of Knowledge Project. http://www.open.org.kh/en/node/167
[26] USAID has supported five large education development projects since 2004, including the Cambodia Basic Education Project (2004-07); Educational Support to Children in Underserved Populations (2005-08); Schools for Life (2008-09); the Improved Basic Education in Cambodia Project (2009-14); and the School Dropout Prevention Pilot (2010-13).

USAID has assisted schools to purchase thin client devices, which consume only about 5 watts of energy, are cheaper than conventional computers and have no moving parts. A recent survey of thin client labs has indicated that even after five years all are still in service. Conventional labs, by comparison, tend to fall out of service after only two years of operation.[27] By subsidizing the introduction of "thin client" technology, USAID reduced energy consumption in Cambodian computer labs by 80 percent, reduced maintenance needs by 92 percent, and reduced equipment costs by 50 percent.[28] Thus, US investments have helped schools adhere to the MoEYS ICT policy guidelines, which suggest investment in technologies that are low cost, energy efficient and low maintenance. US investments have also helped achieve more sustainable access to ICT in schools.

Analysis and conclusions

Cambodia has devoted extensive resources to improvements to its education system. Given the primary focus on expanding access to school, the main use of ICT consists of very basic training at the secondary level and the development of computerized information management systems. The implementation of ICT-based pedagogies in TTCs and the provision of online repositories for research and teaching materials are important steps, but their impact will be minimal until the Internet penetrates much more deeply into Cambodia.

Direct budgeting for ICT development is a minor portion of the MoEYS programme budget. While ICT plays a role in other programmes, the projected budget allocations indicate that there are more pressing challenges confronting the Cambodian education system.

Table 6. Budget allocations (millions of Riel) (Cambodia)

	2010	2011	2012	2013
Total programme-based budget	127,032	164,409	181,014	201,649
Development of ICT	185.8	209.2	230.5	256.6
% of total PB devoted to ICT	0.15%	0.12 %	0.12 %	0.12 %

The ESP's scenario planning projects a potential recurrent budget shortfall of 328 billion Riel between 2010 and 2013. Development partners and other stakeholders will

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[27] World Education. 2013. Thin Client Technology Solutions in Cambodia: A review of progress to date, Phnom Penh.
[28] USAID. 2008. Alternative Computer Labs: Thin Client Laboratories – A Cambodia Pilot, Washington DC, Just In Time Publications.

be asked to meet the financing gap.[29] As Cambodia receives relatively high amounts of ODA and private flows per capita, it is expected that funds will be forthcoming.

Donor funds will need to be carefully targeted to complement investment by the private sector. Viettel (Metfone) has taken a dominant position in the development of ICT infrastructure within Cambodia, including supplying schools with necessary ICT resources. Coordination with existing key private sectors on the rollout of Internet connections and other resources could be useful in piloting of advanced technologies.

The development of ICT in education in Cambodia is currently seen as a lesser priority than increasing access to traditional schools. The introduction of advanced technologies would therefore have to contribute towards increasing access to education. This could perhaps be achieved through widespread tele-centres for remote learning. Combined with the Open Institute's Khmer language software, such centres could bring ICT to a much wider audience than has been available in other developing-world contexts, providing some hope for easier uptake of technology.

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[29] MoEYS. 2008a. op cit.

Lao People's Democratic Republic

A socialist regime since 1975, the Lao People's Democratic Republic (Lao PDR) began decentralizing control and encouraging the growth of private enterprise in 1986. Between 2008 and 2011 economic growth exceeded 7 percent per year.[1] The country acceded to the World Trade Organization (WTO) in February of 2013.[2] The majority of the country's population is engaged in subsistence agriculture, dominated by rice, and farmers are also engaged in coffee cultivation.

Lao PDR still has much ground to cover in developing infrastructure and human capital. The recent expansion of the education system to 12 years has strained resources, but will contribute to long-term socio-economic development.

Policy environment

Several actors have overlapping realms of authority over ICT policy within Lao PDR. The Department of Information Technology, within the National Authority for Science and Technology (NAST), currently the Ministry of Science and Technology, is tasked with formulating and implementing information technology (IT) policies and strategies. The Department of Telecom and Internet, housed within the National Post and Telecom Authority (NPTA), currently the Ministry of Post and Telecommunication, is in charge of overall administration and development of telecoms and the Internet.[3]

The Minister of Post and Telecommunication chairs the Lao National Internet Committee (LANIC), which is in charge of the management and development of the Internet within Lao PDR. This role includes operation of the national Internet gateway, Internet exchange point, and country code top level domain name. LANIC is comprised of the Ministry of Post and Telecommunication (MPT), the Ministry of Information and Culture (MOIC), the Ministry of Public Security, the Ministry of Defense, and the Ministry of Science and Technology (MOST). LANIC is responsible for national telecommunications policies and regulation, while MOIC has responsibility over regulating Internet content. MOST is responsible for promoting and developing research on IT development, electronic data and e-library services, and national network policies and regulations.

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[1] CIA. 2012. Country Reports: Laos. https://www.cia.gov/library/publications/the-world-factbook/geos/la.html
[2] WTO. 2013. Accession Status: Laos. http://www.wto.org/english/thewto_e/acc_e/a1_laos_e.htm
[3] Phonpasit Phissamay. 2010. Lao People's Democratic Republic. http://web.idrc.ca/en/ev-140958-201-1-DO_TOPIC.html

Ministry of Education and Sports

The Ministry of Education and Sports (MOES)[4] is responsible for the management of education and sports at the macro level throughout Lao PDR. Sections include the Department of Preschool and Primary Education, responsible for pre-school and primary Education; the Department of Secondary Education, responsible for lower and upper secondary schools; the Department of Higher Education, responsible for higher education institutions; the Department of Technical and Vocational Education, responsible for all TVET within Lao PDR; the Department of Non-Formal Education, responsible for literacy and other non-formal programmes; the Department of Organization and Personnel, responsible for monitoring and training staff; the Department of Planning, which ensures that international development initiatives align with MOE plans; and the Department of Teacher Training, responsible for pre-service and in-service teacher training. Recently, the MOES established the ICT Centre for Education, which is responsible for all ICT in Education development tasks within the education sector.

Policies related to ICT in Education

National ICT policies

Perhaps a reflection of the tangled governance network surrounding ICT in Lao PDR, few plans has been publically released. The NAST has created a National ICT Policy that attempts to align institutions, human capacities, sectoral conditions and legal frameworks to leverage ICT as a means of developing the nation. The policy identifies nine priority areas for ICT development, namely (1) infrastructure and access, (2) enterprise and industry, (3) R&D, (4) applications, (5) human resource development, (6) legal framework, (7) awareness, (8) poverty alleviation, and (9) standardization and localization. The Department of Information Technology has been developing an ICT Master Plan to define ICT goals. This plan will be used as the basis for ICT master plans for each ministry and focus area, including an e-Education Master Plan.[5]

In the early 2000s, the Information Technology Master Plan in Education Management set the goals of establishing a ministerial Intranet system, facilitating information collection and processes, incorporating ICT content into the secondary and tertiary curriculum, and promoting distance and e-learning.[6] More recently, the Laotian government has set human capital development as a priority in the ICT sector, with the

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[4]Laos Cultural Profiles.Ministry of Education. http://www.culturalprofiles.net/laos/units/366.html
[5]Phonpasit Phissamay Digital Review of Asia Pacific 2009–2010 '.la' Lao People's Democratic Republic
[6]UNESCO Bangkok. Country Overview: Lao PDR. Available at
http://www.unescobkk.org/education/ict/themes/policy/regional-country-overviews/lao-pdr/

goal of ensuring ICT within all MOE programmes and piloting tele-centre programmes for underserved populations.[7]

The Education Strategic Vision 2020

Released in 2000, the Education Strategic Vision (ESV)[8] is an evolving framework used for dialogue between the MOES and the donor communities. It sets out the broad vision for the future of education in Lao PDR and aims to:

- Universalize compulsory education at the primary level and continue to increase enrolment at the lower secondary level, ensuring that all people have the opportunity to apply their education to serve the country's socio-economic development programmes.
- Abolish illiteracy among the target population, thus providing people living in absolute poverty with the means of improving their quality of life.
- Expand vocational, technical, and higher education to meet the needs of new labour market and to improve economic rates of return.
- Train skilled workers, technicians, professionals and intellectuals to have the capability to apply modern science and technology.
- Raise national education standards to be gradually closer to international standards.
- Appropriately invest in education as a core of human resource development and encourage the participation of the community.

The ESV delineates three pillars for education planning, namely equitable access, quality programmes and relevance. The immediate priority noted in the ESV is the expansion and strengthening of primary education.

Education Sector Development Framework 2009-2015

The Education Sector Development Framework (ESDF)[9] drew upon several laws, regulations, and policy statements passed during the 2000s in an attempt to create a cohesive plan of action. Priorities identified within the ESDF include the expansion of primary school classrooms across the nation, the adequate provision of teachers to these classrooms, the completion of all schools lacking resources, and the introduction of new grades and curriculum to increase the length of general education to 12 years.

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[7]SEACOOP (2010)ICT policies, programmes and research priorities in the 10 ASEAN countries. Available at http://seacoop.eu/files/2010/03/ICT_policies-programmes_priorities_SEA.pdf

[8]Lao PDR. 2000.The Education Strategic Vision Up to the Year 2020. Available at http://planipolis.iiep.unesco.org/upload/Lao%20PDR/Lao_PDR_EducationStrategicVision2020.pdf

[9] Lao PDR. 2009. Education Sector Development Framework 2009-2015. http://planipolis.iiep.unesco.org/upload/Lao%20PDR/Lao_PDR_ESDF_2009_2015_Lao_Eng.pdf

The majority of interventions identified in the ESDF focus on remote, isolated and underserved populations, including a substantial scholarship system to improve student retention and cohort survival rates and incentive programmes for bringing high quality teachers to the poorest districts. The integration of ICT into the education system is understandably de-emphasized within the ESDF, as the needs created by the expansion and extension of the education system require substantial resource support. The in-service development of teachers, often an important component of ICT in Education plans, is focused on retraining staff to serve as lower secondary school teachers.

ICT is mentioned in the ESDF as part of the administration and monitoring system. Noting that past assessments identified issues in the areas of timeliness and effectiveness of sector performance reporting, a priority was placed on strengthening ICT-based information systems, particularly at the district level.

Table 7. Key ESDF indicators (Lao PDR)

Dimension	Indicators
Equity and expansion of access	National, provincial and district enrolment trends Gender and urban/rural enrolment balance Representation of students from poorest families Basic education student progression and transition rates Net intake of age 6 in primary Grade 1 Upper secondary, TVET and higher education enrolment patterns In-service teacher training enrolment and redeployment
Quality, relevance and efficiency	Student standards in selected primary and secondary grades Availability of instructional materials and trained teachers Pupil/teacher ratios and share of non-teaching staff Pupil/classroom ratios Number of students re-entering basic education grades Coverage of science, technology and ICT facilities
Governance, accountability and performance management	Education budget volume and share Basic education spending share Salary and non-salary allocations and spending ratios Teaching and non-teaching staff deployment rates Effectiveness of school/institutional governing bodies Actions from joint performance review processes at all levels

Under the ESDF, the only definite ICT-related item in the MOE budget lies in the development of an Education Management Information Service. The ESDF also makes budgetary projections for the refurbishment of laboratory space within schools, which may include both ICT and science laboratories.

ICT in Education infrastructure

Lao PDR has been remarkably successful in fostering the growth of mobile telephony. Several mobile operators have received licenses from the Laotian government. Viet Nam's Viettel has formed a joint venture (Unitel) with military-owned Lao Asia Telecom.[10] The Russian telecommunications giant Vimpelcom entered under the brand of Beeline, with planned investment of 45 million USD.[11] This increased competition

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[10] Paul Budde Communication 2012. Laos - Telecoms, Mobile, Broadband and Forecasts. Available at http://www.researchandmarkets.com/reports/1247162/laos_telecoms_mobile_broadband_and_forecasts
[11] Lao PDR. 2011 Government e-Portal. "Telecom giant makes beeline for Lao market. Available at http://app02.laopdr.gov.la/ePortal/news/detail.action?id=28138&from=search

has lowered prices for consumers and spurred rapid uptake of mobile phones across the country.

Traditional Internet services have not seen the same rapid growth. The Laotian government has prioritized building infrastructure and increasing access in the remote northern regions. Additionally, the government has pledged to reduce import taxes on all ICT equipment.[12]

To build up infrastructure for ICT development, the Government of Lao PDR has been running the government telecommunication project which aims to build a national fibre optic backbone throughout the country, from north to south. The project has been completed in nine of 17 provinces, with the remaining provinces scheduled to be completed by the end of 2014.

Using ICT to improve access to and the quality of education
Although Lao PDR lacks a specific ICT in Education policy or master plan, the Ministry of Education and Sports has taken on an ICT-specific infrastructure project. This project aims to develop ICT infrastructure for the education sector, with the recognition that technology plays a large role in bringing about changes in education.

Seventeen ICT centres (at "model schools") have been built in the country's 17 provinces. These are connected using a cloud-based network through a fibre-optic backbone. These model schools, selected for their optimal location and therefore minimal costs of installation, are intended to facilitate the use of ICT to improve access to and the quality of education. Under this project, the MOES has established a relationship with universities in China to facilitate the introduction of computing into the Lao secondary school curriculum. Alcatel Shanghai Bell (ASB) and Zhejiang University have agreed to train ministry staffs and school teachers in ICT usage.[13] The project is intended to be extended to more schools by 2015.

ODA programmes and projects for ICT in Education

Despite the increase in years of education detailed in the ESDF and a consequent need for greater funding, comparatively little ODA is devoted to secondary education. This may be due to the more pressing need to ensure access to primary education throughout Lao PDR. A substantial portion of ODA to education has been devoted to

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[12]SEACOOP. 2010. ICT policies, programmes and research priorities in the 10 ASEAN countries.
http://seacoop.eu/files/2010/03/ICT_policies-programmes_priorities_SEA.pdf
[13] Lao Voices. 2010. Minister eyes ICT classes for secondary schools. http://laovoices.com/minister-eyes-ict-classes-for-secondary-schools/

education policy. FDI has been concentrated in the hydropower and mining sectors, with additional projects scheduled to open in 2012–15.[14]

Given the priority placed on achieving universal primary education within Lao PDR, there have been relatively few programmes directly relating to ICT in Education in recent years.

Table 8. Country information (Lao PDR)[15]

	2009	2010	2011
Population (million)	6.11	6.20	6.29
GNI per capita (Atlas USD)	900.00	1010.00	1130.00
Net ODA (USD million)	418.98	413.79	396.67
Bilateral share (gross ODA)	60.02%	65.44%	60.62%
Net ODA / GNI	7.39%	6.16%	5.17%
Net Private flows (USD million)	105.44	76.32	24.23

Table 9. Top 10 donors (2010-2011 Average) (Lao PDR) [16]

Overall (USD millions)		Education sector (USD millions)	
Japan	87.85	Japan	12.91
ADB Special Funds	64.31	ADB Special Funds	12.79
IDA	48.46	Australia	5.98
Australia	43.31	Germany	5.41
Korea	30.62	IDA	3.55
Germany	24.56	France	3.32
Switzerland	20.48	Korea	3.29
Thailand	19.53	EU Institutions	1.89
EU Institutions	19.42	Sweden	1.56
France	15.98	WFP	1.22

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[14] IHS Global Insight. 2012. Country Reports: Laos. http://myinsight.ihsglobalinsight.com (Paid database)
[15] World Bank, UNESCAP, and OECD statistical databases.
[16] OECD statistical databases.

Table 10. ODA by sector (2010-2011 average) (Lao PDR) [17]
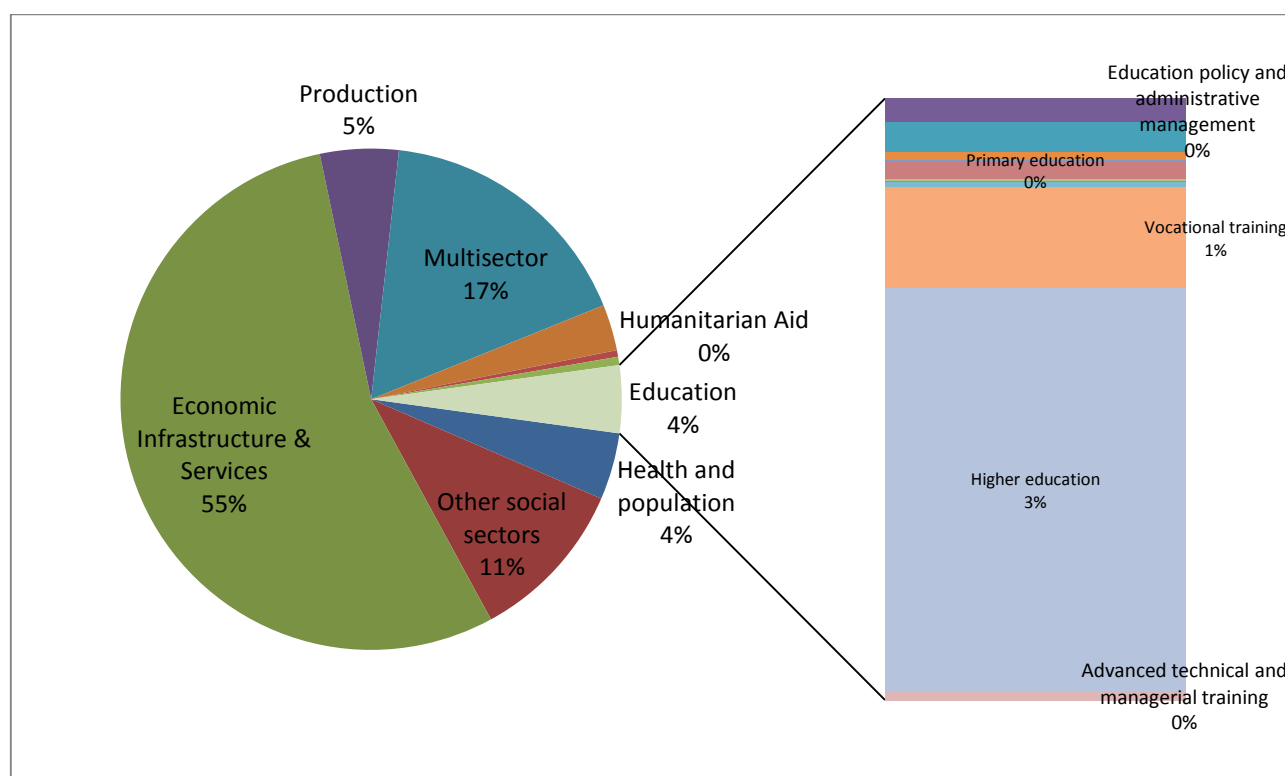
The following sections summarize the programmes initiated during the last decade.

Asian Development Bank

The Asian Development Bank (ADB) has provided substantial funding to Lao PDR. The ADB Special Funds provide the second largest source of donor funding to the country, both overall and in the education sector. Education projects with an ICT component include a 23 million USD training system for vocational needs, undertaken in 2011,[18] and a 25 million USD project to strengthen education delivery at the National University of Laos (Vientiane), Champasak University (Pakse), and Souphanouvong University (Luang Prabang) in 2009.[19] The latter project was intended to develop aspects of a Higher Education Master Plan.

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[17] OECD statistical databases.

[18] ADB. 2011. Strengthening Technical and Vocational Education and Training Project.
http://pid.adb.org/pid/LoanView.htm?projNo=42278&seqNo=02&typeCd=2&projType=GRNT

[19] ADB. 2011. Strengthening Higher Education Project.
http://pid.adb.org/pid/LoanView.htm?projNo=42134&seqNo=02&typeCd=2&projType=GRNT#timetable

UNESCO

The UNESCO ICT in Education Policy project promotes appropriate policy models and strategies to integrate ICT into education in the Asia-Pacific region, with special emphasis on the utilization of ICT to increase access and the quality of education. UNESCO conducted the project's initial training workshops in Lao PDR in 2007.[20] Lao PDR has also been included in UNESCO projects to develop a SchoolNet linking educational institutions in the Asia-Pacific region[21] as well as programmes to improve ICT professional skills through technical and vocational training.[22]

United Nations University International Institute for Software Technology

In 2011, United Nations University International Institute for Software Technology (UNU-IIST) [23] and the University of Bremen designed software to support capacity building at the grassroots level in Lao PDR. The software system utilizes the nascent ICT infrastructure within the country, in particular drawing on the expansion of mobile phone technology, to form a repository for information on successful poverty reduction projects. Agricultural extension officers will be able to utilize the software to form professional networks and further share knowledge.

World Links Programme

In 2007 and 2008, the US-based NGO World Links for Development, Jhai Foundation and the Lao MOE collaborated to implement the World Links programme in Lao PDR. The programme provided technologies, skills and educational resources to selected secondary schools and the MOE. Computer labs with Internet connections were set up in 10 secondary schools, and workshops on computer literacy and ICT-teaching pedagogies were held for 30 teachers.[24]

Jhai Foundation

The Jhai Foundation, a key contributor to the World Links project, has a long history of using ICT solutions for education in Lao PDR. Jhai builds Internet learning centres to help rural villages improve their economic returns from silk textiles and organic agriculture. In 2001 Jhai received the Stockholm Challenge Award for this project.

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[20]UNESCO. Activities. http://www.unescobkk.org/?id=2258

[21]UNESCO SchoolNet project www.unescobkk.org/en/education/ict/ict-in-education-projects/teaching-and-learning/unesco-schoolnet-project/project-description/

[22]UNESCO.TVET project. www.unescobkk.org/en/education/ict/ict-in-education-projects/teaching-and-learning/technical-and-vocational-education/project-description/

[23] UN University. 2011. Poverty Reduction Using ICT Education: The Case of Lao. http://www.ony.unu.edu/events-forums/new/WWNY/2011/ictenabled-education-for-pover.php

[24] Phonpasit Phissamay. 2010. Lao People's Democratic Republic. http://web.idrc.ca/en/ev-140958-201-1-DO_TOPIC.html

For isolated villages, Jhai provides computers powered by car batteries and bicycle-run generators, with radio signals used to create a local area network for an Internet connection. Secondary school students are trained to use computers, with the idea that they will use the computers as part of a business.[25]

Analysis and conclusions

Compared to its neighbours, Lao PDR has not addressed the issue of ICT in Education in a comprehensive and wide-ranging fashion. The multitude of actors involved with the development of ICT infrastructure has led to a lack of a clear timeframe for accomplishments.

The focus of educational plans, including the detailed ESDF, has been on expanding the coverage of secondary education throughout the country. While this expansion is a necessary step for Laotian development, more substantial budgetary resources could be directed to integrating computer skills into the secondary curriculum, training teachers in the use of ICT-enabled pedagogy, providing ICT infrastructure to schools and ensuring that Laotian children have access to Internet resources. While the cloud-based system being implemented by the MOES is a good beginning, it is highly doubtful that any ICT in Education initiatives will be undertaken in Lao PDR without increases in ODA or the intervention of private sector actors. Moving forward in this regard will require significant donor funding commitments. The provision of scholarships and expansion of secondary education set out in the ESDF has created substantial budget gaps. The current levels of ODA devoted to education do not go beyond these budget gaps, and will more likely fall short of meeting the needs.

Table 11. ESDF predicted shortfalls (USD millions) (Lao PDR)

	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Annual Budget Gap	$37.0	$42.8	$44.1	$33.8	$18.8	$16.0	$30.2
Accumulated Budget Gap	$37.0	$79.8	$123.9	$157.6	$176.4	$192.4	$222.5

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[25] UNESCO. Lao PDR: Jhai: Reconciliation through technology
http://www.unescobkk.org/education/ict/themes/teaching-learning/ict-in-development-programmes/lao-pdr/

Republic of the Union of Myanmar

Myanmar's former Prime Minister Thein Sein was elected by parliament as president in 2011 and has since appointed many military officers to prominent posts. Surprising many in the international community, Sein has also enacted series of reforms. As many as 300 political prisoners have been released, including Aung San Suu Kyi, the leader of the National League for Democracy (NLD).[1] Led by Suu Kyi, the NLD has since won 43 of the 45 seats available in parliamentary by-elections.[2] In response to the reforms and given Myanmar's strategic location and substantial natural resources, the international community has begun the process of engagement, including easing political and economic sanctions by several Western nations.

Policy environment

Major actors

Ministry of Communications, Information and Technology
The Ministry of Communications, Information and Technology (MCIT) is responsible for the provision of telecommunications services, including fixed and mobile access, local, national and international calls, and leased lines.[3] The MCIT issues ICT regulations and licenses, monitors ICT services, develops and operates infrastructure, controls e-government data centres and provides ICT-related training.[4]

The MCIT regularly interacts with the Myanmar Computer Science Development Council (MCSDC), the e-National Task Force (e-NTF), and the Myanmar Computer Federation (MCF). While the MCIT is the country's primary Internet service provider, other providers include the private sector's Myanmar Teleport and the ICT consortium Information Technology Central Services (ICTS).[5]

Ministry of Education
The Ministry of Education (MOE) holds primary responsibility for all education-related programmes and projects taking place within Myanmar. There are nine departments under the MOE. The Myanmar National Education Committee, chaired by the Minister for Education, is the highest decision making body for education matters.

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[1] The Economist. 2012. "Change in Myanmar". http://www.economist.com/node/21543221
[2] Sullivan, M. 2012. "Slowly, Myanmar Dares to Believe Change is Real".
http://www.npr.org/2012/04/20/151043087/slowly-myanmar-dares-to-believe-change-is-real
[3] Myanmar Gateway. 2010. Ministry of Communications, Posts, and Telegraphs.
http://www.modins.net/myanmarinfo/ministry/cpt.htm
[4] The Republic of Myanmar. 2011. Dynamics of Women in ICT Sector in the ASEAN member states
http://www.mastel.or.id/files/Dynamic%20Myanmar%20-
%20Presentation%20for%20IT%20capacity%20for%20women%28Final%29.pdf
[5] Ye Maung. 2007. "New Consortium to shake up IT sector". The Myanmar Times.
http://www.mmtimes.com/no370/b001.htm

Ministry of Science and Technology

To enhance the development of science and technology and in accordance with Declaration No. 30/96, the State Law and Order Restoration Council established the Ministry of Science and Technology on 2 October 1996.

The Ministry of Science and Technology was created based on the existing Department of Myanmar Scientific and Technological Research Department (MSTRD), which had been undertaking research and development activities aimed at the industrial development of the nation. The Yangon Institute of Technology (YIT), Vandalay Institute of Technology (VIT), Institute of Computer Science and Technology (ICST) and the Department of Technical and Vocational Education (DTVE), which had previously been under the Ministry of Education, were transferred to the Ministry of Science and Technology.

Policies related to ICT in Education

30-Year Long-Term Education Development Plan

Under the motto of "building a modern developed nation through education", the 30-Year Long-Term Education Development Plan (30EDP) sets the provision of "Education for All" as the country's chief education goal. The 30EDP aimed to achieve universal primary education by the end of the first five-year plan, universal lower secondary education by the end of the third five-year plan, and universal basic education by 2031. A subsequent Special Four-Year Plan for Education implemented between 2001 and 2005 established e-learning and computer training centres in all higher education institutions.[6]

ICT infrastructure development

Myanmar's broad 30-year plan for ICT infrastructure development[7] envisions three concurrent initiatives:

- Expansion (2000-2010), concentrating on major urban areas and connecting village phone networks.
- Dissemination (2000-2020), providing one phone per household and a fully-automatic switching system, and developing a fibre optic backbone network.
- Ubiquitous Telecom (2010-2030), providing broadband and mobile Internet connections throughout the country.

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[6] Myanmar Ministry of Education. 2004. Development of Education in Myanmar.
http://www.ibe.unesco.org/International/ICE47/English/Natreps/reports/myanmar_ocr.pdf
[7] Myanmar Posts and Telecommunciations. 2010. Country Report Myanmar. ITU Subregional Workshop for CLMV. Nha Trang, Vietnam. 14-17 Dec. 2010. http://www.docstoc.com/docs/81375370/International-Telecommunication-Union

ICT Master Plan 2011-2015

The result of a lengthy collaboration between the MCPT and the Republic of Korea, the ICT Master Plan 2011-2015 introduced the specificity necessary for tangible progress in ICT development to take place. Announced in July of 2011,[8] the ICT Master Plan delineates actionable steps in four major sectors: ICT Infrastructure, ICT for industry, human resource development and e-education.[9] Planned interventions in the latter two sectors have strong connections to the education sector.

Table 12. Action steps in human resource development (Myanmar)

- Develop ICT network for universities (2013-2015)
- Set up model ICT schools (2013-2014)
- Establish industry-university cooperation for research and training (2012-2015)
- Set up a National Research Centre for ICT development (2012-2013)
- Establish a cooperation network with foreign universities(2012-2015)
- Establish national certification programmes (2013-2015)
- Connect universities through a digital library (2012-2014)
- Create regional ICT services centres to connect with neighbouring countries (2012-2014)
- Institute incentive policies to foster growth of research personnel (2013-2015)

Table 13. Action steps in e-Education (Myanmar)

- Establish a national committee for information culture movement (2012)
- Promote information culture (2012-2015)
- Revise laws and rules to accelerate e-awareness(2011-2012)
- Incorporate ICT training into the school curriculum (2012-2014)
- Train teachers in ICT usage (2012-2015)
- Develop teaching materials for ICT training (2012-2015)
- Revise laws and rules to promote digital literacy(2011-2013)
- Install national LAN and Internet connections for 1000 high schools (2012-2015)

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[8] Xinghui Guo. 2011. "Myanmar announces second ICT Masterplan" Asia Pacific FutureGov.
http://www.futuregov.asia/articles/2011/jul/25/myanmar-announces-second-ict-masterplan/
[9]MCPT/KOICA. 2011. Myanmar ICT Master Plan (7/18/2011).
www.mcpt.gov.mm%2Fsites%2Fdefault%2Ffiles%2Fpdf%2FMyanmar_ICT_Master_Plan_Final_to%2520print.pd
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ICT in Education infrastructure

Currently, college students are required to complete 30 hours of IT literacy courses, and private computer schools provide basic computer skills training to about 50,000 students annually. [10]

The MOE has identified several key research projects to bridge the digital divide, including "Natural Language" processing to allow automatic English to Burmese translation, a Myanmar Unicode System and fonts to enable Burmese versions of the Windows Operating System, online e-Learning systems and virtualization of operating systems.[11]

Additionally, the MoE has taken steps to introduce e-education learning centres utilizing satellite data broadcasting. Between 2000 and 2008, 741 learning centres were established, with 670 placed within high schools. Over 9,000 talks, lectures and discussions were transmitted to these learning centres during the 2000s. In 2009, 33,947 schools were provided with ICT facilities. More than 90 percent of these facilities were audio only, however, and the frequency of use of ICT for teaching and learning was considered to be very low.[12]

The most notable initiative related to ICT infrastructure has been the establishment of Yatanarpon cyber city, approximately 50 miles from Mandalay. Officially opened in late 2007, the city is linked to the regional networks by both fibre optic cable and satellite.[13] Yantanarpon allows manufacturers to export products directly, with customs offices and banks located within the city and minimal restrictions placed on economic activities.[14]

Despite this development, Myanmar has not yet been privy to the mobile telecommunications boom that has swept through the Asia-Pacific region. While the ICT Master Plan 2011-2015 sets solid action steps for expanding infrastructure, Myanmar can be considered as lacking all but the most basic ICT resources. While this deficiency does present an opportunity to rapidly implement new technologies, the

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[10] Thein Oo and Myint Myint Than 2010. Myanmar. Asia Pacific Digital Review 2009-2010. http://www.digital-review.org/uploads/files/pdf/2009-2010/chap-32_myanmar.pdf

[11] SEACOOP. 2010. ICT policies, programmes and research priorities in the 10 ASEAN countries. http://seacoop.eu/files/2010/03/ICT_policies-programmes_priorities_SEA.pdf

[12] SEAMEO. 2010. Status of ICT Integration in Education in Southeast Asian Countries. http://www.seameo.org/images/stories/Publications/Project_Reports/SEAMEO_ICT-Integration-Education2010.pdf

[13] Thein Oo and Myint Myint Than. 2010. Myanmar. Asia Pacific Digital Review 2009-2010. http://www.digital-review.org/uploads/files/pdf/2009-2010/chap-32_myanmar.pdf

[14] People's Daily Online. 2007. "Myanmar Cyber City to Open". 5 December. http://english.people.com.cn/90001/90777/6315404.html

widespread unfamiliarity with ICT will hinder their uptake. Educational programmes will be crucial in this regard.

Official development assistance

Myanmar received aid of 7USD per capita between 2007 and 2011. This is a very low amount compared to the average of 46.50 USD given to least developed countries.[15] While aid is increasing following reforms made by the Government of Myanmar, FDI has increased in advance of aid flows. Chinese, Thai, Singaporean and Indian investors have made commitments to the Government, mostly concentrated on gaining access to Myanmar's extensive offshore reserves of natural gas and capitalizing on the country's potential for hydropower.[16] To date, neither FDI nor ODA have been a significant contributor to the education sector.

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[15] World Bank. 2012. http://data.worldbank.org/indicator/DT.ODA.ODAT.PC.ZS
[16] IHS Global Insight. 2012. Country Reports: Myanmar http://myinsight.ihsglobalinsight.com (Paid database)

Table 14. Country information (Myanmar)[17]

	2009	2010	2011
Net ODA (USD million)	355.83	355.08	376.11
Bilateral share (gross ODA)	67.98%	65.78%	73.92%
Net ODA / GNI	..	..	..
Net Private flows (USD million)	13.14	292.52	497.21
Population (million)	47.60	47.96	48.34
GNI per capita (Atlas USD)	..	..	..

Table 15. Top 10 donors (2010-2011 average) (Myanmar) [18]

Overall (USD millions)		Education Sector (USD millions)	
United Kingdom	53.19	Japan	7.19
EU Institutions	52.09	United Kingdom	5.98
Japan	44.67	EU Institutions	3.66
Australia	44.42	UNICEF	2.67
United States	30.16	Germany	2.01
Global Fund	22.33	Korea	1.98
Norway	20.81	Australia	1.78
UNICEF	16.90	Denmark	1.55
Sweden	15.64	United States	0.87
Germany	14.52	Norway	0.74

Table 16. ODA by sector (2010-2011 average) (Myanmar)
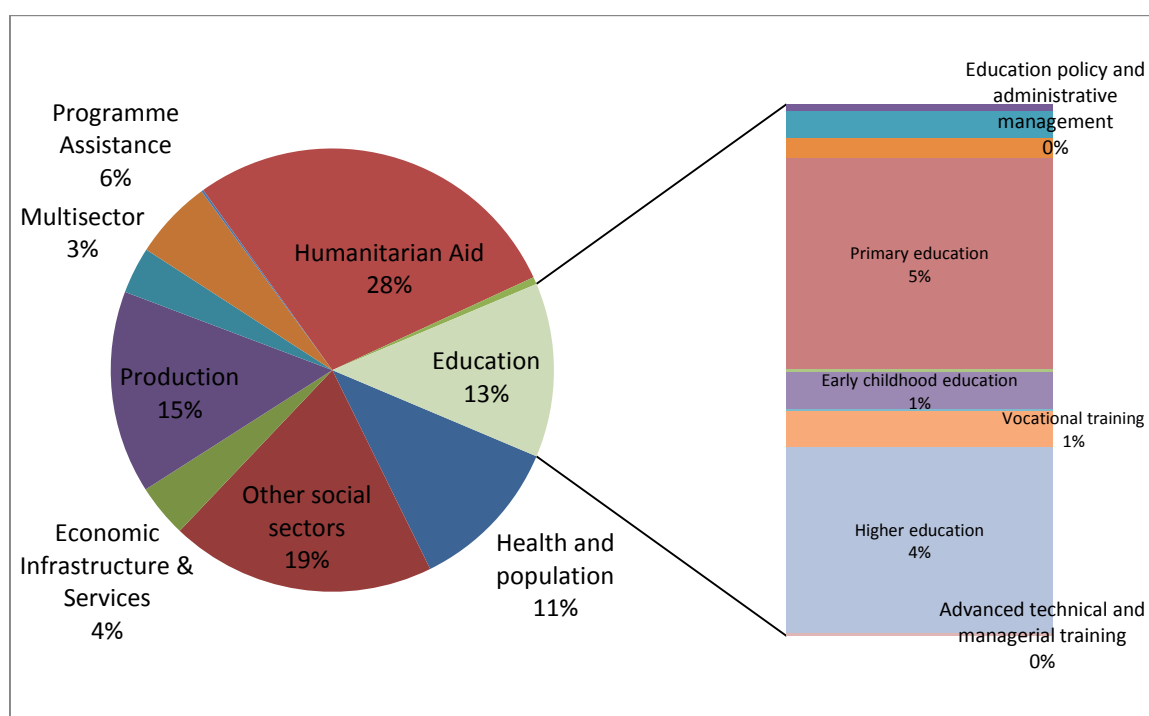
Source: OECD Statistical Databases

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[17] World Bank, UNESCAP, and OECD statistical databases.
[18] OECD statistical databases.

ODA programmes and projects for ICT in Education

Multilateral organizations

The World Bank, International Monetary Fund and Asian Development Bank have not provided assistance or loans to Myanmar for several years.[19] In February of 2012, however, the World Bank declared that it had "begun the process of re-engaging with the government to support reforms that will benefit all of the people of Myanmar".[20] It is anticipated that aid flows to the country will dramatically increase in the near future in response to the political reforms.

NGO-implemented programmes and projects

The majority of international NGOs working in Myanmar are involved with humanitarian endeavours. Education projects are largely focused on providing schooling opportunities to marginalized populations. All NGOs operating in Myanmar do so under a framework agreement with the ministry that has purview over their particular sector. Most international NGOs partner with local organizations for their programming.[21]

Analysis and conclusions

The long-awaited reforms in Myanmar have created excitement and optimism among human rights activists and industrialists alike. Given the country's geographical size and substantial natural resources, Myanmar could become a new "tiger economy" within South-East Asia. Both ODA and foreign direct investment (FDI) are likely to increase, particularly within the mining sector.

In the past, assistance and investments in the education sector were limited to the more abstract planning stages. While the expected increases in aid flows should have substantial amounts earmarked for education, there is reason for pessimism that Myanmar's government will permit foreign entities from engaging in "on-the-ground" resource development and teacher training.

The 30-year plans for education reflect recognition within Myanmar's government that ICT expansion and universal education will lead to a more productive economy. While the ICT Master Plan 2011-2015 demonstrates a comprehensive view of the steps necessary to build a digitally literate society, it remains to be seen whether the

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[19] Soubhik Ronnie Saha. 2011. "Working through Ambiguity: international NGOs in Myanmar". Harvard University. www.hks.harvard.edu/hauser/engage/humanitarianorganizations/research/assets/Myanmar%20Report%20Final%20Version%209-8-11.pdf

[20] World Bank. 2012. Myanmar and the World Bank. http://go.worldbank.org/PRRXN740P0

[21] Soubhik Ronnie Saha 2011. op cit.

Myanmar government is willing to allow the openness necessary for rapid development to occur. In particular, the planned revisions to laws and rules will be crucial determinants of the context for ICT growth.

The current optimism regarding political reforms must be tempered with memories of past Internet shutdowns, reductions in bandwidth and restrictions on access. During the "Saffron Revolution" of 2007, the government demonstrated the willingness and ability to completely shut down the Internet within the country. The Government censors Internet content through filtering and monitoring through a regime that has been rated among the strictest in the world.[22] This control will continue to inhibit the free flow of information and expansion of knowledge necessary to fulfil the policies described in the ICT Master Plan.

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[22] OpenNet Initative. 2010 Burma (Myanmar) Country Profile. http://opennet.net/research/profiles/myanmar-burma

Thailand

In the aftermath of the 1990s Asian economic crisis, Thailand pursued a three-pronged approach to ICT development, emphasizing the potential for the ICT sector to serve as a strong economic engine, and as a means of providing an opportunity for all Thais to be educated, as well as being a critical building block in the development of a peaceful nation.

The 2000s saw general growth in ICT devices. Mobile phone subscriptions rose from 3,056,000 in 2000 to 69,683,069 in 2010, while over the course of the decade the number of Internet users per 100 inhabitants increased nearly sevenfold.[1]

This decade, the much-scrutinized One Laptop Per Child programme led to mass rollout of devices, allotting tablet computers to 865,092 Grade 1 students in 77 provinces in 2012. In recent years, both the Ministry of Information and Communication Technology (MICT) and the Ministry of Education (MOE) have set development plans to build both infrastructure and human capacity for ICT use in the next decade, under the precept that "ICT should be managed with smart governance in order to support the development of…[a] knowledge and innovation based society and [a sustainable and stable] economy".[2]

Policy environment

Key actors

Following the launch of the 1999 National Education Act, the MOE was reorganized to move more administrative responsibilities to the sub-national and local levels. Under these reforms, 185 Education Service Areas were established, each responsible for approximately 200 educational institutions and a population of between 300,000 and 500,000 students.[3] The ESAs have since been further subdivided into Primary ESAs and Secondary ESAs.

The Office of the Basic Education Commission (OBEC) and the Office of the Education Council (OEC) work together to plan and implement Thailand's policies across the decentralized Education Service Areas.[4] These agencies, along with the Ministry of ICT (MICT), are responsible for the development and dissemination of ICT policies and projects. Within OBEC, the Bureau for Innovative Development in Education (BIDE) is

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[1] International Telecommunications Union Database. 2011.
[2] Ministry of Information and Communication Technology, Thailand. 2008. ICT Master Plan 2009-2013
  http://www.mict.go.th/download/Master_Plan.pdf
[3] Ministry of Education. 2008. Towards a Learning Society in Thailand
  http://www.bic.moe.go.th/fileadmin/BIC_Document/book/intro-ed08.pdf
[4] Ministry of Education. 2008. op cit.

responsible for piloting new technologies.[5] The Institute for the Promotion of Teaching Science and Technology (IPST), under the MOE, is responsible for developing a variety of digital teaching and learning resources in science and mathematics, such as interactive books, learning objects and online resources.

Policies related to ICT in Education

11th National Economic and Social Development Plan (2012-2016)
The 11th National Economic and Social Development Plan (NESDP) provides the highest level vision for the use of technology within society and within the Thai education system, declaring that "unequal access to technology by various groups in society will exacerbate economic and social disparities".[6] The NESDP also emphasizes the need for Thailand to shift from being an importer of technology to being a creator. Interestingly, the NESDP provides a range of potential indicators for is lofty objectives, including perceptions of corruption, total factor productivity and wealth distribution.

MICT Second National ICT Master Plan (2009-2013)
The MICT Second National ICT Master Plan (NICTMP) covers the domains of e-Education, e-Society, e-Governance, e-Commerce, and e-Industry, with the common thread of harnessing technological innovation for more efficient knowledge transmission. The NICTMP considers ICT as "a tool for teaching and learning in education at all levels, with a priority emphasis on basic education".[7] The plan emphasizes the integration of ICT into current subjects as well as calling attention to the ethics of using ICT. A variety of policies are suggested for increasing the use of ICT in education, including:

- Providing tax incentives or special loans for parents of school children to buy computers for home use.
- Providing incentives to service providers to develop ICT infrastructure for schools.
- Taking readiness of personnel and infrastructure into consideration, and maintaining a balance between allocations for equipment, Internet services, software, teaching materials, maintenance and training
- Promoting the local development of content, in the Thai language.

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[5] BIDE. 2011. http://inno.obec.go.th
[6] NESDB. 2013. Summary of 2012-2016 National Economic and Social Development Plan.
http://www.nesdb.go.th/Portals/0/news/academic/Executive%20Summary%20of%2011th%20Plan.pdf
[7] Ministry of Information and Communication Technology. 2008. op. cit.

- Building opportunities for applying open source software in the education sector.
- Encouraging public-private partnerships with both domestic and foreign firms.

MOE Master Plan on ICT in Education (2007-2011)

The MOE Master Plan on ICT in Education (MICTE) is based around three key strands for ICT-enabled education:

- Improving the quality of learning.
- Improving educational management through ICT-enable evaluation and collaborations.
- Creating a large number of ICT specialists meeting international standards.

Combining national programmes, local support and external investment to quickly ramp up ICT penetration in Thai classrooms,[8] the plan revolves around lowering student to computer ratios to 1:40 for elementary students, 1:20 for secondary school students, and 1:10 in higher education, along with dramatic increases in teachers' exposure to and training with ICT.[9] In January of 2011, the MOE announced that it had successfully reached the target ratio for secondary students.[10]

The MICTE set a wide range of additional targets for 2011,[11] including:

- Distance learning will reach all areas of the country via educational services centres.
- 90 percent of people in remote areas will receive ICT-enabled knowledge and information.
- 80 percent of education organizations will manage their offices through ICT.
- All levels of education will utilize ICT in managing teaching and learning.
- More than 80 percent of graduates will gain appropriate ICT knowledge, and at least 50 percent will meet international standards.
- 50 percent of all graduates will be in the fields of science and technology.
- 70 percent of working people will use ICT for their professional development.
- More than 80 percent of the general public will have good ICT knowledge.

While the move towards setting quantifiable targets is laudable, the range of potential interpretations raises numerous issues around the efficacy of many of these indicators.

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[8] Ainley et al. 2000. Capacity Building of Thai Education Reform http://www.worldedreform.com/pub/a_tech.pdf
[9] Ibid.
[10] Guo. 2011. Thailand's Race to ICT Literacy FutureGov Asia
http://www.futuregov.asia/articles/2011/jan/18/thailands-race-ict-literacy/
[11] MOE. 2006. Enhancing Learning Through ICT.
http://www.bic.moe.go.th/fileadmin/BIC_Document/book/MOEleaflet/moe2__ict_s_.pdf

It will be exceedingly difficult to determine what constitutes "good ICT knowledge", much less to effectively measure the prevalence of such knowledge in the general public.

ICT in Education infrastructure

The Thai government has pledged over 22 billion USD to build ICT infrastructure throughout Thailand between 2010 and 2020.[12] A large portion of this money will be spent on the expansion of broadband Internet access and improvement of the schools to support MOE ICT targets. According to the MOE, all Thai schools now have access to the Internet,[13] though the quality of the connection has not been assessed.

Government programmes to enhance ICT in Education infrastructure

Distance education via satellite
The oldest large-scale ICT programme in Thailand is the Distance Learning Foundation e-learning project (DLFe), which was established in 1996 to commemorate the 50th anniversary of His Majesty the King of Thailand's ascension to the throne. The DLFe broadcasts, via satellite television, the entire curriculum to schools throughout Thailand. As of 2004, all schools in Thailand were equipped to use the DLFe content in all 12 grades. Not only does the broadcast cover the entire grade 1 to 12 curriculum, it includes two channels of continuing education, runs 24 hours a day, and is available on any television in Thailand.[14]

Thailand SchoolNet
Thailand began to develop its own internal school Internet and Intranet-based network in 1995, coordinated by the National Electronics and Computer Technology Centre (NECTEC) under the Ministry of Science and Technology in collaboration with the Telephone Organization of Thailand (TOT) and CAT Telecom, at that time under the Ministry of Transport and Communications. In 1996, SchoolNet Thailand expanded to provide local Intranet access to a library of Thai-language informational content. Pilot schools were given dial-up accounts, with 80-hours of usage per month and 8 megabytes of storage space. By 2005, 4,787 secondary schools had registered as members of Thailand SchoolNet. 1,322 schools had their own web page, and 1,000

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[12] Ibid. ICT for the Future Education in Thailand.
[13] MOE. 2006.
[14] Surasit Ratree. 2007. Distance Education via Satellite in Thailand.
  http://www.aprsaf.org/data/w_sea_data/March3%20Presentations/3_8Ratree.pdf

online lessons had been developed (in the Thai language) in seven subjects.[15] NECTEC has also organized monthly competitions for outstanding web content development.

ICT Schools Pilot Project

A pilot project was designed to identify best practices for the integration of ICT into Thai schools, specifically focusing on administrative structure, teacher training and supporting individual student learning paths. This project was run between 2003 and 2006 in eight primary and eight secondary schools, seven in the greater metropolitan Bangkok area, and one in the Chiang Mai area.[16] An academic review of the programme concluded that the success of the schools in terms of promoting individual learning and higher-level thinking was highly dependent on the ICT skills of the individual teachers. In particular, the study identified successful teachers as those with high technological literacy, including knowledge of basic computer operations, professional use of multimedia, and the applications of technology in lessons.[17]

Thailand Cyber University Project

The Thailand Cyber University (TCU) project aims to provide higher education access to anyone with an Internet connection. In 2009, the TCU had over 76,000 students with over 3,000 teachers from a consortium of 38 universities and organizations. The age breakdown of the students showed that over 50 percent of the students were over 27, with over 20.5 percent being over the age of 40. This programme supports lifelong learning goals and connects Thai campuses with other campuses in the Asia-Pacific region. ICT courses are shared with Hanoi and Sydney through distance learning.[18]

One Tablet PC per Child

Thailand has a large-scale OTPC programme. In 2012, the Thai government distributed over 800,000 tablet computers to Grade 1 students. The Thai tablets were preloaded with content for the core subjects, namely science, mathematics, Thai, English and social studies. Teachers were trained and supplied with two hundred days of lesson plans for integrating the tablets into their classrooms. In 2013, the Thai government plans to provide tablets to Grade 7 students in 77 provinces.

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[15] UNESCO. 2005. Regional Planning Workshop on the Creation of National and Regional SchoolNet. http://www.unescobkk.org/fileadmin/user_upload/ict/schoolnet/documents/SchoolNet_-_Report_Regional_Planning_Workshop_4-6_Apr05.pdf

[16] Rumpagaporn et. al. 2007. Students' critical thinking skills in a Thai ICT schools pilot project. International Education Journal. http://ehlt.flinders.edu.au/education/iej/articles/v8n2/Rumpagaporn/paper.pdf

[17] Rumpagaporn et. al. 2007. op. cit.

[18] Kamjorn Tatiyakavee 2009. ICT for the Future Education in Thailand. Office of the Higher Education Commission http://202.29.13.241/stream/apec09/kamjorn/1_APEC_v4_eng.pdf

The size of the OTPC programme and the rapidity with which it was rolled out raised many concerns among the Thai populace and international community. A research-based, transparent dialogue on the efficacy will be essential to ensure that the programme is adapted to meet educational needs.

Official Development Assistance

Thailand is both a provider and recipient of ODA. Its net flow of ODA is therefore relatively low, although it receives sizeable funds from outside parties. The vast majority of this funding goes to economic infrastructure projects, focusing on the alleviation of traffic in the Bangkok area as well as preparation for adverse conditions resulting from climate change. ICT in Education has not received substantial direct ODA funding. Most of the support going to the education sector has been in the form of scholarships for study abroad.

Table 17. Country information (Thailand)[19]

	2009	2010	2011
Population (million)	68.71	69.12	69.52
GNI per capita (Atlas USD)	3720.00	4150.00	4420.00
Net ODA (USD million)	-77.76	-11.4	-153.06
Bilateral share (gross ODA)	78.43%	79.31%	81.04%
Net ODA / GNI	-0.03%	0.00%	-0.05%
Net Private flows (USD	3851.99	6030.3	10491

Table 18. Top 10 donors (2010-2011 average) (Thailand) [20]

Overall (USD millions)		Education sector (USD millions)	
Japan	260.02	Japan	12.85
United States	54.27	Germany	12.66
Global Fund	51.91	France	6.47
EU Institutions	23.59	EU Institutions	1.91
Germany	20.42	Korea	1.10
France	16.63	Austria	1.05
Australia	9.22	United Kingdom	0.76
Sweden	8.45	Australia	0.36
UNHCR	6.33	Netherlands	0.29
GEF	5.99	Denmark	0.23

Table 19. ODA by sector (2010-2011 average) (Thailand)
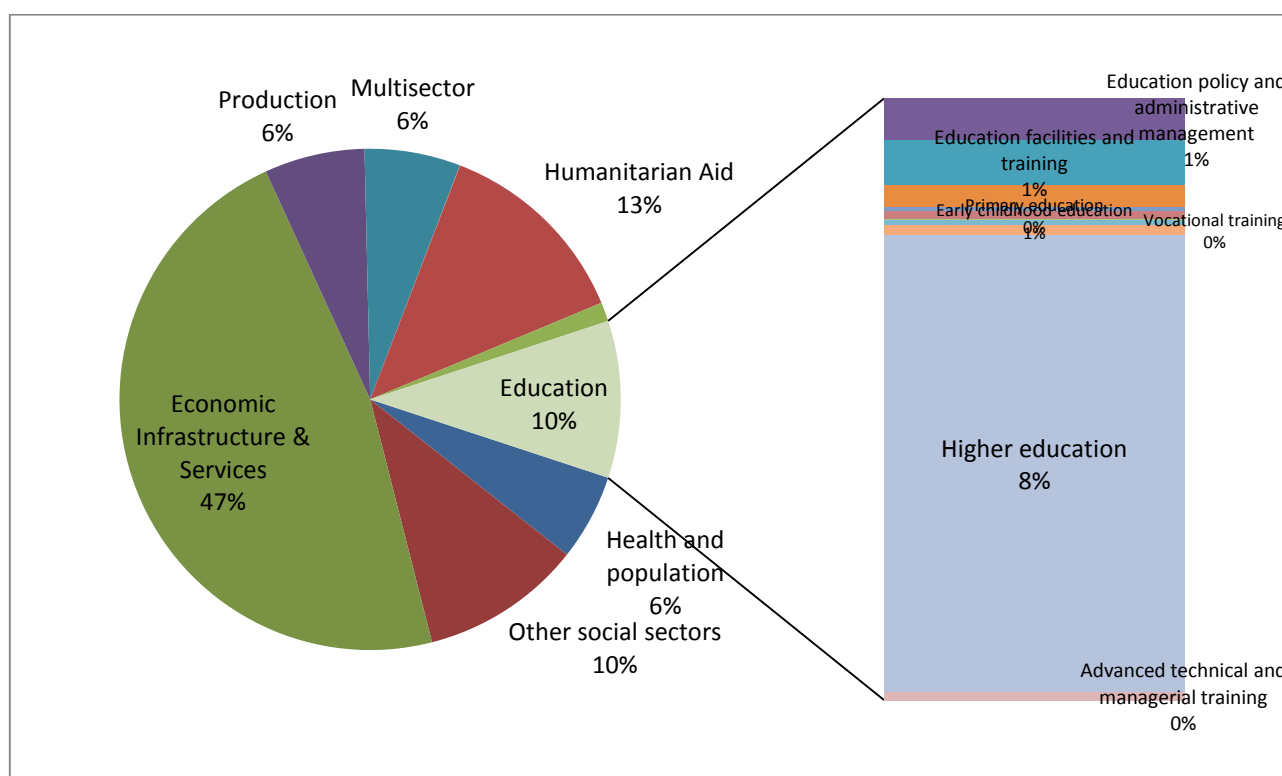
Source: OECD statistical databases

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[19] World Bank, UNESCAP, and OECD statistical databases.
[20] OECD statistical databases.

Analysis and conclusions

The level of ICT infrastructure in Thailand public schools is not yet strong enough to support the mass implementation of advanced ICT in Education projects. The Second National ICT Master Plan (2009-2013) notes that "the main factor holding back the development…is the readiness of the information and communication infrastructure".[21]

The OTPC programme and National Wireless Internet programme can be seen as attempts to solve this issue. If these programmes are adapted effectively and seen through to successful outcomes, then inlets for the development and installation of other hardware, software and educational content could exist. There is optimism that, over the next decade, the strong Thai economy and continued government investment in ICT will spread Internet access and computer infrastructure.[22] Thailand is consistently ranked in the top 20 countries for "ease of doing business", and the nationwide expansion of satellite-based wireless access points will facilitate greater interconnectivity.

The development of ICT for foreign language learning is an express priority in long-term national plans. Therefore, considering low-cost means of delivery of language learning technologies in collaboration with the Bureau for Innovative Development in Education would allow the testing of new technologies.

The Institute for the Promotion of Teaching Science and Technology (IPST) has continuously supported the use of ICT in teaching and learning of science and mathematics in Thai schools for many years. Thus, it might be worthwhile to contact IPST for possibilities of piloting new advanced technologies.

It is also possible that private and international schools would be interested in piloting advanced technologies for language teaching. The International Schools Association of Thailand has 99 members,[23] and Thailand's bifurcated economy has created a wealthy class that has already highly invested in obtaining the latest educational technologies. While small in scale, advanced ICT use would likely begin at the top of the private educational market.

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[21] Ministry of Information and Communication Technology. 2008. op. cit
[22] Thailand Business News. 2011. Thailand ICT market to gain momentum in 2011 http://thailand-business-news.com/
[23] International Schools Association of Thailand. 2011. http://www.isat.or.th/

Viet Nam

In 2001, Viet Nam officially recognized the necessity of improving IT competencies. Since then, mobile phone, fixed landline and Internet penetration have increased dramatically. As of 2010, there were 113.40 mobile phone subscribers per 100 people in Viet Nam, a fivefold increase from 2006. These numbers meet the ICT targets set forth in the 2005 strategy,[1] and are in line with the expanded targets for 2020.

The next targets dramatically increase the use of ICT in education and teacher training. Specifically, Viet Nam aims to ensure most "officials, clerks, and teachers at all levels, doctors, nurses, university and college students, pupils of professional, vocational and high schools, 50 percent of secondary pupils and over 30 percent of the population can explore ICT applications and utilize [the] Internet".[2]

Policy environment

The Ministry of Education and Training
Ministry of Education and Training (MOET) is in charge of meeting the ICT targets outlined in the national ICT plan, and has encouraged the adoption of ICT-based learning throughout Viet Nam, especially in teacher training programmes and higher education.[3]

Although MOET is in charge of higher education, most of the top tier universities are largely independent and rely on MOET only for general direction and regulations.[4] As of 2008, private college and university attendance had reached 11.8 percent of total enrolment, with private tertiary institutions making up 25 percent of the higher education landscape.[5]

Despite this shift towards decentralization of the education system, MOET is still responsible for large scale initiatives and national education planning.[6] MOET has worked closely with international organizations, such as UNESCO, to improve access and ICT penetration throughout Vietnamese education.[7]

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[1] Nguyen Thanh Phuc. 2010. Review of Strategy for Development of Vietnam's Information and Communication Technology toward 2010 and Orientations toward 2020. National Institute of Posts and Telematics Strategy, MIC. http://www.tapchibcvt.gov.vn/News/PrintView.aspx?ID=18325

[2] Nguyen Thanh Phuc. 2010.

[3] MOET. 2011. Overview of Education System in Vietnam. http://en.moet.gov.vn/

[4] Charles Runkel. 2009. The Education System in Vietnam. http://www.business-in-asia.com/vietnam/education_system_in_vietnam.html

[5] Ibid

[6] Ibid

[7] VVOB. 2011. UNESCO ICT curriculum development workshop. http://www.vvob.be/vietnam/?q=node/1072

Policies related to ICT in Education

ICT in Education Plan (2001-2005)

This initial plan, covering the period between 2001 and 2005, laid out both the first steps and long-term goals for ICT in Viet Nam, with the following objectives:[8]

- To meet demand for IT human resources to facilitate building the IT industry as a key industry in Viet Nam and broad IT applications to promote the socio-economic development of the country.

- To meet demand for educational reform in terms of innovation in content, teaching and learning methods, as well as in educational management.

These goals work in two dimensions. First, MOET is charged with improving familiarity with and training in ICT for students, which in turn will improve the developing IT industry. Second, MOET is charged with improving ICT use by teachers to enrich the development of students and enhance the educational content of lessons.

Year of ICT

In 2007, MOET announced that 2008/09 would be the "Year of ICT" in Vietnamese schools. This programme aimed to provide all schools with basic Internet access and it funded several academic reviews of ICT policy and penetration in Viet Nam. These studies found that there had been excellent improvement in physical access to ICT resources in schools in Viet Nam, but that having computers, projectors and Internet access was not enough to transform education. It was concluded that, despite extensive development and focus on ICT use in schools, "in practice, ICT is mainly used to replace existing teaching practice, in a very limited way".[9]

Comprehensive and fundamental reform of higher education in Viet Nam (2006-2020)

Viet Nam's current ICT strategy focuses on three aspects:[10]

- *ICT as an enabler*

    ICT is one of the most important tools to realize the MDGs and set up an information society. The application of ICT is thus a strategic means to enhance economic growth, social development, productivity and efficiency.

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[8] Vietnam Institute for Education Sciences and VVOB. 2009. Policy Analysis Integration of ICT into Teaching. http://www.vvob.be/vietnam/files/PolicyAnalysisIntegrationofICT_Vietnam_UNESCO-APEID2009.pdf
[9] Ibid.
[10] Nguyen Thanh Phuc. 2010.

- *ICT as an economic sector*

    The ICT industry serves as a spearhead economic sector for development, contributing to economic growth, helping other sectors develop and enhancing national technological capacity.

- *ICT as infrastructure*

    ICT infrastructure must be a priority for development, ensuring modern technology throughout the nation.

Understanding the rapid changes possible through the use of ICT in education, Viet Nam is focusing on moving from traditional standards to new paradigms.

Table 20. Shifting paradigms (Viet Nam)[11]

Traditional standard	New paradigm
Instructor-centred	Learning centred, by using ICT
Local and individual application	Online community applications
ICT teachers teach ICT as a subject	ICT embedded in each subject
Presentation by Power Point	E-learning content made by teachers
Presentation in classroom	Self-learning at home
Proprietary software	Open standard
Translations	Direct English

In order to rapidly improve ICT penetration in all disciplines, including education, Viet Nam's plan highlights the expansion of ICT training in colleges and universities. Furthermore, it calls for the evaluation of current programmes and the removal of low-impact training. Specifically, this plan looks to the Vietnamese colleges and universities to take two major steps. First, to develop new curricula for all levels of education, which both utilize ICT and teach about ICT. Second, all advanced ICT-focused training should be taught in English in order to comply with the goal of increasing English language expertise in Viet Nam.[12]

Viet Nam's master plan is ambitious, but its current level of ICT integration and access are still low compared to some other nations in the Asia-Pacific region. The Government of Viet Nam is aware that the low level of ICT access in the home is a

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[11] Quach Tuan Ngoc. 2013. Presentation, Regional Consultation Workshop on ICT in Education Policy, Infrastructure, and ODA Status in Selected ASEAN Countries

[12] Intel. 2009. Strengthening ICT Education for Teachers in Partnership with the Government: Intel Vietnam's Experiences.http://www.rvr.aim.edu/fckeditor2/userfiles/file/publications/Intel%20Case%20Book/10_E%20Intel%20Teach%20Vietnam%20Case.pdf

major roadblock for ICT uptake in the schools. As a result, its 2010-2020 ICT programme lists "Improving Awareness" as its highest priority goal.[13]

ICT in education infrastructure

Viet Nam has made several investments in developing its ICT infrastructure and improving access to ICT for students and teachers,[14] working closely with private industry. These projects have resulted in dramatic gains in Internet penetration, computer ownership, school networking and other key foundations for widespread use of ICT in education.

Viettel Internet Access Collaboration

Since 2008, Viettel, the Vietnamese Telecom company, has donated necessary components to provide Internet access to all schools in Viet Nam. At the end of 2012, all schools with stable power supplies had free Internet access.15 Furthermore, 21,000 of the 29,600 schools in Viet Nam were equipped, by Viettel, with broadband or ADSL high-speed access. In the mountains of Dien Bien Province, Viettel laid 65 kilometres of fibre-optic cable to give Internet access to just one primary and one lower secondary school. The use of fibre-optic cable provides a more consistent connection than satellite. This universal school Internet access makes reaching the country's 2020 ICT targets a distinct possibility. Viettel has also cooperated with the MOET to build a student management system that provides parents with information by SMS.

In early 2013, the MOET decided to provide teacher training through the Internet and education network, in order to provide more efficient and cost-effective professional development opportunities. The next stage of school connection involves the creation of an Education Management Information System (EMIS) at the kindergarten, primary and secondary levels. The culmination of the system is intended to be a school portal that allows access to all resources through a single log-in.

Official Development Assistance

Viet Nam's largest donor is Japan, but the largest donor to the education sector is the International Development Association (IDA), the World Bank's "fund for the poorest".

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[13] Nguyen Thanh Phuc. 2010.
[14] Vietnam-Comm. 2010. The 10-year plan for ICT. http://www.vietnam-comm.com/VNC11/Files/Pdf/MarketNews/mn_en_20110113.pdf
[15] Thanh Nien News. 2010. Education Ministry, Viettel Extend School Internet Project http://www.thanhniennews.com/2010/Pages/20110114103058.aspx

The IDA provides interest-free loans (credits) and grants to the Government of Viet Nam for education projects and other initiatives.

Table 21. Country information (Viet Nam)[16]

	2009	2010	2011
Population (million)	86.03	86.93	87.84
GNI per capita (Atlas USD)	1030.00	1160.00	1260.00
Net ODA (USD million)	3731.7	2940.1	3513.8
Bilateral share (gross ODA)	57.12%	63.78%	60.54%
Net ODA / GNI	4.03%	2.88%	2.98%
Net Private flows (USD million)	1745.8	3216.4	3761.7

Table 22. Top 10 donors (2010-2011 average) (Viet Nam) [17]

Overall (USD millions)		*Education Sector (USD millions)*	
Japan	1233.795	IDA	104.71
IDA	975.83	ADB Special Funds	48.93
ADB Special	305.65	France	45.51
France	289.71	Germany	37.15
Australia	128.55	Japan	20.62
Korea	123.83	United Kingdom	16.08
Germany	115.97	Canada	6.48
United States	102.40	Belgium	5.49
Denmark	68.58	EU Institutions	5.19
United Kingdom	58.95	Netherlands	4.69

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[16] World Bank, UNESCAP, and OECD statistical databases.
[17] OECD statistical databases.

Table 23. ODA by sector (2010-2011 average) (Viet Nam) [18]
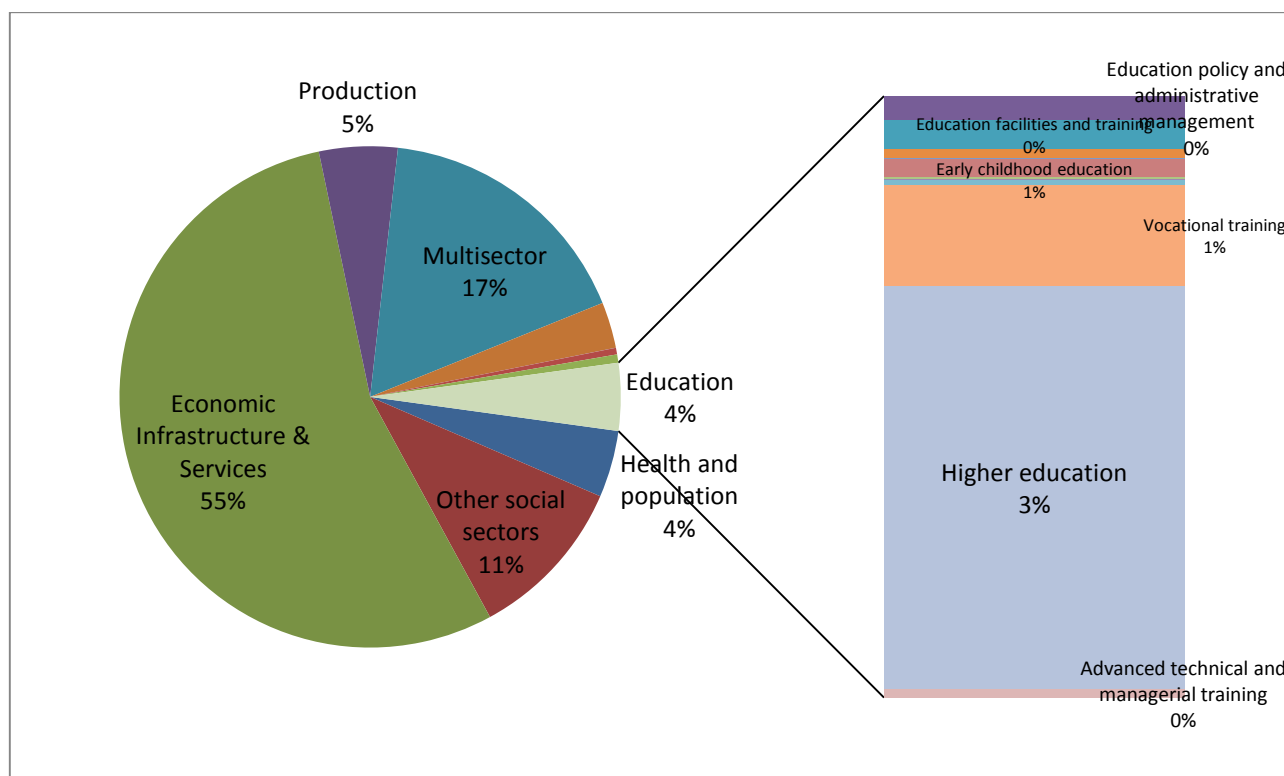
ODA programmes and projects for ICT in Education

Intel Teach

The Intel® Teach programme is an ICT in Education initiative developed by Intel that is composed of a series of modules designed to train teachers to use basic ICT in their classrooms and demonstrate how ICT can serve as an effective tool in teaching and learning. The programme has both in-service and pre-service tracks.

The programme began in 2004 as a small pilot in the two largest teacher training colleges in Viet Nam, and expanded to include over 39,000 teachers in 21 provinces/cities by 2008.[19] In 2008, an updated programme began in the teacher training college at Ho Chi Minh City. A review of the Intel Teach Essentials programme in 2007 found that a significantly "higher percentage of Essentials Course participants used technology to support their teaching than non-participants".[20]

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[18] OECD statistical databases.
[19] Intel. 2008. Intel CSR Projects in Vietnam
http://www.intel.com/cd/corporate/csr/apac/eng/education/countries/vn/346679.htm
[20]SRI International and EDC/Center for Children and Technology. 2007. Evaluation Summary: Intel Teach and Intel Learn. http://wenku.baidu.com/view/ff4d29d1240c844769eaee2f.html

Laurence S'Ting Foundation

In collaboration with the Laurence S'Ting foundation, the ICT department of MOET organized an e-Learning contest for secondary teachers in 2009. In 2012, the contest was held for the second time, with over 9,000 teacher participants. The contest enables teachers to become familiar with e-Learning technology. Additionally, the MOET is putting in an online management and information system (MIS), replacing the current desktop-based system.

Analysis and conclusions

The Vietnamese government is seeking to develop an information society, digitalizing communications and making electronic conferencing a mainstay of organizational life.[21] To meet these goals, the Vietnamese government has promised 8.4 billion USD in ICT investment between 2010 and 2022, as well as favourable licensing and business support for companies developing Viet Nam's IT capabilities.[22]

Much of the Vietnamese ICT landscape remains in the basic development stage. While meeting national targets, the number of personal computers remains low with only 5.61 computers per 100 people. While all schools have Internet access, only 12.5 percent of households have a computer, and only 12 percent of households have an Internet connection at home.[23] Viet Nam's relatively low ICT penetration in the general population indicates that it is unlikely that a substantial market for advanced ICT applications will develop in the short term. The IT sector has grown at around 16 percent per year since 2008, however, and is projected to reach a value of 4.1 billion USD per year in 2015.[24]

Viet Nam's MOET has laid out the following criteria for new ODA programmes relating to ICT in Education: They must use the latest technology; must contain open-source software; and should utilize English directly, not translations. Programmes adhering to these criteria have a higher likelihood of success. Providing advanced services could be a means to gain experience and develop a solid working relationship with the MOET. The MOET encourages the establishment of "education institutions with 100 percent foreign capital or joint ventures with Vietnamese partners in higher

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[21] Vietnam Institute for Education Sciences and VVOB. 2009.
[22] Business Monitor International. 2011. Vietnam ICT Review 2011.
http://www.agentschapnl.nl/onderwerp/vietnam-ict-kwartaal-ii-2011
[23] Report on Information and Communication Technology Infrastructure. 2010.
[24] Business Monitor International. 2011.

education, vocational training, [and] distance education".[25] One model could be seen in the experience of Intel. After partnering with MOET for numerous training programmes, in 2010 Intel announced the opening of a 1 billion USD chip testing and assembly facility in Viet Nam, the biggest such facility for Intel anywhere in the world.[26]

The success of Intel, Viettel, and other industry partners shows that the MOET is actively engaged in promoting ICT implementation and training. Thus, given the extraordinary growth rate of the ICT sector over the past decade, there could be substantial opportunities for investment by companies, universities and non-profit groups interested in working with Vietnamese schools in the near future.

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[25] MOET. 2006. Solutions for Education Development. http://en.moet.gov.vn/?page=6.4&view=3461
[26] PC World. 2010. Intel Opens US$1 Billion Chip Factory in Vietnam.
http://www.pcworld.com/businesscenter/article/209161/intel_opens_us1_billion_chip_factory_in_vietnam.html

PART B:

The Readiness of Advanced Technology in Education

in Indonesia, Malaysia and Singapore

Malaysia
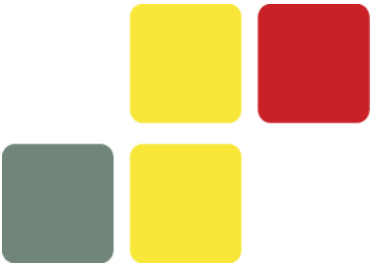
Under the theme "Turning Ripples into Tidal Waves", the 1996 National Information Technology Agenda envisioned the transformation of Malaysia into a values-based knowledge society by 2020. This vision requires a technologically literate workforce to sustain productivity growth. The 1996 launch of the Multimedia Super Corridor provided support for over 200 technical parks and incubation zones.[1] Malaysia's telecommunications infrastructure is now second only to Singapore in South-East Asia.[2] The combination of long-term planning, collaboration with the private sector and willingness to experiment indicates that Malaysia has the potential to utilize advanced technologies in the education sector.

Policy environment

Key government actors

The Ministry of Education (MOE) establishes specifications and guidelines for the installation and use of ICT in education in Malaysia at the pre-school, primary, secondary and post-secondary levels, while the Ministry of Higher Education is responsible for tertiary education. The Multimedia Development Corporation (MDeC), a private entity funded by the Malaysian government to implement MSC Malaysia,[3] manages industry contracts and collaboration between the private sector and government organizations.[4]

The MDeC is responsible for guaranteeing that new Smart Schools have access to the technology infrastructure necessary to meet MOE specifications and guidelines. Furthermore, the MDeC provides professional development and training to teachers and administrators to help them integrate new technology into their daily lives. Teachers and administrators are trained in using learning content management systems (LCMS), custom courseware, school Intranet and website maintenance.

Industry partners

In 1999 MDeC partnered with Telekom Smart Schools, a consortium of private companies headed by Telekom Malaysia,[5] the largest DSL and telecom provider in

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[1] Malaysian Industrial Development Authority. 2011. Invest in Malaysia.
http://www.mida.gov.my/env3/index.php?page=industrial-land
[2] American University ICT Database. 2004. Malaysian Telecom Overview.
http://www1.american.edu/initeb/ym6974a/telecom.htm
[3] Multimedia Development Corporation. http://www.mdec.my/ (Accessed 2011)
[4] Multimedia Development Corporation Mission http://www.mdec.my/about_mission.php (Accessed 2011)
[5] MDeC. 2007. Principal Stakeholders. http://www.msc.com.my/smartschool/overview/stakeholder.asp

Malaysia.[6] This partnership was designed to bring together infrastructure providers, technology companies and content developers to customize the Malaysian Smart Schools programme. In 2011, Telekom Malaysia sold its majority share, citing the completion of its investment goals.

Policies related to ICT in Education

Smart Schools Initiative
The Smart Schools initiative integrated ICT into classroom learning, administration and students' daily lives. The programme progressed in three phases:

- 1999-2002: Pilot 87 Smart Schools
- 2002-2005: Consolidate Smart School Principles
- 2005-2010: Implement Smart Schools in 10,000 Malaysian Schools

A planned fourth phase, Consolidate and Stabilize: Technology enables teaching and learning (2010-2020),[7] was made obsolete with the advent of the Education Blueprint 2013-2025.

Education Blueprint 2013-2025
In October 2011, the Ministry of Education launched a comprehensive review of the education system in Malaysia. The report found strong improvements in universal access and literacy, as well as a system wide commitment to developing students holistically. Consistent low rankings in Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA) exams provided reason for concern, however, particularly as Malaysia lagged behind countries with similar or lower levels of expenditure per student.

The review process preceding the formation of the Blueprint provided the space necessary for Malaysia to confront the shortcomings of previous policies regarding ICT in Education. Despite the massive expenditure relating to the Smart Schools initiative, the review found that 80 percent of teachers used ICT less than one hour per week, with most ICT usage for instruction being limited to the use of word processing applications.

Of the eleven policy "shifts" identified in the Education Blueprint as being critical to building a better education system, one was to "leverage ICT to scale up quality learning across Malaysia". The Blueprint defined the successful implementation of this shift as follows.

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[6] Telecommunication Services http://www.mida.gov.my/en_v3/index.php?page=telecommunication-services. "The Malaysian government holds a 30 percent ownership share in Telekom Malaysia. TM Shareholding Structure". http://www.archive.org/stream/TmShareholdingStructure/tmshareholding2007nov30#page/n0/mode/2up
[7] MSC Malaysia. 2011. Smart Schools. http://www.mscmalaysia.my/topic/About+Smart+School

Across all 10,000 schools in Malaysia, ICT will enhance how teaching and learning happens. Students will be able to access a wider range of content that is more engaging and interactive. They will be able to learn some lessons at their own pace, and will have fewer limitations in what they choose to study through distance-learning programmes. Teachers and principals will have access to both national and international learning resources and communities to help them improve their practice. ICT will be a ubiquitous part of schooling life, with no urban-rural divide, and with all teachers and students equipped with the skills necessary to use this technology meaningfully.[8]

The following implementation steps were laid out in the Blueprint:
- Provide Internet access and virtual learning environments via 1BestariNet for all 10,000 schools by 2013.
- Augment online content to share best practices, starting with a video library in 2013 of "Excellent Teachers" delivering lessons in science, mathematics, Bahasa Malaysia and the English language.
- Maximize use of ICT for distance and self-paced learning to expand access to high-quality teaching regardless of location or student skill level.

ICT in primary and secondary schools

Teaching and learning resources

The Educational Technology Division (ETD) of the MOE has produced thousands of web-based teaching and learning materials. In 2008, the MOE instituted a series of online and streaming videos known as EduWeb TV. The curriculum and interactive channels are designed on the basis of national curriculum. The curriculum channel, with 497 separate learning videos, covers seven subjects for primary schools and 13 subjects for secondary schools.[9]

The interactive channel has 130 learning videos to help students prepare for the Lower Secondary Assessment and the Malaysian Certificate of Education. The fast Internet connections provided to all Malaysian schools enabled EduWebTV.com to enhance educational access for both rural and urban schools.

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[8]MOE Malaysia. 2012. *Education Blueprint 2013-2025*. http://www.moe.gov.my/userfiles/file/PPP/Preliminary-Blueprint-ExecSummary-Eng.pdf

[9] The primary school videos comprise English, Malay, Mathematics, Civics, Islamic Education, Morals, and Science. The secondary school videos add History, Physics, Geography, Living Skills, Career Development and general subjects.

Despite the wealth of titles available, evaluations conducted in 2010 revealed concerns with EduWeb TV.[10] Panels of video production experts, educational specialists and students gave low ratings for both the video quality and learning potential.

School Resource Centres

The MOE established School Resource Centres (SRCs) to support teachers to use various educational resources.[11]

Table 24. Framework of SRC administration (Malaysia)

National Level - Educational Technology Division (ETD), Ministry of Education

State Level - 15 State Educational Technology Divisions (STEDs)

District Level - 367 Teacher Activity Centers (TACs)

School Level - 9,844 School Resource Centers (SRCs)
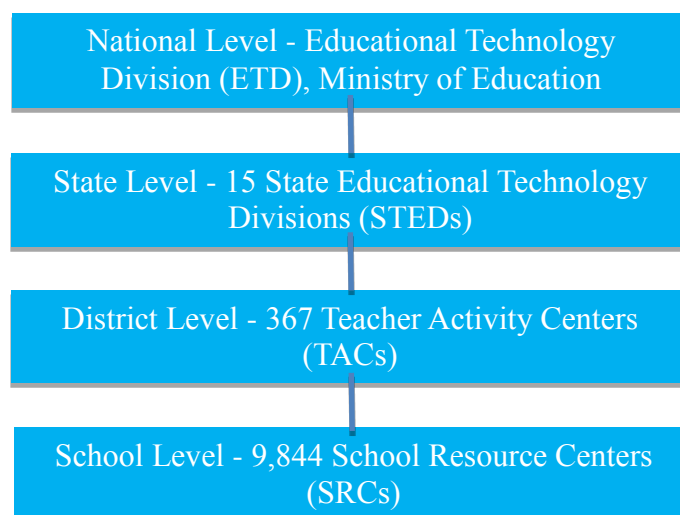
As of 2012, 3.1 million primary school students and 2.3 million secondary school students use the educational resources of SRCs. Each SRC is composed of three rooms: reading, audio-visual and teaching–learning materials. Full-time teacher librarians teach six to eight periods per week and spend 18 to 20 hours per week managing the SRC.

1BestariNet

The most recent programme focusing on providing equitable access to learning resources, the 1BestariNet, provides all teachers, students and parents nationwide with personalized login IDs for a cloud-based virtual learning environment (VLE). Under the 1BestariNet programme, every school will be equipped with high speed Internet via 4G technology, with coverage expected to extend into the local communities. A Malaysian company, YTL Communications, received the contract to develop the infrastructure and host the VLE.

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[10] Abdullah, M. N. L. Y., Fook, F. S. and O Lan, S. 2010. An Evaluation of Instructional Videos in EDUWEBTV: Technical Qualities, Pedagogical Aspects, Engagement and Perceived Impact on Learning. *Malaysian Journal of Educational Technology*, 10 (2): 101-113.

[11] Zainudin, F. and Ismail, K. 2010. Measuring Malaysia school resource centers' standards through iQ-PSS: An online management information system.
http://bibliografi.moe.edu.my/sumberpendidikan/index.php/schoolresourcecentres/67-laporan-kajian/86-school-resource-centers-quick-facts.html

The MOE selected the Frog Virtual Learning Environment (VLE), which is a UK-designed application created to ease lesson plan development, facilitate administrative tasks and allow students to access learning resources independently. FrogAsia has trained 671 MOE delegates on the use of the VLE, following which the MOE then trained all schools. The VLE is set to be used as the main site for teacher professional development.

ICT infrastructure provision

School Access Centres and Computer Lab Project
Malaysia has undertaken several initiatives to reduce digital divides among schools. The 2007 Computer Lab Project outfitted 6,636 schools with full laboratories. The 2006 School Access programme[12] targeted after-school computer use. A total of 155,516 computers were installed in 3,029 schools, two-thirds of which were in rural areas.

Teaching of Mathematics and Science in English
Substantial ICT resources were distributed under the Teaching of Mathematics and Science in English (PPSMI) programme,[13] which aimed at increasing English language proficiency through English-based mathematics and science classes. The programme provided schools with 132,649 laptops, 78,333 LCD projectors, 67,439 screens, 63,254 mobile trolleys and 9,662 printers, and trained over 200,000 teachers in basic ICT skills and the integration of ICT into teaching and learning activities. With the hefty cost of the programme, PPSMI is currently optional, depending on school demand.

Education management
The MOE has provided several Internet-based applications to manage education-related processes and ensure quality and standardization of ICT usage. As recommended by the 2011 UNESCO Review, the MOE is implementing a single log-on system, Sistem Pengurusan Sekolah (SPS). The applications listed in the table below will be integrated into the SPS by the end of 2013.

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[12] Ministry of Education. 2009. *Report on the Implementation of Access Centre*. Putrajaya, Malaysia: Ministry of Education Malaysia.
[13] Hassan, S. 2007. *Integrating ICT in teaching and learning: Country report*: Malaysia.
http://www.scribd.com/doc/19335654/ICT-in-Malaysia.

Table 25. Education-management applications (Malaysia)

Application	Scope	Users
EMIS	To manage the collection of educational data at the school level	School Data Teachers
e-Gtukar	To manage teacher transfers	Teachers
e-Disiplin	To manage student discipline	State/District, Education Offices, Teachers
Adu Disiplin	To manage complaints on student discipline	Teachers
e-Perlu	To manage collation of school's operational data	Teachers
Sistem Pengurusan Peperiksaan Atas Talian	To facilitate SPM registration and school-based scores (coursework, oral assessment, and trial examinations)	Teachers, Examination Coordinators
SSQS	To rank schools according to Smart School Qualification Standards	Administrators, Teachers, IT Coordinators, Students
STS	To manage and report on school's ICT issues	Teachers
SPPICT	To monitor ICT usage in schools	Teachers
IQ-PSS	To rank SRCs according to required indicators	Teacher-Librarians/ Media Teachers

Smart School Qualification Standards

In 2003, Malaysia developed its own set of standards for ICT use in schools. These standards, the Smart School Qualification Standards (SSQS), [14] were designed to encourage the effective integration of ICT into teaching practices throughout the Malaysian education system. The SSQS evaluates schools by key performance indicators (KPIs) across four areas, aiming for every school to rank at least three stars on its five-star ICT ranking scale. [15]

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[14] MSC Malaysia. 2011. Smart Schools. http://www.mscmalaysia.my/topic/About+Smart+School
[15] Malaysia New Center. 2010. 5-Star Schools by 2010 http://newscentre.msc.com.my/articles/719/1/Five-star-schools-by-2010/Page1.html

Table 26. SSQS ranking scale (Malaysia)

Utilization (40 percent of star ranking)	*Human Capital* (40 percent of star ranking)
The extent to which the school makes use of ICT in its operation, management, teaching and learning activities. Examples of KPIs include: • Student-to-PC contact hours • Courseware/ICT-based content integration by teachers for core subjects • Educational TV content and Learning Management System (LMS) usage • Completion of self-learning materials	The competency of end-users in integrating ICT in teaching, learning and/or administration. Examples of KPIs are: • ICT competencies of coordinators, teachers, and students • Use of ICT in dissemination of information • Use of multimedia in teaching
Applications (10 percent of star ranking)	*Technology Infrastructure* (10 percent of star ranking)
Smart Schools must adopt the various applications provided by the MoE and others. KPIs include: • At least five modules used for school management • MoE courseware are used for teaching • Presence and maintenance of school website	Smart Schools must meet the following minimum infrastructure targets/KPIs: • Computer to Pupil Ratio 1 to 10-14 • Computer to Teacher Ratio 1 to 7-9 • LCD Projectors to Classes 1 to 11-15 • Internet Access 3 locations • Maintenance Every 2 weeks

The ETD is working on SSQS version 2, to be implemented in 2013. The core elements listed in the table above are likely to change to reflect the aims of the Education Blueprint.

ICT Literacy Curriculum

The MOE first made plans to include computer literacy elements in the national curriculum in 2002, recognizing that basic computer skills were essential for the integration of ICT into all levels of education.[16] The ICT Literacy Curriculum (ICTL)

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[16] Ministry of Education, Malaysia. 2000. *Education Development Plan for Malaysia 2001-2010*.
http://planipolis.iiep.unesco.org/upload/Malaysia/Malaysia%20Education%20development%20plan%202001-2010%20summary.pdf

was implemented at the primary level in 2005 and at the secondary level in 2007. The MOE also developed curriculum and teaching guides with ICT standards. Content specifications are detailed according to learning areas, outcomes and suggested activities.[17]

Table 27. ICT Literacy Curriculum (Malaysia)

Primary Stage 1 (Year 1-3)

Enable pupils to:

1) Identify the main parts of a computer system

2) Explain the concept of operating system and computer application

3) Use basic operating system and computer applications

4) Use function keys on a keyboard

5) use basic typing techniques

6) do basic maintenance work

Primary Stage 2 (Year 4-6)

Enable pupils to:

1) Perform steps to maintain the computer system and handle data

2) Use the computer in a proper manner

3) Develop a basic webpage

4) Carry out internet activities

5) Abide by and practice netiquette and copyright policy.

Secondary Form 1 and 2

Enable pupils to:

1) Acquire and apply ICT knowledge and skills creatively to assist them in their daily life

2) Share ideas and information among themselves within and beyond the school environment

3) Demonstrate responsibility and accountability towards ICT infrastructure and its use.

The ICTL Primary Schools programme comprises 120 hours of instruction per year, usually delivered during a three-month block. Given the diversity of secondary school timetables within Malaysia, several scheduling alternatives are provided within the MOE curriculum, with two hours per week the most common option.[18] By 2008, the ICTL had been implemented in 92 percent of primary schools and 97 percent of secondary schools.[19]

In late 2005, the MOE and Microsoft Malaysia conducted an assessment of 1,647 primary Year 1 students. The students demonstrated basic recognition of computer hardware and software, fulfilling learning objectives for that age group. However, the assessment found low levels of ability in typing, voice recording and drawing activities,[20] possibly indicating an asynchronous relationship between enacting and meeting ICTL standards.

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[17] The Malaysian Experience.

[18] Curriculum Development Center. 2007. *ICT Literacy for Secondary School Guideline*. Putrajaya, Malaysia: Ministry of Education Malaysia. Available at http://www.smksgpusu.net/ict/ictl_guideline_2007.pdf

[19] The Malaysian Experience.

[20] The Malaysian Experience.

ICT in higher education

In 2007, the state of ICT in the Malaysian higher education institutes was weak at best. Great variation existed in ICT infrastructure, with low availability of computers for students and provision of wireless networks. ICT was not widely used to facilitate communications, student assessments, or information storage. ICT training courses were limited, and technical support services were insufficient at a number of the colleges. Most problematic was the scarcity of access to online journals and databases.[21]

In response, the MOHE set a series of initiatives to ensure that Malaysian higher education was equipped to meet the human resource needs of the 21st century. The 2010 MOHE Implementation Plan for Development of Innovative Human Capital at Tertiary Level (IPDIHC) sets a priority on implementing fast broadband capabilities campus-wide to support efforts for development, teaching, research and global collaboration.

Table 28. Specific IPDIHC targets (Malaysia)[22]

KPI/Milestone	Year
Use ICT in operational matters throughout higher education institutions	2013
Ensure 10% of campus areas are Wi-Fi accessible	2012
Update 80% of campus-wide ICT facilities with hardware and software	2012
Ensure 80% of campuses have high broadband connectivity	2013
Achieve 70% broadband accessibility on-and-off campus	2012-2015
Achieve 100% mobile connectivity	2012
MOHE attends 2 international ICT conferences annually	2011

Notably, these targets set responsibilities for several governmental agencies, including the Ministry of Information Communication and Culture, the Malaysian Communication and Multimedia Commission, and the Ministry of Science, Technology and Innovation. The inclusion of these bodies demonstrates both the priority placed on innovation in higher education and the necessity of collaboration for successful policy implementation.

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[21] Shamsul Anuar Mokhtar, Rose Alinda Alias and Azizah Abdul Rahman
2007, Universiti Teknologi Malaysia, Malaysia Academic computing at Malaysian colleges. *International Journal of Education and Development using Information and Communication Technology*
(IJEDICT), Vol. 3, Issue 2, pp. 30-56.
[22] MOHE. *Implementation Plan.* http://www.mohe.gov.my/portal/images/utama/penerbitan/MOHE%284-1-11%29%20211111.pdf

The MOHE also partnered with domestic and international higher education institutions (HEIs) and ICT companies to deliver professional training programmes. A key component of these programmes includes training Malaysian lecturers in the use of ICT-enhanced pedagogy, as the lecturers are expected to incorporate the knowledge in other courses.[23] Computerized examination systems have been implemented at the Malaysia Certificate of Education (SPM) and Malaysia Higher School Certificate (STPM) levels.

ICT in non-formal learning

E-learning universities

Malaysia has several universities offering blended or hybrid models of virtual education, including the Open University Malaysia, Asia-e-University, Wawasan Open University and United Nations Institute for Training and Research (UNITAR). UNITAR received MSC status recognition in 2001 and, as of 2006, enrolled over 7,500 students annually.[24] Students access lectures either on CD or online, and attend face-to-face tutorials at study centres throughout the country. This model allows UNITAR to partner with several Malaysian colleges to offer several graduate programmes in combination with its regular undergraduate offerings. These schools provide support through an online system of e-mail, forums, bulletin boards, announcements, course management facilities and electronic student records.[25]

E-Learning for the Public Sector

E-Learning for the Public Sector (EPSA) is an e-learning platform built to facilitate public sector training in leadership, management and ICT skills. The EPSA platform is intended to strengthen human resource development initiatives throughout the public sector. Content is shared among training institutions, reducing costs and increasing quality. Users have the ability to access the EPSA at any time, and follow online assessments and progress reports.

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[23]MOHE. *Higher Education Action Plan 2007-2010*
http://planipolis.iiep.unesco.org/upload/Malaysia/Malaysia%20Higher%20education%20action%20plan%202007-2010.pdf
[24]Peng and Samah. 2006. Measuring Students Satisfaction for Quality Education in a e-Learning University.
UNITAR E-JOURNAL Vol. 2, No. 1, January 2006 . http://myais.fsktm.um.edu.my/8148/1/ainon%27s.pdf
[25]Susan D'Antoni. 2006. The Virtual University
http://www.unesco.org/iiep/virtualuniversity/media/document/Ch4_UNITAR_Alhabshi.pdf

Research and development relating to ICT in Education

Government support for development of advanced ICT

Most research and development activities are self-funded by the MOE and the MOHE. Although limited, the MDeC provides some funding towards the development of new research, technology, and content.[26] The Telekom Smart Schools have used these grants to custom build most of the content and management systems used in the Smart Schools. In particular, the Technopeneur Development Division looks to provide seed funding not only for businesses, but also for entrepreneurs graduating from Malaysian universities.[27]

The MDeC provides multiple avenues of funding for local Malaysian businesses to improve ICT, with the stated goals as follows.

- Establish vibrant research and development (R&D) activities by local companies, leading to innovative ICT/multimedia products that have significant commercial potential.
- Increase the creation of Intellectual Property (IP) that facilitates global competition.
- Strengthen the R&D capabilities of Malaysian knowledge workers.[28]

In general, Malaysia favours developing local talent and companies rather than importing international solutions.[29] While there is no official funding available for foreign researchers, there are cases where the use of a local partner has allowed internationally-based companies to receive substantial MDeC funding.

Techno-entrepreneurship in Malaysia

As part of the goals of fostering innovation in the three "Technology Focus Areas", the NICT has made a commitment to promoting techno-entrepreneurship, including the following.

- Provision of techno-entrepreneurship courses and annual competitions for university students.
- Amendments to university service schemes to enable sabbatical leave for staff to commercialize research findings.
- Establishing and encouraging venture capital and credit guarantee schemes to support formation of new technology based firms.[30]

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[26] MSCMalaysia. 2011. R&D Grant Scheme. www.mscmalaysia.my/topic/R&D+Grant+Scheme
[27] http://www.technopreneurdevelopment.net.my/cms/AllProduct.asp?CatID=123
[28] Ibid
[29] Zainudin, F. and Ismail, K. 2010. op cit.
[30] NICT Malaysia. 2012. Science and Technology Policy. http://www.nitc.my/index.cfm?&menuid=67

The NICT has also recommended incentivizing public schools and HEIs to develop curricula that use virtual learning environments.

R-Learning in Malaysia

Malaysia has shown interest in using robotics tools in its classrooms. Between 2007 and 2010 Malaysia piloted multiple robot-assisted secondary school programmes to enhance teaching of STEM (Science, Technology, Engineering, and Mathematics) subjects. [31] Malaysia also hosted the World Robotics Competition in 2012. While Malaysia has not yet piloted robot-assisted learning in language classes, there is some precedent for computer assisted language learning (CALL):

- The Globalization and Localization in Computer Assisted Language Learning (GLoCALL) Conference 2010 was hosted by the University of Malaysia Sabah.
- The president of the Asia-Pacific Association for Computer-Assisted Language Learning (APACALL), Jeong-Bae Son, was invited to speak on the topic of online language learning at Malaysian universities several times throughout 2009-2010.[32]
- In 2010, Malaysian academics examined the applicability of advanced ICT in language learning.[33]

Official Development Assistance

Official Development Assistance to Malaysia has fallen drastically in recent years, as a consequence of the country's move to middle-income status and the scarcity of aid dollars following the 2008 economic crisis. The aid provided goes overwhelmingly to scholarship grants for study abroad. Given these trends, it is highly doubtful that Malaysia's education sector can rely on consistent ODA for funding new advances.

[31]Robotics Learning. http://www.myroboticslearning.com/
[32]Son, J. 2011. Invited Speeches http://www.usq.edu.au/users/sonjb/research.html
[33] Hafizoah Kassim and Zuraina Ali. 2007. The Use of ICT in the Implementation of Student-Centered Learning Internet Journal of e-Language Learning and Teaching http://myais.fsktm.um.edu.my/10457/1/HafizoahKassim.pdf

Table 29. Country information Malaysia)[34]

	2009	2010	2011
Population (million)	27.95	28.40	28.86
GNI per capita (Atlas USD)	7230.00	7760.00	8420.00
Net ODA (USD million)	142.96	2.06	30.64
Bilateral share (gross ODA)	96.54%	91.82%	95.02%
Net ODA / GNI	0.08%	0.00%	0.01%
Net Private flows (USD	5236.02	6540.21	6996.16

Table 30. Top 10 donors (2010-2011 average) (Malaysia) [35]

Overall (USD millions)		Education Sector (USD millions)	
Japan	168.29	Japan	25.32
United States	14.47	Germany	9.49
Germany	11.01	France	3.56
France	7.36	Korea	1.01
United Kingdom	5.70	United Kingdom	0.89
GEF	5.05	EU Institutions	0.11
UNHCR	5.02	Finland	0.09
Australia	2.90	Austria	0.08
Korea	1.79	Spain	0.06
EU Institutions	1.36	Italy	0.05

Table 31. ODA by sector (2010-2011 average) (Malaysia)
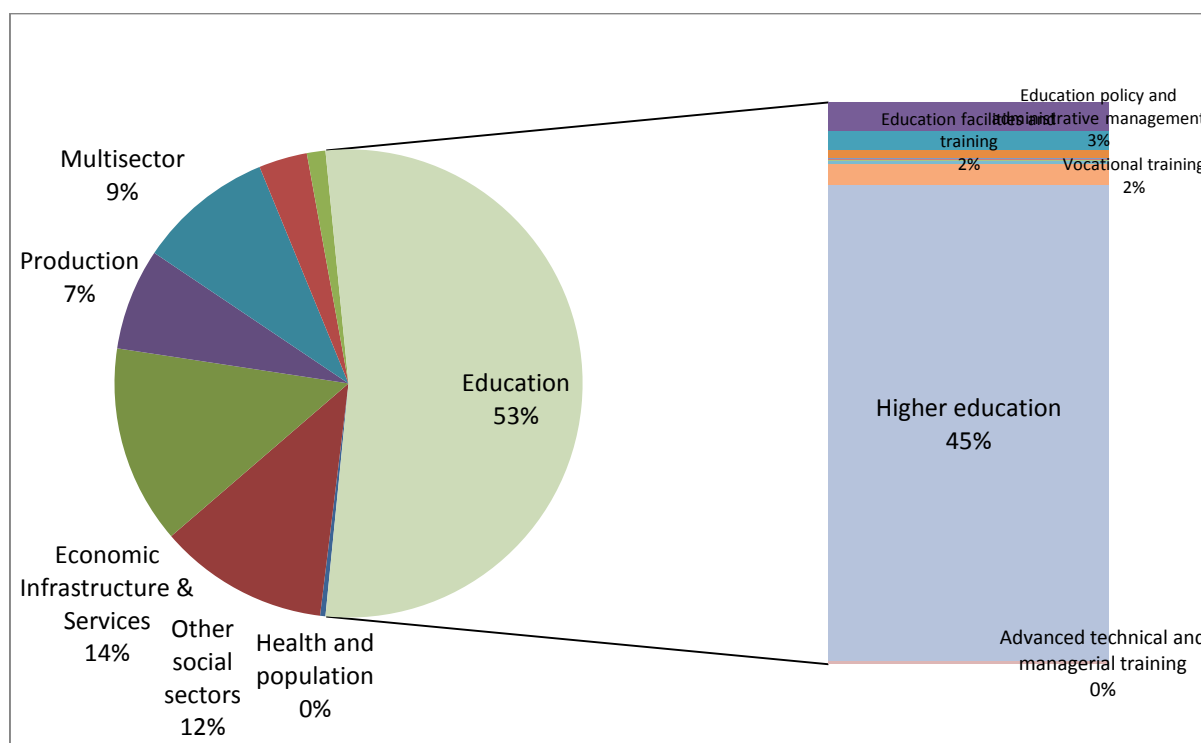
Source: OECD statistical databases

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[34] World Bank, UNESCAP, and OECD statistical databases.
[35] OECD statistical databases.

ODA programmes and projects for ICT in Education

Japan International Cooperation Agency

Japan has been far and away the most prolific donor to Malaysia, though, as with other nations, this support has diminished as Malaysia's economy has grown. Between 2001 and 2005, the Japan International Cooperation Agency (JICA) [36] conducted the "Networked Multimedia Education System" project, aiming to establish a Networked Multimedia Education System (NMES) at Malaysia's Multimedia University (MMU) and five regional education institutions. JICA improved the NMES to enable MMU and the five regional institutions to provide online courses and multimedia-based learning resources.

The World Bank

In response to the 1997 Asian Financial Crisis, the World Bank undertook a 244 million USD project titled "Education Sector Support" in Malaysia in the early 2000s.[37] The overall objective of the project was to mitigate the negative impact of the economic crisis on the education sector and to enhance students' technical skills. Through extensive support, this project led to the improvement and expansion of Malaysia's Education Management Information System (EMIS).

UNESCO

Malaysia has been part of UNESCO's SchoolNet projects for the Asia-Pacific region since 2004[38] and has also participated in workshops focusing on enabling policy makers and planners to establish ICT in Education policies and strategies[39] and on facilitating effective ICT-pedagogy integration.[40]

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[36] JICA. Evaluation Summary.
http://www.jica.go.jp/english/operations/evaluation/tech_and_grant/project/term/asia/2005/ma_01.pdf
[37] World Bank. 2005. *Implementation and completion report*. http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2005/06/17/000160016_20050617104451/Rendered/PDF/31811.pdf
[38] UNESCO. Project Description. http://www.unescobkk.org/education/ict/ict-in-education-projects/teaching-and-learning/unesco-schoolnet-project/project-description/
[39] UNESCO.2007. ICT in Education Toolkit Workshop, Malaysia, 25–29 June 2007. http://www.unescobkk.org/?id=6786.
[40] UNESCO. Facilitating Effective ICT-Pedagogy Integration Project. http://www.unescobkk.org/education/ict/ict-in-education-projects/training-of-teachers/facilitating-ict-pedagogy/.

Analysis and conclusions

Malaysia has a strong history of forward-thinking policies and has clearly recognized the benefits of utilizing ICT to enhance the reach and quality of education and of strengthening the country's IT sector.

The MOE has proven remarkably astute in integrating monitoring and evaluation systems in schools and using the findings to drive planning. Impact assessments conducted by the MOE have been based on the SSQS, showing significant differences between Smart Schools and Non-Smart Schools in creativity perception, critical thinking, integrated science processes and ICT knowledge. [41] Advanced learning technologies, including robotic-learning, need to be integrated into these ranking systems if they are to be successfully implemented.

The Smart Schools initiative exemplifies Malaysia's ICT in Education policy, especially in the maintenance of infrastructure and use of school rankings. However, the implementation of the Smart Schools initiative and the ranking standards have not resulted in improvements in learning outcomes, as measured by the PISA and TIMSS studies. The main value of the SSQS and iQ-PSS lie in their use in implementing improvements to the Malaysian education system, rather than to learning outcomes.

Successes realized to date in Malaysia in the use of ICT in Education have been in the "low-hanging fruit" of basic ICT literacy and infrastructure provision. The solutions developed for these problems have involved resource allocation and training, admirably implemented and monitored through the SSQS and iQ-PSS. To move beyond ICT literacy into ICT creativity and towards building a "techno-entrepreneurial" society will require a culture of experimentation, particularly within higher education.

While the programmes implemented during the last five years provide a measure of hope for the upgrading of Malaysian HEIs, it appears that progress has generally been more substantial at the primary and secondary levels. As Malaysia continues to develop into a knowledge-based economy, it will be essential for more developments to take place at the university level.

Malaysia has transformed itself from a primary commodity producer to an exporter of higher value products. This export-oriented development has made the country extremely susceptible to shocks in the global economy. Following the 2008 global

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[41] MDec/MOE. 2009. *Study on Outcomes and Characteristics of Students from Smart Schools and Non Smart Schools.*
http://www.mscmalaysia.my/codenavia/portals/msc/images/img/rakyat/empower_your_life/empowering_learning/OutcomeStudy.pdf

financial crisis, Malaysia experienced a recession as demand for its exports dropped. In response, the Malaysian government enacted a massive fiscal stimulus package, equal to 10 percent of GDP. While this package has been effective in restoring economic growth, the domestic debt burden has been increased by the extensive subsidies and transfer programmes.[42]

Given this fiscal situation, investments in advanced and experimental educational technologies within Malaysia may require outside funding. Though some funds are in place for research links in higher education, it is highly unlikely that funding of the scope needed will come from ODA. Malaysia is open to foreign investment and has a generally conducive atmosphere for conducting business. Therefore, proposals for projects utilizing advanced educational technologies are likely to be successful in Malaysia.

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[42] IHS Global Insight. 2012. *Malaysia: Country Report*

Indonesia

The 1999 "Big Bang" decentralization of government in Indonesia went hand-in-hand with sweeping reforms of telecommunications laws. Relaxations of traditional state monopolies and of private investment in communications infrastructure were followed by a wave of mergers and acquisitions in the early 2000s.[1]

There is a huge digital divide in the east and west parts of the country, and between the big cities and rural villages. While mobile phone coverage of Indonesia's 17,000 islands has reached 90 percent, providing Indonesia's 232 million people with access to the Internet, particularly in remote areas, has proved more challenging.

The lack of a comprehensive fibre-optic network to serve as backbone for services is a major issue. The Indonesian Telecommunications Regulatory Authority (BRTI) has plans to connect all of Indonesia to the Internet by 2015.[2] A long-proposed initiative is the Palapa Ring Project,[3] which would link the islands with over 50,000 km of fibre optic cable.[4] Funding issues have slowed the implementation of the project. The Indonesian government had been restricted from making investments favourable to the telecommunication industry, causing the withdrawal of several companies from the project consortium.[5] The government is, however, committed to tapping its ICT fund to see it through.[6]

Policy environment

The Ministry of National Education of Indonesia (MoNE) oversees education in Indonesia. Within the MoNE, the National Education Standards Agency (BSNP) is responsible for setting ICT-related competency standards. The PusTekKom unit is responsible for the use of ICT in education in the country. Its website publishes training modules for educators on integrating ICT into classrooms and downloadable learning materials.[7] PusTekKom also manages the National Education Network (JarDikNas).[8]

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[1] Ken Zita. 2005. Indonesia Telecom Brief. http://www.ndaventures.com/Indonesia_Telecom_Brief.pdf
[2] Asia Pacific FuturGov. 2010. Indonesia Reveals Plans to Bridge Digital Divide.
http://www.futuregov.asia/articles/2010/may/13/indonesia-reveals-plans-bridge-digital-divide/
[3] Muhammad Iqbal and Rio Simanjuntak. 2011. ICT Fund to be included in 2012 State Budget.
http://en.indonesiafinancetoday.com/read/4228/ICT-Fund-to-be-Included-in-2012-State-Budget
[4] Ratri Adityarani. 2011. Every District in Indonesia Will Be On the Net by June 2011.
http://www.penn-olson.com/2011/05/23/every-district-indonesia-june/
[5] Chanuka Wattegama and Juni Soehardjo. 2011. ICT Sector Performance Review for Indonesia. LIRNEasia's Sector Performance Review (SPR)/Telecom Regulatory Environment. http://lirneasia.net/wp-content/uploads/2010/07/ID_SPR_WattegamaSoehardo_JakartaEvent.pdf
[6] Oleh Surya Mahendra Saputra 2011. Financing for Palapa Ring to complete this year. *Bisnis Indonesia* http://en.bisnis.com/articles/financing-for-palapa-ring-to-complete-this-year
[7] E-dukasi.net. 2011. Bahan Pelajaran Edukasi.net. www.e-dukasi.net
[8] International Development Research Centre. *Digital Review of Asia Pacific 2009-2010*. Indonesia, pp. 206-207.

The Indonesian National ICT Council (DeTIKNas) was established in 2006. Its vision is to accelerate ICT growth through policies that would synchronize the ICT programmes of all government departments, ministries and units.[9] The Ministry of Communication and Information Technology (MCIT) is responsible for national policy formulation, policy implementation, including technical policies in the field of communication and informatics, encompassing the postal, telecommunications, broadcasting, information technology and communications, and multimedia services, and the dissemination of information.[10]

The government also partners with the private sector and with educational institutions, including Telekomunikasi Indonesia (Telkom), Intel, Microsoft, UNESCO and SEAMEO, to increase the penetration of ICT in education.

Policies related to ICT in Education

Five-Year Action Plan for the Development and Implementation of ICT in Indonesia
Announced in 2001, this Action Plan contained the following steps for implementation of ICT in education:

- Develop ICT networks for public and private universities as well as research and education networks in Indonesia.
- Use ICT as an essential part of the curricula and learning tools in schools/universities and training centres.
- Establish distance education programmes, including participation in Global Development Learning and other networks.
- Facilitate the use of Internet for more efficient teaching and learning.[11]

ICT in primary and secondary schools

Teaching and learning resources

Education Television
Launched in October 2004, Televisi Edukasi (TVE)[12] was created with the objective of providing high quality programmes to support the national education goals. Owned by

[9] DeTIKNas. 2010. Tentang Kami. http://www.detiknas.org/index.php/home/page/2/1/about-us/
[10] Asian Development Bank. 2011. *ICT Development in Indonesia*. http://www.adb.org/ICT/ino-ictdev.asp
[11] Indonesian Telematics Coordinating Team. 2001. Five-Year Action Plan for the Development and Implementation of information and Communication Technologies in Indonesia. http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan002101.pdf
[12] TVE. 2011. Televisi Edukasi. http://tve.kemdiknas.go.id/

the MoNE, TVE works together with the TVRI, Telkom, local TV stations, cable TV operators and local governments. [13] With the motto "Santun dan Mencerdaskan" (Courteous and Nourishing), TV Edukasi is dedicated exclusively to education, providing learning sources and media for students, teachers and community members. TVE broadcasts educational programmes 24 hours a day for formal education (from kindergarten to university, teacher certification, open university), informal education (drama and non-drama, quiz, documentary), non-formal education (citizen education, training lessons), and education information (news and policies from the MoNE).[14]

TV Edukasi Streaming is an alternative service that can be used by communities to access TVE's broadcasts online. Following trial broadcasts by the MoNE, TVE Streaming was officially launched in 2012 and can be accessed at tve.kemdikbud.go.id.

Electronic School Book

Buku Sekolah Elektronik (BSE) is an initiative launched by the MoNE with the aim of providing standardized, high-quality, affordable and easy-to-access school textbooks. The MoNE has purchased the copyrights of textbooks and made them downloadable for free.[15] The objectives of BSE are to provide alternative learning resources and stimulate creative thinking. In 2010, Hewlett Packard (HP) and the MoNE signed a memorandum of understanding related to BSE. Under this programme, each school will receive a computer and printer package that can be used for downloading and printing electronic school books.[16] The BSE may be copied, printed and sold at only 15 percent mark-up and without royalty fees, in order to facilitate widespread dissemination.

Rumah Belajar

The Rumah Belajar [17] project was funded by the MoNE to provide Internet-based learning materials for junior secondary, general senior secondary and vocational secondary school students in a number of subjects, including mathematics, physics, chemistry, biology, electronics and information technology. As well as providing learning materials, the Rumah Belajar portal also provides facilities for communication and interaction between members of the educational community, such as a community

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[13] TVE. 2008. Saluran TVE.
http://tve.kemdiknas.go.id/index.php?option=com_content&view=article&id=40%3Asaluaran-tve&catid=35&Itemid=29

[14] TVE. 2011. Latar Belakang.
http://tve.kemdiknas.go.id/index.php?option=com_content&view=article&id=47&Itemid=29

[15] BSE – Buku Sekolah Elektronik. 2011. Latar Belakang, Visi dan Misi, Tujuan.
http://bse.kemdiknas.go.id/index.php?option=com_content&view=article&id=4&Itemid=28

[16] ITPopular. 2010. HP Provide Indonesian Electronic School Book. http://itpopular.com/267/

[17] Rumah Belajar. 2012. http://belajar.kemdikbud.go.id/

activity forum, a question bank and a learning media catalogue. Rumah Belajar is an improvement from previous Internet-based learning products provided by the MoEC, previously known as edukasi.net.

ICT infrastructure provision

School conditions in Indonesia are quite diverse in terms of students' economic backgrounds and teachers' abilities. More affluent schools can afford to buy computers and equip them with Internet and other supporting learning media. On the other hand, poor schools or schools in rural areas struggle to get even basic infrastructure.

The MoNE has implemented the following programmes to develop ICT infrastructure.[18]

ICT block grants for secondary schools
In 2002 and 2003 the MoNE provided 4,179 USD per school for 174 schools throughout the country to enable the schools to procure computer facilities.

High School 2000
The MoNE collaborated with the Indonesia Internet Service Provider Association to connect senior secondary schools to the Internet through the development of an educational portal. By March 2002, about 1,800 high schools had been provided with Internet connections.

Wide Area Network City
The Wide Area Network City (WAN-City) project built wireless-based connection among schools in 30 cities, with funding from the MoNE and participating schools. The WAN-City serves as a distance library, a medium for teleconferencing and as access to the Internet through which all the schools will have a space for developing and hosting their own websites.

One School One Computer Laboratory
In 2003, the Ministry of Communication and Information Technology launched the One School One Computer Laboratory (OSOCL) programme to address the digital divide between rural and urban schools. A total of 30 schools were encouraged to build

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[18] Tian Belawati. 2005. Indonesia – ICT Use in Education.
www.unescobkk.org/fileadmin/user_upload/ict/Metasurvey/indonesia.pdf

computer laboratories.[19] Assistance was provided from Microsoft Indonesia in the form of free and low-cost used computers, operating system and applications, Telkom (Internet access) and PusTekKom (basic learning content).

The evaluation of the OSOCL programme showed that providing equipment, Internet access and learning content was not sufficient for the ICT to be of value to students. Teachers required proper training to be able to implement ICT in lessons, and schools required learning software. The evaluation also found that decisions in implementation (selecting schools, areas, etc) should be based on input made by stakeholders, as opposed to being justified by empirical data. Many parties, particularly in the private sector, wanted to take part in future such projects. Unfortunately, the OSOCL programme was not continued beyond the initial pilot.

Speedy Schoolnet

The Jardiknas School Zone, also called Schoolnet Indonesia, is a national-scale Wide Area Network (WAN) that provides the transfer of information and communication among more than 20,000 schools throughout Indonesia. Jardiknas facilitates both administrative communications as well as learning processes in primary, junior high and senior high schools.[20] To support the programme, in 2009 Telekomunikasi Indonesia (Telkom) launched the Speedy SchoolNet programme, a low-budget, high-speed Internet access service for the education community. Telkom, together with the Industry and Business Incubator of Bandung Institute of Technology (ITB), has provided learning content for SchoolNet. Called Indismart, the content is available online, with learning materials for elementary through to high school level, in various disciplines.[21]

Teacher training

Intel®Teach Indonesia

Intel® Teach is a professional development programme that increases K-12 teachers' knowledge and ability in integrating the use of ICT in teaching and learning in the

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[19] Rudy Salahuddin. 2005. One School One Computer Laboratory (OSOL) Program to Address Digital Divide in Indonesia. www.itu.int/osg/spu/ni/wsisbridges/linked.../Rudy_SALAHUDDIN.pdf

[20] Suhartanto, Nugroho and Herdiani. Province Based Design and Simulation of Indonesian Education Grid Topology. *IJCSI International Journal of Computer Science Issues*, Vol. 9, Issue 1, No 2, January 2012. 0814 http://www.ijcsi.org/papers/IJCSI-9-1-2-142-147.pdf

[21] Telkom Indonesia. 2009. TELKOM Organizes National Education Network in Almost 20,000 Schools throughout Indonesia. http://www.telkom.co.id/media-corner/press-release/telkom-organizes-national-education-network-in-almost-20-000-schools-throughout-indonesia.html

classroom. In May 2007, Intel Indonesia signed an MoU with the MoNE to implement the Intel® Teach programme in Indonesia. The programme includes:

- "Getting Started" course to train teachers who lack basic knowledge and skills in the use of ICT.
- "Essential" course to assist teachers in creating student-centreed lesson plans and project-based learning with ICT integration.
- An online interactive training series for teachers called "Intel Teach Elements", which enables teachers to explore 21st century learning concepts, and providing K-12 learning sources and tools on its website.[22]

By the end of 2007, a total of 1,200 "Participant Teachers" had been trained in the Getting Started Course. Since May 2007, a total of 141 "Master Trainers" have been trained in Indonesia. In 2008, JarDIKNas began efforts to integrate the Intel® Teach programme with their own ICT training programme, with an overall target of 11,000 Master Trainers.[23]

Quality management and standardization

National Education Standards
The National Education Standards Agency (BSNP) has developed the following eight National Education Standards (SNPs):[24]

- Learning content standards: This includes the materials and competencies required, i.e. the competency criteria of graduates, specific subject competency, basic frame and structure of the curriculum, load of learning, curriculum within the units of education, academic calendar and learning syllabi that the learners need to complete in every level and type of education.
- Learning process standards: This includes the conduct of learning in a unit of education to achieve the standard of competencies for graduates.
- Teachers and education personnel standards: This includes the pre-service criteria and physical and mental eligibility of teachers and education personnel and in-service education.
- Equipment and infrastructure standards: This covers the minimum criteria for a classroom, library, sport centre/hall, praying room/venue, playing space and

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[22] Intel. 2011. Program Intel® Teach di Indonesia.
http://www.intel.com/cd/corporate/education/apac/ind/teach/teach1/388834.htm
[23] Intel. 2011. Intel® Education – Indonesia.
http://www.intel.com/cd/corporate/csr/apac/eng/education/countries/id/385613.htm
[24] Jalal, Fasli, et al. 2009. Teacher Certification in Indonesia: A strategy for teacher quality improvement. ddp-ext.worldbank.org/EdStats/IDNprwp09c.pdf.

working laboratories, workshop and other learning resources that are needed to support learning, including the use of information and communication technology.

- Education management standards: This relates to the planning, implementation and monitoring of education activities in every unit of education, and at the district, province and national levels to achieve efficiency and effectiveness in the conduct of learning.
- Cost and finance standards (not yet complete): This concerns the component and amount of operational costs of education units in one year.
- Educational assessment and evaluation standards: This is the national education assessment standard on the mechanism, procedure and instruments for assessing learners' outcomes.

The Indicator Framework for Assessing the Achievement of the National Education Standards for the eight SNPs are being developed by the BSNP.

ICT in higher and vocational education

Universitas Terbuka

Indonesia was the first country in South-East Asia to mainstream open and distance learning within the educational system. Universitas Terbuka (UT) was among the first open universities to be established in ASEAN,[25] with no limitations for student age, period of study or frequency of examinations. UT coordinates with state and private universities, which provide assistance in formulating learning materials, tutorials and practice classes.[26]

Despite the openness of UT, evaluations show that students' level of experience with ICT prior to participating in the UT courses dictate their success. Furthermore, the students' interests, attitudes and learning approaches, which are shaped by their socio-cultural backgrounds, determine their ability to work effectively with e-learning tools.[27] While the use of ICT has not yet been widely implemented even as a basic subject in primary and secondary schools, the potential of open learning at the tertiary level also remains limited.

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[25] Alexander Gonzalez Flor. 2011. Economics of eLearning for the Indonesian Maritime Education and Training Sector. ICDE World Conference 2011 http://vid4edu.info/paper/index.php/icde/2011/paper/view/73

[26] Universitas Terbuka. UT in Brief. http://www.ut.ac.id/en/ut-in-brief.html

[27] Heemskerk, Volman, Admiraal & ten Dam 2012. "Inclusiveness of ICT in secondary education: students' appreciation of ICT tools" International Journal of Inclusive Education, 16:2, 155-170

INHERENT

Launched in 2008, INHERENT is designed to link universities and HEIs throughout the Indonesian archipelago.[28] The network covers over 220 public and private universities, allowing for information transfer, resource sharing and distance learning opportunities. Moreover, the World Bank's Global Development Learning Network allows any Indonesian university connected to INHERENT to access distance learning opportunities throughout South-East Asia.

ICT for vocational education

Begun in 2001, the School Internet Network[29] programme aims to increase Internet accessibility for vocational secondary schools (VSS), providing ten PCs and one server for each school. A communication forum known as the School Information Network[30] was established in vocational secondary schools in every region, utilizing a mailing list application. VSS students were taught basic knowledge and skills on information technology.

ICT in Education research and development

There are few entities performing research on ICT in Education with a specific focus on meeting the challenges of the Indonesian archipelago. Small pockets of advanced research have been seen in the development of robotic-focused schools and Indonesian students have had success in international robotics competitions.

There are several robotic learning centres in Indonesia, which were built by the private sector. The NEXT SYSTEM Robotics Learning and Experience Centre[31] in Bandung provides intensive learning on microcontrollers and robotics, as does the Robokidz Computer and Robotics Learning Centre[32] in Surabaya.

Indonesian students have scored well in international robotic competitions. Teams from the Indonesian Computer University won gold medals in the 2011 and 2010 Annual Robogames Competition,[33] while Indonesian university students won first and second place in the Walking Division and the Senior Division in the 2011 Trinity

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[28] World Bank. 2008. Indonesia Expands GDLN. http://go.worldbank.org/XQEFC6IYA0

[29] Nandika, D., Priowirjanto, G. H. and Soekartawi. 2007. Integrating ICT for better quality and values of education: lesson from Indonesia. Policy forum: 42nd SEAMEO Council Conference, Bali, Indonesia. http://www.seameo.org/vl/library/dlwelcome/publications/report/thematic/07forum42.pdf.

[30] Tian Belawati. 2005. op. cit.

[31] NEXT SYSTEM Robotics Learning and Experience Center. 2011. http://nextsys.web.id/edukasi/

[32] Robokidz Computer and Robotics Learning Center. 2011. http://www.e-robokidz.com/front/

[33] Beritu Kemla. 2011. Indonesia Raih 2 Medali Emas pada "Robogames". http://www.kemlu.go.id/riyadh/Pages/News.aspx?IDP=4715&l=idhttp://www.robogames.net/2011.php

College Fire-Fighting Robot Contest.[34] Furthermore, an Indonesian elementary school team won first place in the "Regular" category in the World Robotic Olympiad (WRO) 2011, following up on a gold medal in the Robot Soccer category in WRO 2010 and three top-five placements in WRO 2009.[35] These achievements have sparked interest in learning about robotics among more young people, leading to the founding of the National Robotical Contest in June 2011 in Gadjah Mada University, Yogyakarta.[36]

Official Development Assistance

Given its large population, Indonesia's aid dollars per capita are among the lowest in the world, behind even "aid orphan" Myanmar. The country has consistently received aid, however, both from its neighbours and from Western donors. But advanced technologies in education have received a relatively small amount.

Japan has far and away been the most generous donor and investor for Indonesia, most likely in recognition of the importance of the archipelago's natural resources. Over 1,000 Japanese companies employ more than 30,000 people in Indonesia.[37]

[34] Direktorat Jenderal Pendidikan Tinggi. 2011. Robot Indonesia di Kancah Dunia.
http://www.dikti.go.id/index.php?option=com_content&view=article&id=2077:layanan-informasi&catid=54:berita-dirjen&Itemid=185

[35] Indonesia Proud. 2011. Siswa SD Indonesia Juara World Robotic Olympiad Arabia 2011 di Abu Dhabi.
http://indonesiaproud.wordpress.com/2011/05/14/siswa-sd-indonesia-juara-world-robotic-olympiad-arabia-2011-di-abu-dhabi/

[36] Indonesia Kreatif News. 2011. National Robotical Contest 2011: To Professionally Train the Competitive Attitude. http://www.indonesiakreatif.net/index.php/en/news/read/national-robotical-contest-2011-to-profesionally-train-the-competitive-attitude

[37] Jakarta Post. 2010. Huge Opportunity from Japanese Investment.
http://www.thejakartapost.com/news/2010/08/23/huge-opportunity-japanese-investment.html

Table 32. Country information (Indonesia)[38]

	2009	**2010**	**2011**
Population (million)	237.41	239.87	242.33
GNI per capita (Atlas USD)	2160.00	2500.00	2940.00
Net ODA (USD million)	1046.53	1392.51	414.6
Bilateral share (gross ODA)	78.52%	85.87%	83.89%
Net ODA / GNI	0.20%	0.20%	0.05%
Net Private flows (USD	4435.44	3511.66	10258.7

Table 33. Top 10 donors (2010-2011 average) (Indonesia)[39]

Overall (USD Millions)		*Education Sector (USD Millions)*	
Japan	1303.77	Australia	92.37
Australia	401.83	IDA	57.69
United States	262.55	Netherlands	50.17
Germany	199.12	Germany	46.93
France	190.64	Japan	42.87
EU Institutions	118.67	United States	37.98
AsDB Special Funds	109.67	EU Institutions	30.37
IDA	87.69	AsDB Special Funds	27.84
Global Fund	82.13	France	3.40
Netherlands	79.78	New Zealand	2.59

Table 34. ODA by sector (2010-2011 average) (Indonesia)
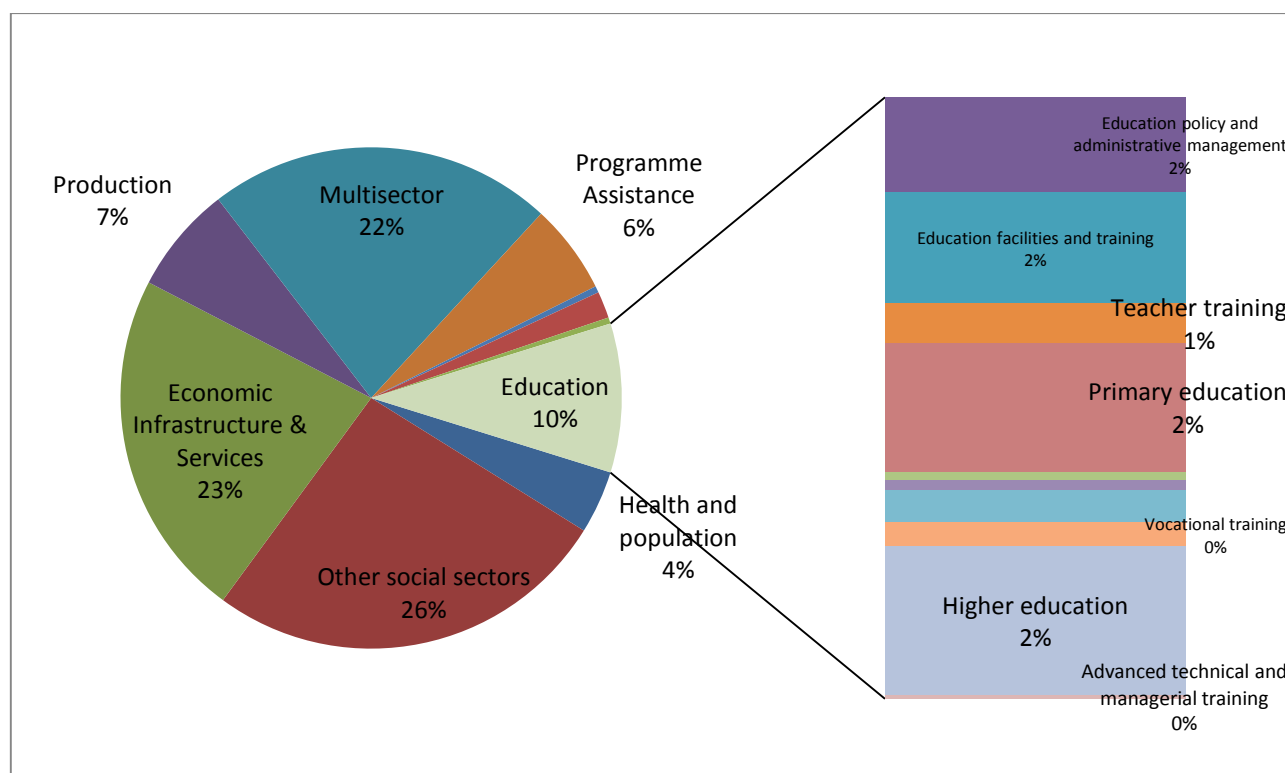
Source: OECD statistical databases

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[38] World Bank, UNESCAP, and OECD statistical databases.

[39] OECD statistical databases.

ODA programmes and projects for ICT in Education

Japan International Cooperation Agency

Although much of the Japan International Cooperation Agency (JICA) aid has focused on infrastructure development, JICA has also supported education projects, including providing funding of 4.01 million USD for a 2006-2010 project to assist the Institute of Technology Sepuluh Nopember (ITS) to train advanced ICT engineers throughout Indonesia. JICA engaged experts from Japan to enhance ITS's research and training capabilities involving ICT. In addition, linkages were built with Japanese HEIs to allow continued staff transfers and joint research projects.[40]

Australian Agency for International Development

The Australian Agency for International Development (AusAid) supplied 355 million AUD to support the Basic Education Programme (BEP), which aimed to improve access to quality educational services in Indonesia. Along with substantial physical resource development, AusAid focused on improving the capacity of instructors. Of particular success has been the BRIDGE project, which links schools in Australia and Indonesia.[41] Since 2008, 63 schools across Australia have partnered with 62 Indonesian schools, including 11 BEP schools. Indonesian teachers were trained in Melbourne on classroom ICT usage and online collaborative learning. Teachers at BEP schools were also formally linked to Indonesian instructors with ICT expertise.

International Development Research Centre

Between 2001 and 2004, Canada's International Development Research Centre (IDRC) developed web-based learning materials and a course for the Universitas Terbuka's distance learning system.[42] Tutors and counsellors were trained in online teaching methodologies, and evaluation systems were created for continuous improvement of instructional quality. This programme was critical for UT's evolution as a viable distance learning option.

Asian Development Bank

ADB programmes implemented in Indonesia have mainly focused on educational management and planning initiatives. Programmes undertaken in 2003 strategized the use of ICTs for upcoming decentralization of secondary education and provided ICT

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[40] JICA. 2010. *Evaluation of PREDICT-ITS*. http://www.jica.go.jp/english/operations/evaluation /tech_and_grant/ project /term/asia/pdf/indonesia_2009_02.pdf

[41] Bridge. 2010. Australia-Indonesia BRIDGE Project. http://www.indonesia.bridge.edu.au/default.asp?lang=en

[42] IDRC 2012. ICT-Supported Distance Education in Indonesia
www.idrc.ca/EN/Themes/Information_and_Communication/Pages/ProjectDetails.aspx?ProjectNumber=100570

training to the MOET.[43] In 2010, the ADB utilized 50 million USD in grants from the EU and Australia for a series of policy and operational research papers related to educational reforms, including an ICT-enabled EMIS.[44]

UNESCO

In 2007, UNESCO implemented a project on training Indonesian policy makers, which included introducing the ICT in Education Toolkit.[45] More recent workshops have focused on instructors, building skills for curriculum development among the "next generation" of teachers. [46] In 2012, UNESCO introduced its ICT Competency Framework for teaching to Indonesian educators, with an aim to eventually developing ICT standards for Indonesian teachers.[47]

The World Bank

The World Bank has a substantial presence in Indonesia, with annual lending averaging 3.176 billion USD in 2009 and 2010. ICT in Education has received solid support, usually as part of long-term capacity building and management programmes.

The seven-year, 114.54 million USD "Managing Higher Education for Relevance and Efficiency Project"[48] was begun in 2005 with an aim of building a knowledge economy through reform and support for HEIs. The six-year 195.06 million USD "Better Education through Reformed Management and Universal Teacher Upgrading Project" (BERMUTU)[49] was begun in 2007 with an overall objective of enhancing teacher's knowledge of subject matter and pedagogical techniques. The BERMUTU project also included ICT training and the development of an improved teacher database.

The World Bank faced issues with the 3.6 million USD "Global Development Learning Network Project" carried out between 2002 and 2009. The GLDN project established centres at four Indonesian universities, connected to GDLN Washington through multimedia facilities for video, data and voice exchange. Asynchronous lessons were

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[43] ADB 2012. ICT-Related Projects. http://www.adb.org/sites/default/files/ict-projects.pdf#page=6a

[44] ADB. 2010. Analytical and Capacity Development Partnership: Indonesia.
http://pid.adb.org/pid/TaView.htm?projNo=43273&seqNo=01&typeCd=2

[45] UNESCO. 2007. ICT in Education Policy Makers' Toolkit. http://www.unescobkk.org/education/ict/ict-in-education-projects/policy/toolkit/

[46] UNESCO. 2012. Next Generation of Teachers project. http://www.unescobkk.org/education/ict/ict-in-education-projects/training-of-teachers/next-generation-of-teachers-project/

[47] UNESCO. 2012. Workshop on Developing National ICT competency standards for Indonesian teachers, Jakarta, 19-20 April 2012. http://portal.unesco.org/geography/en/ev.php-URL_ID=15596&URL_DO=DO_TOPIC&URL_SECTION=201.html

[48] World Bank. 2012. Project for Managing Higher Education for Relevance and Efficiency
http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=40941&menuPK=228424&Projectid=P085374

[49] World Bank. 2012. BERMUTU. http://web.worldbank.org/external/projects/main?Projectid= P097104
&theSitePK=40941&piPK=64290415&pagePK=64283627&menuPK=64282134&Type=Overview

envisioned to expand access to development management information. The project was ultimately deemed unsatisfactory due to mismatches between the technologies implemented and Indonesia's ICT environment. Furthermore, insufficient training in equipment maintenance and operation hindered the project's sustainability.[50] Despite these shortcomings, the GDLN Indonesia programme eventually linked to INHERENT, Indonesia's national university communication network, with more tangible success.

Analysis and conclusions

Indonesia lacks a coherent and cohesive Master Plan for implementing ICT throughout its education system, perhaps as a result of the continued efforts to decentralize its governmental processes. Without a forward-looking plan that can go beyond the electoral cycle and bring public and private actors together, piecemeal and stopgap measures will continue to be introduced.

There are several constraints on the use of ICT in schools in Indonesia, including the lack of appropriate ICT equipment and infrastructure (including telephone lines and reliable electricity supply); the lack of skilled teachers who can integrate ICT in the teaching and learning process; the unavailability of personnel to manage ICT equipment, particularly in rural areas; the prohibitively high cost of Internet access in much of Indonesia; and the lack of digital learning resources written in Bahasa.

It is difficult to envision traditional means of using ICT in education taking hold in such an environment. Indonesia's sprawling geography might enable new forms of ICT-enhanced education, however. A primary technical principle guiding the design of the Internet was "open architecture networking". Under this approach, each individual network is separately designed to fit its own user and environment requirements. These networks are connected to each other without any global control at the operations level.[51] Taking a similar perspective on the development of education in Indonesia could have remarkable potential.

One potential growth opportunity exists in the development of mobile learning applications. Indonesia has the highest dependence on mobile Internet access in Southeast Asia. Around 48 percent of Internet users in Indonesia use a mobile phone to access the Internet, while another 13 percent use other handheld multimedia devices.[52]

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[50] World Bank. 2008. *Implementation Completion and Results Report*. http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2008/08/05/000333037_20080805030826/Rendered/PDF/ICR00007920ICR1Disclosed0Aug0102008.pdf
[51] Internet Society. Brief History of the Internet. http://www.internetsociety.org/internet/internet-51/history-internet/brief-history-internet (Accessed 4 June 2012)
[52] Indonesia The Most Reliant On Mobile Internet Access Across Southeast Asia.

These numbers, when taking into account with the large size of the Indonesian population, indicate the possibility for developing educational content that can be used directly from a mobile phone with Internet connection. There could be a healthy market for mobile educational products such as language learning applications, mathematics problem sets, or Internet-enabled tutors. Furthermore, forecasted changes in technology, including the spread of tablet computing and low-cost projectors, could open new avenues for using ICT to enhance education throughout Indonesia.

The Republic of Singapore

In 1997, the Singapore Ministry of Education (MOE) adopted the vision statement "Thinking Schools, Learning Nation",[1] aiming to develop an education system that meets the needs of the 21st century and acquisition of critical thinking, communication and life-long learning skills.[2]

Singapore has conceptualised and implemented three ICT Master Plans in Education. Overall, these three Master Plans drive the use of ICT in education, with the underpinning philosophy that the public schools education system should continually anticipate the needs of the future and prepare learners to meet those needs. The master plans for ICT in education provide a blueprint for the use of ICT in Singapore schools and access by every student, regardless of socioeconomic background, to an ICT-enriched school environment. Under these plans, ICT is harnessed to enhance the learning experiences of students and to equip them with essential learning skills, creative thinking skills and communication skills. These skills are envisaged to help prepare them for the workplace of the future and to be effective in globalized environment, in addition to being able to use ICT to enhance their own learning.

These Master Plans are also aligned with evolving national ICT plans, for example the current plan, "An Intelligent Nation 2015" (iN2015), which aims to develop Singapore into a global ICT capital, e-economy and e-society through national initiatives such as research related to interactive and digital media (IDM). Singapore has become a global leader in ICT, ranking in 2010 as the world's second-most networked economy.[3]

Policy environment

Within the MOE, the Educational Technology Division (ETD) has the overall mission to serve as a "catalyst in harnessing ICT to enrich learning and teaching".[4] The ETD is divided into two branches, the Learning Partnership in Educational Technology (LPET) branch and the Media Design and Technologies for Learning (MDT) branch.

The LPET branch develops and provides professional development programmes to build schools' capacity for effective integration of ICT into curricula. Through consultancy services, the branch supports schools in the planning, implementation and review of ICT programmes. The MDT Branch is responsible for evaluating different

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[1] Singapore Ministry of Education. 2011. http://www.moe.gov.sg/about/
[2] Ministry of Education. 2008. *Learning to Think, Thinking to Learn: Towards Thinking Schools, Learning Nation.* Singapore Ministry of Education
[3] World Economic Forum/INSEAD. 2010. *The Global Information Technology Report* www3.weforum.org/docs/WEF_GITR_Report_2011.pdf
[4] Singapore Ministry of Education Educational Technology Division. http://www.moe.gov.sg/about/org-structure/etd/

technologies and media resources to assess how they can be effectively integrated into curricula. The branch also explores and experiments with emerging technologies and ICT-based pedagogies to set the direction for the development of pedagogically sound, effective and innovative ICT-based resources for teaching and learning.

In view of the alignment with national ICT plans and anticipating future needs, one of the cornerstones of the three Master Plans is the emphasis on partnerships between the MOE and various stakeholders in the field. The MOE works closely with schools, institutes of higher learning (IHL) and the National Institute of Education (NIE) in the development of educational resources and ICT-based pedagogies and innovations. Other partners, such as the Infocomm Development Authority of Singapore (IDA) and technology industry leaders have also contributed to technological development.

Policies related to ICT in Education

First Master Plan for ICT in Education 1997–2002
The First Master Plan for ICT in Education 1997–2002 (MP1) provided an essential foundation for schools in Singapore to begin innovating regarding the use of ICT in learning. Schools were provided with ICT infrastructure, hardware facilities and computer laboratories to support ICT-enabled learning. MP1 laid a strong foundation for schools, particularly in equipping teachers with a functional level of competency in the integration of ICT into learning and teaching. This use of ICT has achieved a widespread acceptance among teachers.

Second Master Plan for ICT in Education 2003–2008
The Second Master Plan for ICT in Education 2003–2008 (MP2) was built on the foundation laid in MP1 to strive for effective and pervasive use of ICT in education, and its focus was on seeding innovation. Hence, the MOE adopted top-down support for bottom-up initiatives, focusing on establishing baseline ICT standards for students, supporting schools in achieving higher levels of ICT use, strengthening the integration of ICT into the curriculum, and encouraging schools to implement innovative ICT-based pedagogical practices. In line with this, all schools were given funds to purchase ICT equipment, software and services to meet their needs. Furthermore, the MOE developed competitive programmes whereby schools could access additional resources to try out new innovations.[5] Schools were encouraged to take a whole-school approach in ICT planning as this helps to bring about pervasive ICT integration into schools.

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[5] Dr Ng Eng Hen. 2008. Speech at the International Conference on Teaching and Learning with Technology at the Suntec Convention Hall, Singapore. 5 August 2008

Third Master Plan for ICT in Education 2009-2014

The Third Master Plan for ICT in Education 2009-2014 (MP3) builds on the work under MP1 and MP2 and goes further by strengthening the integration of ICT into curricula, pedagogy and assessment; levelling up the professional development of teachers to deepen their understanding and use of ICT-enhanced pedagogies; and scaling up practices that emerge from innovation. It continues to focus on enriching and transforming the learning experiences of students through the use of ICT so as to equip them with the critical competencies and dispositions to succeed in a knowledge economy. The goal is for students to develop competencies for self-directed and collaborative learning through the effective use of ICT, as well as to become discerning and responsible ICT users. Supporting this, the enabler goals are for school leaders to provide the directions and create the conditions to harness ICT for learning and teaching, for teachers to have the capacity to plan and deliver ICT-enriched learning experiences, and for ICT infrastructure to support learning anytime, anywhere.

ICT in schools

Curriculum for ICT in Education

Under MP3, usage of ICT is both taught as a discrete subject and infused into other subjects.

Table 35. ICT-infusion (Singapore)

Course[6]	Instructional objectives
Computer Applications	• Students understand how to use software programmes such as word processing, computer drawing, multimedia presentations, data tabulation and charts and Internet applications.
Primary and Secondary English	• Students are able to research and select relevant information from print and non-print resources. • Students develop appropriate listening and viewing attitudes and behaviour, and apply skills and strategies strengthened by exposure to spoken, audio and visual texts.
Social Studies	• Students develop a plan to locate and collect information using various ICT tools. • Students use digital media to present ideas and findings with clarity, persuasion and in creative ways. • Students exercise integrity in the use of ICT.

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[6] Curriculum Planning & Development Division. 2007. Computer Applications Syllabus: Lower Secondary Normal (Technical), English Language Syllabus 2010: Primary & Secondary, Primary Social Studies Syllabus 2012 Singapore: Ministry of Education, Singapore.

Teaching and learning resources

Inter-cluster Sharing of Resources

Initiated as an innovative project with three clusters in the West Zone in 2005, the Inter-cluster Sharing of Resources (iSHARE) project has since grown to encompass all 28 school clusters.[7] The iSHARE system connects all cluster repositories through common metadata and taxonomy standards. Currently, there are four zonal ICT repositories under iSHARE where teachers can search across zonal portals and access more than 100,000 teacher-created resources.

English Language Portals

The We-Learn portal, which aligns with the English Language syllabus, is designed to enable teachers in the Normal (Technical) course to create e-assignments for teaching and learning purposes, as well as school-based e-assessments that are aligned with EL Syllabus 2010.[8] In 2011, 43 secondary schools subscribed to the We-Learn portal and more schools in 2012. The Curriculum, Planning and Development Division (CPDD) of the MOE provides comprehensive teacher training as well as briefing of school support personnel to cultivate effective use of the portal. The CPDD has trained teachers and provided support for effective use of this portal, used by 43 secondary schools. Still at the developmental stage, the English Language Oracy Portal (ELOP) aims to provide interactive English learning environments to students. It has been piloted in Yu Neng Primary School and Yusof Ishak Secondary School. Software programmes such as an Interactive Story Book and a Virtual World Role-Playing Game are being developed.

iMTL Portal

A web-based interactive portal, the iMTL enables students to learn languages online, utilizing meaningful assessment tools.[9] It provides opportunities for oral presentation and interactive communication and improves self-directed learning through task-based activities. In addition, teachers can share their teaching resources through its repository.

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[7] Mun, W. K. and Chuan, T. C. 2008. iSHARE Framework for Sharing of Digital Resources to Support Teaching and Learning in Singapore Schools.
http://acce.edu.au/sites/acce.edu.au/files/archived_papers/conf_P_1042_iSHARE%20Framework%20for%20Sharing%20of%20Digital%20Resources%20to%20Support%20Teaching%20and%20Learning%20in%20Singapore%20Schools%20ACEC%202008.pdf

[8] edumall 2.0. 2011. The ICT Connection.
http://ictconnection.edumall.sg/cos/o.x?c=/ictconnection/pagetree&func=view&rid=760

[9] Ibid.

edumall2.0

Accessible by all teachers in Singapore, edumall2.0 is an online content repository that provides teachers with educational resources to support the school curriculum.[10] These resources include full-length video productions, video clips, interactive websites, multimedia activities, lesson plans, visual, aural and textual resources as well as an array of easy-to-use online tools, as shown in the following table. In addition, a diverse selection of digital resources from trusted providers are provided for use by teachers.

Table 36. Edumall2.0 resources (Singapore)

Subject	e-Contents
Art	• ArtDR: A platform that allows teachers to publish, rate and comment on each other's art lessons and packaged resources. • Blitx: An online gallery for students to showcase, rate and comment on each other's artworks from across all genres and media.
Chinese Language	• 10'C: A portal for teachers and students participating in the 10'C programme. • Chinese Language Word Games: An online gallery for students to showcase, rate and comment on each other's artworks from across all genres and media. • Culture Bridge: A website that features topics of interest in Chinese and other cultures with multimedia and interactive resources. • HappyTown: A platform for CL students to share journals, tell stories and exchange views on topics of interest. Also features content for CL learning. • Oracy eLand: An online interactive learning portal designed to equip primary 1 to 3 students with commonly used vocabulary and sentence patterns that they can use in their daily conversations with others. • Xue Le: A website that features multimedia content that complements the CL primary curriculum 2007 and interactive resources for secondary schools.
English Language	• STELLAR: A website using authentic children's literature and learner-centred, developmentally appropriate pedagogical approaches.

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[10] Ministry of Education Singapore. 2012. Teaching and Learning Resources. Retrieved from http://www.moe.gov.sg/resources/

Malay Language	• Tinta: A website that features multimedia content that complements the ML primary curriculum 2008 with interactive resources. • Nadi: An e-magazine for primary ML students with a wide range of multimedia content and online activities.
Mathematics	• AlgeTools: A learning tool that allows students to explore algebra through the use of digital manipulatives.
Sciences	• Sciberdiver: A web portal with great science websites that closely match the learning objectives in the Primary and Lower Secondary science syllabuses.
Tamil Language	• Nam Naadi: An e-magazine for primary TL students with a wide range of multimedia content and online activities. • Sangamam: A website that features multimedia content that complements the TL primary curriculum 2008 and interactive resources for secondary schools.

ICT infrastructure provision

NEU PC Plus Programme
This programme provides full-time students and disabled from low-income households the opportunity to own new computers at an affordable price.[11] There are three schemes under this programme:

- PC-Bundle: Beneficiaries purchase a new computer (from a pre-selected list) with free software and three years of free subscription to broadband services at a highly subsidised cost
- iNSPIRE Fund: Last mile solution under which beneficiaries receive a full subsidy for the computer, applied under the PC-Bundle scheme, by performing stipulated number of hours of community service.
- Broadband-Only: Beneficiaries pay a nominal fee for broadband access.

With the increased diversity of ICT devices used in schools to support their curricula, the programme also provides grants to schools in the procurement of such devices.

Professional development

ICT Mentor Programme
The ETD implemented the ICT Mentor Programme over five phases between 2010 and 2012, with the objective of building a critical mass of teacher advocates or champions to

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[11] IDA Singapore. 2011. NEU PC Plus Programme. Retrieved from http://www.ida.gov.sg/neupc

cascade effective ICT practices in schools.[12] Each school selected up to four ICT mentors and each mentor coached teachers to become effective users of ICT for teaching. The programme adopted an experiential approach for ICT Mentors to learn to use various ICT tools to design lessons for their own classroom use and to coach their colleagues in their respective schools. A combination of both face-to-face workshops and on-site consultation sessions were employed along with online learning experiences in the form of Webinars.

Integration of ICT into pedagogy

Schools Digital Media Awards

A yearly competition, the Schools Digital Media Awards (SDMA) is a platform to provide teachers and students with opportunities to express their creative ideas on teaching and learning activities through various media.[13] The SDMA aims to increase media literacy and to promote the values of teamwork and collaboration among students and teachers. This competition provides teachers with a platform to engage in media production for educational purposes.

Interactive Heritage Trails

Currently, seven Interactive Heritage Trails (iHTs) have been developed by the MOE to enable students to take learning of humanities outdoors.[14] Leveraging on mobile phone applications, the iHTs enhance the pen-and-paper predecessor, the National Heritage Trails. The iHTs recognise user locations and push site-specific information and questions for students to engage with. Students use mobile devices to access and respond to information sources such as photographs, oral history accounts and videos about the sites on the trails, creating a multi-sensory learning experience. The iHTs thus enrich students' learning by connecting learning in the classroom with authentic environments, while encouraging them to become more independent and self-directed in their learning, and also developing in them a sense of belonging and pride in Singapore and the people's rich heritage.

Prototyping Pedagogies for Learning with Technology/Computer Supported Collaborative Learning

The Prototyping Pedagogies for Learning with Technology/Computer Supported Collaborative Learning (Propel-T/CSCL) promotes students' self-directed and collaborative learning aligned with the MOE's ICT Master Plans. Under this project, the

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[12] edumall 2.0. 2011

[13] edumall 2.0. 2012. School Digital Media Awards. Retrieved from
http://sdma.edumall.sg/sdma/slot/u140/sdma2013/index.html

[14] Ministry of Education, Singapore. 2012. Press Release. Retrieved from
http://www.moe.gov.sg/media/press/2012/05/launch-of-the-interactive-heri.php

role of the teacher is to stimulate students' inquiry through a knowledge-building approach and as a result students become engaged in self-directed learning and collaborative discussion through an online platform. It has been implemented for primary and secondary students.[15]

SEED-ICT

The Strategies for Effective Engagement and Development (SEED) programme is an initiative to engage primary Grade 1 and 2 students effectively in learning through various learning and teaching strategies in a conducive learning environment. The SEED-ICT Framework was developed to guide teachers in developing a technology supported curriculum in an age-appropriate environment that nurtures confident and curious students with strong literacy and numeracy skills. ICT offers additional ways to learn and demonstrate learning through the manipulation of images and data, visualization of concepts and interaction with on-screen materials and receiving instant feedback.[16]

Cyber Wellness

Baseline ICT Standards for Cyber Wellness Skills and Values
To ensure that students acquire skills related to ethical, legal, safe and responsible use of ICT by the end of their secondary school education, age-appropriate cyber wellness skills and values have been built into the Baseline ICT Standards.[17]

Table 37. Baseline ICT standards for safety (Singapore)

Areas	Primary 4-6	Secondary 1-2	Secondary 3-5
Ethical and Legal Use	• Handle Inappropriate Content • Prevent Cyber Abuse • Display Internet Etiquette • Respect Intellectual Property	• Respect Intellectual Property	• Respect Intellectual Property
Safe and Responsible Use	• Protect Private Information • Avoid Computer Addiction	• Protect Private Information • Avoid Computer Addiction • Manage Security Risks • Verify Information Sources	• Verify Information Sources

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[15] edumall 2.0. 2011
[16] Ibid.
[17] edumall 2.0. 2009. Baseline ICT Standards. Retrieved from
    http://ict.edumall.sg/ict/slot/u151/baseline/cyberwellnessskills.html

Cyber Wellness Framework

All schools implement their cyber wellness programmes based on the cyber wellness framework developed by the MOE in 2008.[18] Adhering to the key principles of "Respect for Self and Others" and "Safe and Responsible Use", the framework follows a three-step process: Sense, Think and Act. The framework provides cyber wellness topics and learning outcomes to schools, and there is potential to incorporate cyber wellness into subjects such as civics and moral education.

Cyber Wellness Research and Programmes

In 2009, the MOE analyzed students' online activities to improve cyber wellness. The MOE developed cyber wellness educational resources, including relevant topics for teachers, comic books for students and tips for parents. Resources are available at the One-Stop Resource Portal for Cyber Wellness within the edumall2.0 website.

Also in 2009, the MOE, IDA and Microsoft launched the Cyber Wellness Student Ambassador Programme (CWSAP). The CWSAP leverages positive peer influence to promote cyber wellness through student-led activities. An annual conference is organized to encourage student ambassadors to share good practices. Since its launch, the programme has reached 95 percent of primary, secondary schools and junior colleges/centralized institutes.

Quality management and standardization

Baseline ICT standards

By the end of MP2, a set of baseline ICT standards for students had been established. The Baseline ICT Standards is a set of ICT skills set out in progressive stages that every student must achieve at the various educational levels. For example, every student must be able to create, edit and format a text document by primary Grade 2[19] and be able to plan and design spreadsheets based on a scenario to solve a problem by secondary Grade 4.[20] The use of baseline ICT skills is integrated into core subjects such as English, mathematics and science.

To facilitate monitoring, the MOE developed an online Baseline ICT Standards Assessment System (BasIC). The current system measures the technical competencies of the students, but the MOE is reviewing the possibility of developing a system to

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[18] edumall 2.0. 2011

[19] Ministry of Education. 2009. Baseline ICT Standards Key Stage 1. Retrieved from
    http://ict.edumall.sg/baseline/keystage1.html

[20] Ministry of Education. 2009. Baseline ICT Standards Key Stage 2. Retrieved from
http://ict.edumall.sg/baseline/keystage2.html

measure the less tangible skills such as communicative abilities and higher order thinking abilities of synthesis, collaboration and analysis.

Table 38. Baseline ICT standards (Singapore)[21]

Baseline ICT Skill Areas	Primary 1-3	Primary 4-6	Secondary 1-2
Basic Operations	• Navigate in a Graphical User Interface (GUI) • Use Application Software, Files and Folders	• Work across Multiple Applications • Manage Files and Folders	• Navigate in an Interactive Media Environment
Learning with Standards	• Use Digital Resources from Specified Sources	• Search and Gather Information from the Internet	• Refine Internet Searches
Learning with Text	• Create a Document with Text and Graphics • Edit and Format Words, Phrases and Sentences	• Edit and Format Paragraphs of Text • Combine Text with Tables and Graphics	• Edit and Format Pages of Text
Learning with Multimedia	• Create a Presentation with Text and Graphics • Edit and Format Text and Graphics	• Combine Multimedia with Text and Graphics in a Presentation	• Link Text and Graphics to Other Sources • Produce Simple Multimedia Elements
Learning with Spreadsheets	-	• Create a Spreadsheet • Edit and Format Data and Cells • Manage Small Data Sets	• Manage Large Data Sets • Create, Edit and Format Graphs and Charts
Learning with Communication Tools	-	• Communicate Online	• Communicate and Collaborate Online
Learning with Data Collection Tools	-	• Gather Data	• Export Data Collected

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[21] edumall 2.0. 2009. Baseline ICT Standards. Retrieved from http://ict.edumall.sg/baseline/trainingguide.html

ICT in Education research and development

Singapore has been at the forefront of developing advanced ICT applications in its education system. The IDA and the MOE have utilized partnerships with several actors in the private sector to pilot the use of advanced technologies in schools.

eduLab

The eduLab programme was initiated by the MOE and the NIE in 2010. This programme serves as a conduit through which ideas with system-wide potential can be brought into practice, with a view to scaling within the education system.[22] Through eduLab, these ideas can be developed into ICT-infused lessons and product prototypes, with support from a central pool of MOE-NIE expertise as well as international and local experts, including IHL researchers and industry. To date, six projects proposed by schools or the NIE have been approved, involving a total of 29 partner schools. The titles of the projects are:

- Learning Trail Design Toolkit - From Schools' Choices to Students' Voices
- Java Simulation Design for Teaching and Learning
- Extending the Six Learnings framework for Curriculum Design in Virtual Worlds
- Online SDL Virtual Laboratory with CoL and ICT in Assessment Platforms for School-based Science Practical Assessment
- Designing Knowledge Building Environment (with Technologies) Through Teachers' Collective Discourse
- Creating Poetry on the Go – PoGo!

Established at the Academy of Singapore Teachers (AST) premises in 2012, eduLab@AST[23] serves as a conduit for teachers, industry partners and researchers to come together and bring ideas into practice, with selected practices being subsequently spread within the education system. The key objectives of eduLab@AST include:
- Foster ideation and collaboration in experimenting with technology in education.
- Promote adoption of successful use of technology in education.
- Provide ICT infrastructure to facilitate technology experimentation for schools and the MOE to assess potential solutions prior to adoption.

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[22] edumall 2.0. 2010. Edulab Program. Retrieved from
http://iresearch.edumall.sg/cos/o.x?c=/iresearch/pagetree&func=view&rid=218
[23] Ministry of Education, Singapore. 2012. Press Release. Retrieved from
http://www.moe.gov.sg/media/press/2012/03/edulab-at-the-academy-of-singa.php

BackPackLIVE!

Following the success of the BackPack.NET 2003-2008, the MOE, IDA and Microsoft Singapore announced a new collaboration in 2009, aiming to inspire, explore and scale ICT up practices among teachers in developing self-directed and collaborative learning capabilities in students. BackPackLIVE! focuses on the following research programmes:[24]

- *Supporting Professional Learning Communities in Schools*

Educators tap into the expertise of overseas education consultants and local research partners to develop pilot projects on the use of ICT to achieve self-directed learning, collaborative learning and effective assessment.

- *Cultivating Developers Community*

Educators work directly with ICT developers to see their ICT ideas transformed into reality. The IDA provides development grants to selected industry partners to develop and test their applications and products.

FutureSchools@Singapore

In May 2007, the Ministry of Education announced five schools as the pioneer batch of schools participating in the FutureSchools@Singapore programme, namely: Beacon Primary School; Canberra Primary School; Crescent Girls' School; Hwa Chong Institution; and Jurong Secondary School. In March 2008, the MOE named the School of Science and Technology (SST) as the sixth "FutureSchool". In April 2011, Nan Chiau Primary School and Ngee Ann Secondary School joined the FutureSchools@Singapore programme as announced by the Senior Minister of State, Ministry of Trade and Industry and Ministry of Education.

The schools participating in the FutureSchools@Singapore programme focus on innovative teaching approaches that use ICT tools, such as immersive virtual environments and educational games, and the re-designing of physical space to improve learning. These schools also undertake studies on the impact of ICT use on students' cognitive, emotional and social development. The learning points, ideas, programmes and technologies from these studies are then shared with other schools.

The MOE continues to support the FutureSchools@Singapore programme to experiment and push the frontiers of ICT use for learning and teaching on a school-

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[24] Ministry of Education, Singapore. 2009. Press Release. Retrieved from
http://www.moe.gov.sg/media/press/2009/07/backpacklive.php

wide level to transform learning experiences. These schools provide other schools with possible models for the seamless and pervasive integration of ICT into the curriculum and for engaged learning in schools. They work closely with the MOE, the IDA and institutes of higher learning.

EdVantage

EdVantage is a flagship programme by the IDA that is implemented with the support of the MOE.[25] Aligned to MOE's ICT Master Plans, it aims to strategically deploy infocomm to provide a learner-centric, collaborative learning environment within and beyond the classroom, thereby enabling a diverse and vibrant schools landscape in the use of ICT. With the aim of transforming the educational landscape, EdVantage bases its initiatives on three core programmes, two of which are heavily focused on research and piloting new educational technologies.

Experimentation@Schools

Experimentation@Schools (ESP) focuses on pioneering innovative use of technology that supports self directed learning and collaborative learning. It aims to seed and encourage ICT innovations and collaboration between schools and industry in the use of ICT for learning and teaching.

Themes addressed under this programme include:

- *Collaborative Learning Tools*

The Collaborative Learning (CoL) Tools aim to provide access to a variety of familiar web 2.0 collaborative tools through an online system. The system enables teachers to analyze students' use of social networking platforms to see collaboration patterns.

- *Learning on the Move*

The Learning on the Move (LOTM) tool was developed with the aim of supporting the creation of highly engaging and interactive mobile learning trails for students to collaborate and learn more effectively outside the classroom. Through the interactive trails, it is possible for students to exchange ideas and participate in ways that increase interaction and retention of information. The LOTM also allows students to have direct and hands-on experience to access and analyze information, which supports self-directed learning and critical thinking.

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[25] IDA Singapore. 2011. EdVantage Programmes
http://www.ida.gov.sg/Collaboration-and-Initiatives/Initiatives/Store/EdVantage-Programme.aspx

Analysis and conclusions

Singapore is a global leader in the use of technology in education. From infrastructure provision to skills training to standards implementation, the Master Plans have followed a logical progression and provided a solid basis for the future. Like other Asian nations with the outward appearance of having successful education systems, however, Singapore has recognized the need to push creative thinking and innovation within its schools.

While encouraging the use of technologies within all subjects is a key part of Singapore's education plans, the MOE must carefully consider its end goal. The use of ICT alone does not necessarily lead to better learning, and advanced technologies can in fact mask low levels of student comprehension. The numerous projects being piloted for innovative ICT usage in schools would do well to maintain an evaluative focus on learning outcomes.

Singapore's MOE has already demonstrated its willingness to partner with both foreign and domestic industry leaders to achieve its ICT goals. Indeed, following the strong development of basic infrastructure and human capacity for utilizing ICT in teaching, Singapore has largely relied on the private sector to develop innovations and integration of advanced ICT into education. The IDA, in particular, serves as a nexus between government and industry.

The FutureSchools initiative stands as the main focal point for the development of advanced educational technologies. The IDA and MOE are open to proposals from domestic and foreign bodies to develop and test technologies. However, with service provision already realized through MP1, and many partnerships already established under MP2 and MP3, the relatively small market could be nearing saturation.

In particular, it appears that the market for e-learning and online teaching resources has been well covered through initiatives like edumall2.0 and the iShare system. A strong theme among the current FutureSchools initiatives is the development of personalized learning experiences through technology-enabled educational environments. New entities seeking to establish themselves in the Singaporean ICT education market should focus on technologies that can foster higher-order cognitive and analytical skills.

The pervasiveness of ICT use by students and teachers in schools and other informal learning spaces mean that it is increasingly critical for Singapore to anticipate and ameliorate cyber wellness issues such as cyber bullying and Internet addiction.

Synthesis

Analysis of the country case studies indicates the diverse nature and development levels of ICT in Education policy and implementation in the eight ASEAN countries. The national policies and plans of each of the country demonstrate awareness of the need to build ICT capabilities within the education system in order to advance towards knowledge-based economies. The reviewed countries have each developed some form of ICT in Education policies, including ICT in Education (Master) Plans (Cambodia, Myanmar, Thailand, Singapore and Viet Nam), a national ICT policy framework (Lao PDR), an Education Blueprint (Malaysia) and a 5-year action plan for ICT (Indonesia).

The title of the policy is less important than what is actually contained. In analysing the policies, the following questions can be asked. Are the components of the policy are aligned with the national educational vision? Does the policy include measureable goals, implementation strategies, a timeframe and costing, or is it just a wish list? Does the policy think ahead regarding how to monitor and evaluate the implementation of the policy?

Insufficient elaboration of such plans is not uncommon, leading to unfortunate cases where a policy "stays on the paper" without actually being followed up or monitored. In this regard, Singapore's three-phased Master Plan can be a promising model for those countries who seek to integrate the use of ICT into education and envision development in a step-by-step manner, especially how to advance from one master plan phase to another. There is strong value in looking for benchmarks in international comparisons and seeking to decipher "lessons learned" from the successes and struggles of other nations.

Although each of the eight countries has an ICT in Education policy, few of the countries have an implementation agency or institution dedicated to ICT in Education (e.g., Educational Technology Division of Malaysia and Singapore, Pustekkom of Indonesia). Not surprisingly, the existence of a special agency dedicated to ICT in Education makes a difference in successful and timely implementation of policy.

Policy priority areas differ from one country to another and indicate the varying phases of development of each country. For example, the spread of basic infrastructure, level of curricular and pedagogical integration, and pilot projects for advanced educational ICT achieved by Singapore put this nation in an "advanced phase", followed closely by Malaysia. Meanwhile, the range of initiatives and experiments undertaken in Thailand,

Viet Nam and Indonesia put these nations into an "implementing phase", while Myanmar, Lao PDR and Cambodia could be considered as still in the "entry phase" of ICT utilization in education. For the "entry phase" countries, the priority regarding ICT is being given to improving infrastructure to ensure the access and connectivity, whereas the advanced-phase Singapore has moved on to the effective "integration" of ICT into education to enhance student-centred learning processes.

When considering the implementation of ICT in education, building human capacity is as important as supplying basic infrastructure. Indeed, the Smart Schools Qualification Standards (SSQS) used by Malaysia put fully 80 percent of their assessment on the competency of end-users and the extent to which each school makes use of ICT in teaching, learning and administration. Step-by-step planning is crucial to ensure that those supplied with technology know how best to use it in their teaching and learning.

A summary of the analysis is presented in Table 39.

Table 39. Summary of the analysis

Category / Country	Education Policies related to ICT	Main Actors	Policy priority areas	ODA Top 3 Donors in Education Sector (USD millions)	Education Proportion in ODA
Cambodia	• *The Education Strategy Plan 2009-2013(ESP)* • *ICT-in-Education Master Plan 2009-2013*	• The Ministry of Education, Youth, and Sport (MoEYS) • The Open Institute • The Education Strategy Working Group (ESWG) and Joint Technical Working Group (JTWG)	• Ensuring Equitable Access to Education Services • Improving the Quality and Efficiency of Education Service • Institutional and Capacity Development for Educational Staff for Decentralization	• World Bank 20.356 • World Food Program 11.027 • European Union 8.8285	6% Education policy and admin. Management 1%; Education facilities and training 1% Primary education 1% Higher education 2%
Lao PDR	• *National ICT Policies Education Sector Development Framework 2009-2015*	• The Department of Information Technology • The Department of Telecom and Internet • Lao National Internet Committee (LANIC) • Ministry of Education and Sports (MOES)	(1) infrastructure and access; (2) enterprise and industry; (3) R&D; (4) applications; (5) HR development; (6) legal framework; (7) awareness; (8) poverty alleviation; and (9) standardization and localization.	• Japan 12.91 • ADB Special Funds 12.79 • Australia 5.98	4% Vocational training 1% Higher Education 3%
Myanmar	• *ICT Infrastructure Development* • *ICT Master Plan 2011-2015*	• Ministry of Communications, Information and Technology (MCIT) • Ministry Of Science and Technology	• Phone network • Fully-automatic switching system, and developing a fiber optic backbone network • Providing broadband and mobile Internet connections	• Japan 7.19 • United Kingdom 5.98 • EU Institutions 3.66	13% Primary education 5% Early childhood education 1% Vocational training 1% Higher education 4%
Thailand	• *Eleventh National Economic and Social Development Plan 2012-2016 (NESDP)* • *MICT Second National ICT Master Plan 2009-2013 (NICTMP)* • *MOE Master plan on ICTs in Education 2007-2011(MICTE)*	• Ministry of ICT (MICT) • Office of the Basic Education Commission (OBEC) Office of the Education Council (OEC)	• Unequal access to technology • Being creator of technology	• Japan 12.85 • Germany 12.66 • France 6.47	10% Education policy and admin. Management 1%; Primary education 1% Higher education 8%

Category \ Country	Education Policies related to ICT	Main Actors	Policy priority areas	ODA Top 3 Donors in Education Sector (USD millions)	Education Proportion in ODA
Viet Nam	*ICT in Education Plan (2001-2005)*	The Ministry of Education and Training (MOET)	• Improving familiarity with and training in ICT for students • Improving ICT use by teachers	• IDA 104.71 • ADB Special Funds 48.93 • France 45.51	4% Early childhood education 1% Vocational training 1% Higher education 3%
Malaysia	*Education Blueprint 2013-2025*	• Ministry of Education (MOE) • Multimedia Development Corporation (MDeC)	• Provide Internet access and virtual learning environment • Augment online content • Maximize use of ICT for distance and self-paced learning	• Japan 25.32 • Germany 9.49 • France 3.56	53% Education policy and admin. Management 3% Education facilities and training2% Vocational training 2% Higher education 45%
Indonesia	*Five-Year Action Plan for the Development and Implementation of ICT in Indonesia*	• Ministry of National Education of Indonesia (MoNE) • National Education Standards Agency (BSNP) • Indonesian National ICT Council (DeTIKNas) • Ministry of Communication and Information Technology (MCIT)	• Develop ICT networks • Use ICTs as an essential part of learning • Establish distance education programs • Facilitate the use of Internet	• Australia 92.37 • IDA 57.69 • Netherlands 50.17	10% Education policy and admin. Management 2% Education facilities and training2% Teacher training 1% Primary education 2% Higher education 2%
Singapore	*Third Master Plan for ICT in Education (mp3)2009-2014*	• Educational Technology Division (ETD) • Learning Partnership in Educational Technology Branch (LPET) • Media Design and Technologies for Learning (MDT)	• Strengthening the integration of ICT into learning process • Professional development of teachers • enriching and transforming the learning experiences through ICT		

The vast majority of ODA in the eight ASEAN countries is being used to fund economic infrastructure projects, with only a small fraction allocated for education. Almost 70 percent of overall ODA funding in education is apportioned to higher education, largely to the provision of scholarships for students to study abroad. Relatively little ODA is dedicated to secondary education, teacher training and vocational training, or to the use of ICT in education.

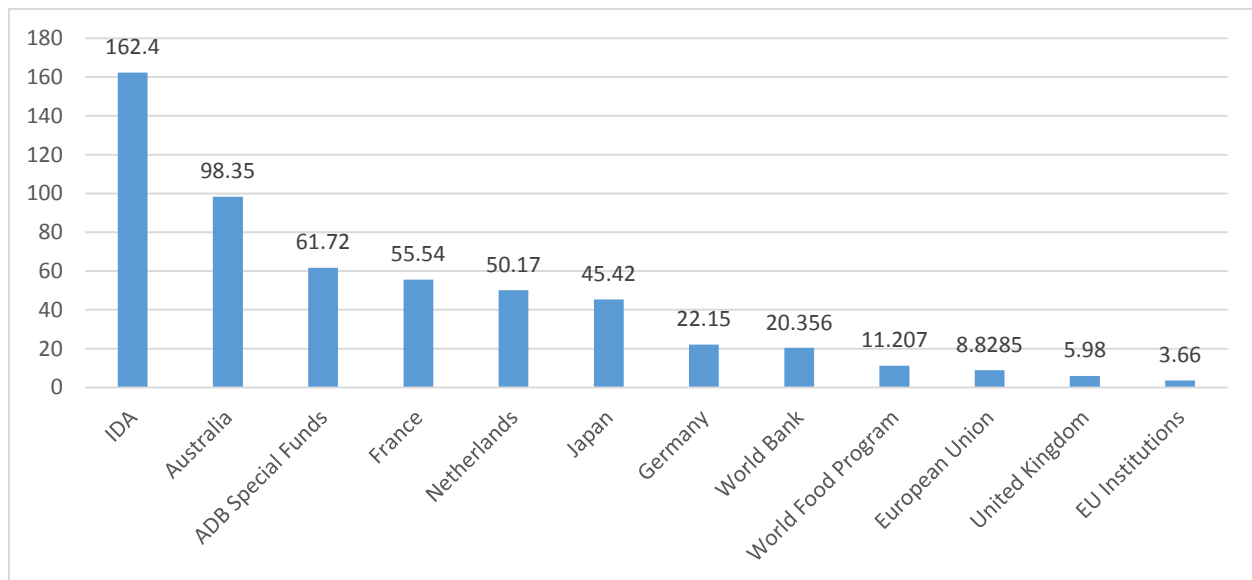**Table 40. ODA funding investment in the studied countries, by donor**

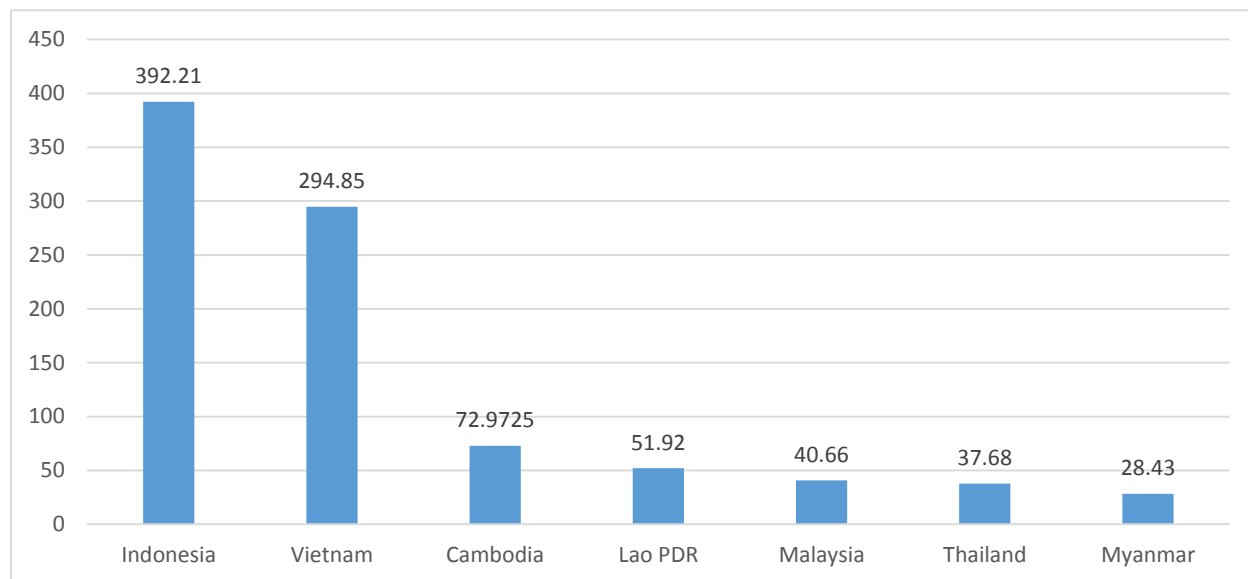**Table 41. 2010-2011 Total received ODA funding in the education sector, by country**

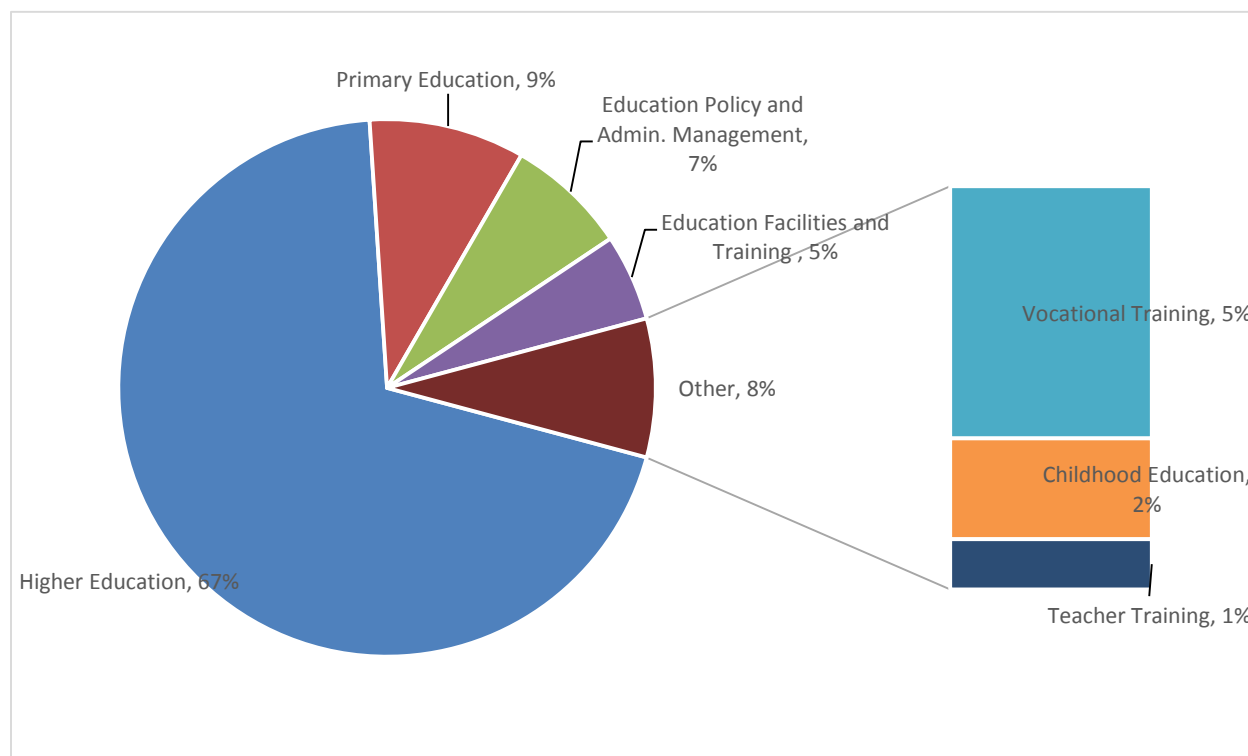**Table 42. Percentage ODA funding for each education sector**

Table 43. Net Official Development Assistance (Net ODA) in 2011

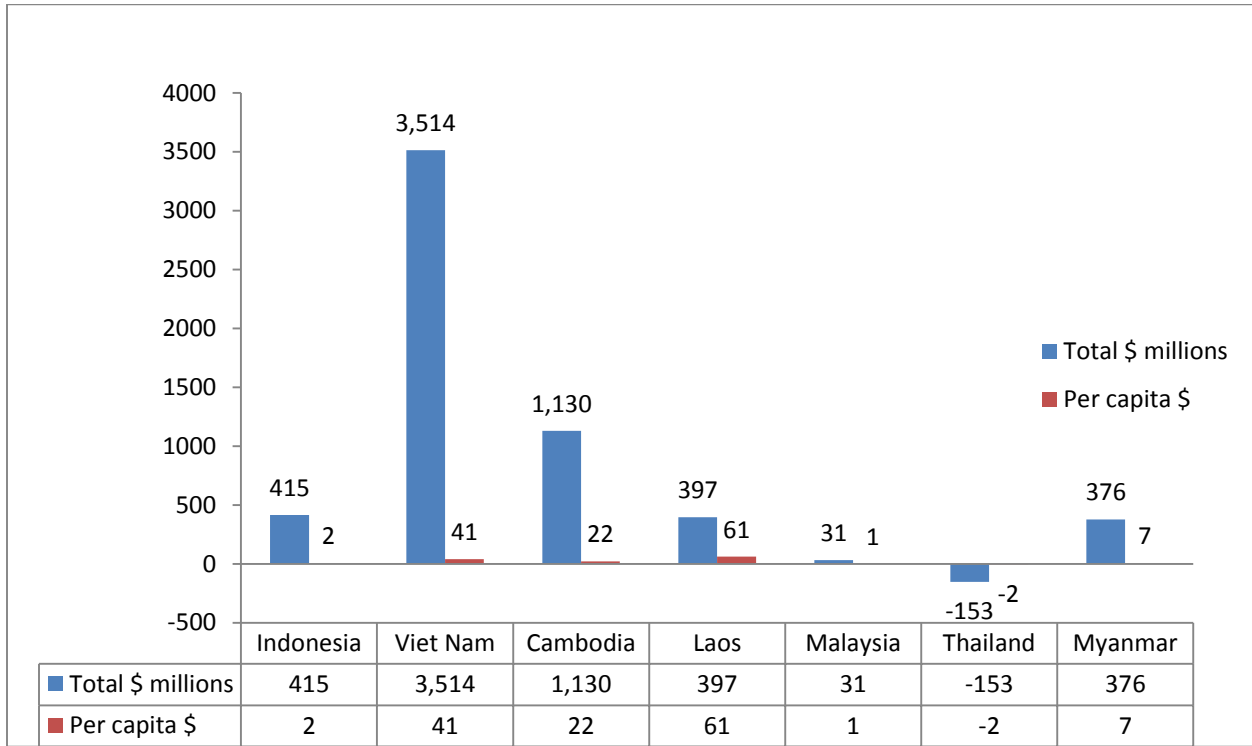|	Indonesia	Viet Nam	Cambodia	Laos	Malaysia	Thailand	Myanmar
Total $ millions	415	3,514	1,130	397	31	-153	376
Per capita $	2	41	22	61	1	-2	7

Table 43 indicated the net ODA received in 2011 by the seven ASEAN countries studied in this report, excluding Singapore. The total net ODA varies among those countries, with three largest recipient countries being Viet Nam (3,514 million USD), Cambodia (1,130 million USD) and Indonesia (415 million USD). Interestingly however, when it comes to ODA per capita, Lao PDR turns out to be the biggest recipient, 61 USD per person compared to 41 USD per person in Viet Nam. Not surprisingly, the net ODA in Malaysia and Thailand is relatively low, reflecting their progressive development and economy growth. Thailand showed a clear sign of shifting from a recipient to donor country in this data set.

Viet Nam is the only one among ASEAN countries, whose annual ODA amounts in 2011 has reached more than 3,000 USD million, mainly because Japan continues to provide a high level of aid to Viet Nam. Cambodia receives more than 1,000 USD million in net ODA in 2011 and the annual amount of ODA in the past three years remained relatively steady in Cambodia

With aid flow in education predominantly concerned with supporting access to quality primary education and the advancement of tertiary education, the integration of ICT into education is currently seen as a lesser priority and has not received substantial direct ODA funding. Notably, there have been relatively few programmes initiated by ODA donors directly targeting ICT in Education in recent years. The ADB, World Bank and JICA represent key actors who have supported ICT in Education programmes in ASEAN countries and have had significant impact.

Unless advanced technologies can demonstrate the objective of increasing access to quality education, they may not fall in the scope of ODA funding. Thus, the development of programmes to integrate advanced and experimental technologies into education is not being pursued in most ASEAN countries.

Conclusions

While comparative analysis of the kind undertaken in this publication is important to get an overall view of the situation in the ASEAN countries, it must be noted that each nation is of course on its own particular path for ICT development. The OTPC project initiated in Thailand, the priority placed on open-source technology by Viet Nam, and the Virtual Learning Environment implemented in Malaysia can each be assessed as being of value as they are each relevant to the particular cultural, geographical, historical and political contexts of their respective nations.

No nation should 'copy-and-paste' a master plan, evaluation criteria, or a teacher-training programme. Instead, every nation should first consider their needs and the available resources and ICT infrastructure when making plans to implement ICT in Education development programmes.

Singapore must think carefully about the role that ICT will play for its future economic plans, while Malaysia's lack of tangible success in PISA results serves as motivation for reflection. Indonesia, Thailand and Viet Nam may have slower rates in the spread of ICT infrastructure, but the large populations of these countries represent substantial markets for ICT in the future, provided that these countries are able to properly assess what is best for their own particular context. Cambodia and Lao PDR each have a long history of building relationships with international aid donors, and the nuances of each of these relationships are critical for future progress. Finally, the resurgent interest in Myanmar from foreign investors and development organizations provides a unique opportunity for the nation to experiment with a variety of specialized programmes.

To paraphrase a popular adage, when considering the state of ICT in Education across the region one should not wonder why the "grass is greener on the neighbour's side of the fence". Instead, it is necessary to consider what the unique conditions are in one's own backyard. Each nation that is serious about making real progress in the development of ICT in Education should look closely at its own conditions before making important choices around the scope and sequence of initiatives. Using international comparisons for inspiration and benchmarking is certainly valid, but the experiences of others cannot serve as a replacement for detailed analysis of the domestic situation.