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A policy and planning framework on information and communication technology for basic education in the Philippines

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ABSTRACT

Information and communication technology (ICT) is fast transforming economies and social processes, particularly the Philippine education sector. However, the sector is beset with technical, content, utilization, programmatic, structural and political issues that prevent it from fully tapping the potentials of ICT. An analysis of these issues points towards certain deficiencies in existing policies. The Department of Education needs to address the following policy gaps: an expanded definition of ICT; appropriate use; donor coordination and harmonization; and public-private sector partnership. This paper addresses these gaps with a recommended comprehensive Appropriate Use Policy on Information and Communication Technology for Education (ICT4E) for the Philippines. The proposed Appropriate Use Policy is based on a strategic planning and advocacy framework that resulted from a situation analysis of Philippine ICT4E. The paper presents the proposed Appropriate Use Policy as four policy instruments in the form of draft Department of Education Orders.

Keywords: edu*cational technology; developing countries; social appropriation of technology*

INTRODUCTION

Background

In the Philippines and elsewhere, there is an increasing recognition that the advent of new ICTs is transforming economies and social processes. ICT is indeed changing the corporate horizon. Its potential for catalyzing development in poor countries should be seriously considered as well (Okinawa Summit, 2000; The Chennai Statement, 2005). However, there are serious reservations about its applications in the development world, particularly on the basic education sector, considering its classification as high-end or “non-appropriate" technology (Flor, 2005). Nevertheless, valid arguments have been forwarded to underscore the significance of an explicit policy for ICT4E. This paper was prepared to formulate a responsive policy agenda for the Philippine basic education sector and to develop a framework for advocacy of this policy agenda.

Policy Gaps

There are a number of policy gaps in this area that the Department of Education needs to address:

Policy Gap 1. An Expanded Definition of ICT

Taking a cue from UN agencies, ICT4E in the Philippines should adopt an expanded liberal definition of ICT inclusive of both low-end and high-end technologies, digital and analog devices.

Policy Gap 2. An Appropriate Use Policy

With the adoption of the above definition, what logically follows is an Appropriate Use Policy that sets efficient and effective utilization guidelines for ICT with due consideration given to technological, ethical, proprietary and humanistic issues. The Policy should be considerate of the primary, secondary and higher order impact of specific technologies to be employed on individual stakeholder groups as well as communities. The use of technology should be guided by practicality, cost-effectiveness and sustainability.

Policy Gap 3. Donor Coordination and Harmonization

With the variety and diversity of ICT for education initiatives and donors, as well as their attendant interests, a donor coordination and harmonization policy may be in order. This policy begins with the tacit agreement that one unified framework should be adopted and that ICT initiatives in the Philippine education sector should be guided and situated accordingly by and within this framework.

Policy Gap 4. Public Private Sector Partnership

A policy on public-private sector partnerships for the ICT4E movement should be enforced. The private sector should be sensitized to the fact that supporting ICT4E is a long-term but solid investment for the ICT industry. This is based on the assumption that an information literate workforce will stimulate the demand for ICT products and services.

This paper validates all four policy gaps and recommends a comprehensive Appropriate Use Policy on ICT4E for the Philippines based on a strategic framework that resulted from nationwide stakeholder consultations.

SITUATION ANALYSIS

Rationale for ICT4E

The acronym ICT4E is a relatively recent derivative of the acronym ICT4D or information and communication technology for development. The term ICT, itself, is hardly a decade old. Before 1996, the term most prevalently in use was IT or information technology. Another earlier term used was telecommunications. There were three factors that influenced the shift from IT to ICT: firstly, the merger of information technology and telecommunications in the form of the Internet; secondly, the spawning of revolutionary applications based on the World Wide Web, which required expertise not generally associated with IT; and the increasing recognition that the advent of new IT is transforming social processes that are often classified under the gamut of communication.

The initial impact of ICT was felt in the corporate world in the nineties with the preponderance of ICT products and services, the dominance of Dot Com companies in the market, and the emergence of Microsoft founder, Bill Gates, as the world's richest man. Then in 2000, the Okinawa Summit of G10 Nations declared the potential of ICT for catalyzing upheavals in the development sector. However, there were and still are, serious reservations about its applications in developing countries considering its classification as high-end or non-appropriate technology (Flor, 2005). After all, how can one talk about connectivity in rural and remote areas in the Third World when electricity itself is lacking? How can one assume computer literacy when functional literacy itself is a problem?

Nevertheless, proponents of ICT4E have forwarded the following arguments:

Systems Argument

From the point of view of instructional systems, ICT is not merely an aid but a necessity in today's teaching-learning environment. Among the first to benefit from digital technologies were presentation and instructional media. ICT has become a necessary element in instructional systems and instructional design.

Technological Argument

From the point of view of sociologists and historians, we are now in the third major age of human civilization, the Information Age (Porat, 1978). This was preceded by the Industrial Age that began with the development of the steam engine and the Agricultural Age that began with the development of the plough. According to Machlup (as quoted in Porat, 1978), the Information Age was heralded by the invention of the computer and the launching of the first telecommunications satellite, Sputnik. In the Information Age, information has become the primary resource and ICT, a primary asset. Each and every aspect of our lives, including education, is being increasingly influenced by ICT.

Economic Argument

From the point of view of economists, that portion of the country's gross national product attributable to information-related activities is getting larger and larger (Porat, 1978; Jussawalla et al, 1989). The number of our information workers is also increasing while the number of agricultural and industrial workers is decreasing (Flor, 1986). In other words, the Philippine economy is getting to be more and more information-based. Thus, information and communication technology must become an integral part of the basic education curriculum and delivery. Otherwise, the products of our schools will not be able to compete in the world of work.

Environment for ICT4E

When ICTs first hit the limelight in the development arena during the nineties, one of its most logical areas of application was education. Historically, educational communication, in general, and instructional systems technology, in particular, have benefited immensely from the arrival of new ICTs compared with other development sub sectors. These benefits came as soon as the first PCs, laptops and digital presentation media were developed in the early eighties. Furthermore, with the advent of the World Wide Web, the marriage of computers and telecommunications offered an entire new range of possibilities to enhance the teaching-learning situation. Simultaneously, the realization that the world is turning into a global information society wherein information becomes the source of wealth and the most critical economic resource, has prompted development planners to support investments in ICT.

Based on the researcher's personal experience, the international development assistance community (composed of UN agencies, the World Bank, the Asian Development Bank, the EU and other bilateral aid agencies) has since been actively endorsing ICT as a thematic area that cuts across all sectoral concerns such as agriculture, health, the environment, and most especially, education. Thus, almost every development project proposed, funded and implemented contains an ICT component or element in the form of the design and development of information systems or the provision for public awareness employing digital tools.

Government policy and programs have also been quite supportive. To the Arroyo Administration's credit, a cabinet-level Commission on Information and Communication Technology has been

established. ICT programs in every line agency have been supported by the GAA and financial injections from international funding agencies and the private sector.

The education sector, particularly basic education, is no exception. Since 1999, almost every project designed and implemented, be it funded by multilateral financial institutions as a loan or by bilateral agencies as a grant, contains an ICT component (Lallana and Tan, 2006). Civil society has also been quite active in promoting ICT for education projects.

This supportive policy and program environment resulted in a situation that featured both advantages and disadvantages. Firstly, there are now several ongoing ICT4E initiatives coming from the international development assistance, government and private sectors. Secondly, this has spawned a wide array of stakeholders including industry, civil society, and even politicians. Attendant to this is the diversity of agendas, which may conflict at times in prioritization. Thirdly, an ICT framework has already evolved organically within the education sector. Lastly, there is a need to harmonize these initiatives and agendas to fit into an ICT framework.

CURRENT ICT INITIATIVES FOR PEDAGOGY

Presently, the Philippine education sector has a variety of ICT for Pedagogy initiatives.

DepED Computerization Program

Beginning in 1996, the Department of Education (DepED) embarked upon an undertaking that would provide computers to all public secondary schools in the country. Supported by the DepED's line budget (110 million pesos annually) as well as infusions from the Governments of Japan and the Republic of Korea, the DepED Computerization Program not only includes computerization and connectivity but also teacher professional development, technical training, content development, and strategic planning. FIT-ED (2005) reported that the program has succeeded by dramatically increasing computer penetration among public secondary schools in terms of geographic spread. Last year's penetration estimate was 60 to 75 percent. However, the number of computers supplied to these public secondary schools is small compared to the number of student-users. The average computer to student ratio is still quite low. From 2007 onwards, the Department has accelerated the program by increasing both the geographical spread of computerization and the number of computers for each school.

DTI PCs for Public Schools Project

Initiated by the Department of Trade and Industry and funded by the Government of Japan, public secondary schools are being supplied with ten to twenty PC units to equip their Computer Laboratories including the teachers' training component. This initiative started in 2002 and is still continuing.

Commission on ICT

The Commission on Information and Communication Technology *(CICT)* has been an active player in the ICT4E movement since its inception. It has launched several initiatives in collaboration with DepED such as: the Broadband Deployment Program, which intends to provide broadband access to public secondary schools and Community eCenters (CeC); the iSchools Program, which among other things, will provide computers and content for basic education to

Community eCenters; and the eSkwela Program, the nonformal or alternative learning system counterpart of iSchools.

BALS

As stated, the ICT4E movement logically covers the nonformal subsector. The Bureau of Alternative Learning Systems (BALS) has developed more than 500 modules, some in two languages (English and Filipino), distributed to ALS service providers in print and CD-ROM formats. Some modules are supplemented by audio and video materials that are made available in selected learning centers. Furthermore, pilot projects on radio-based instruction in support of the Accreditation and Equivalency (A&E) program are being conducted.

Regional Initiatives

Other ongoing programs have taken on a regional or subregional scale. These are the ASEAN SchoolNet Program and the APEC ICT Model School Network Project sponsored by the Association of Southeast Asian Nations and the Asia Pacific Economic Council, respectively. Both undertakings involve equipment provision, teachers' training, telecollaboration and exchange visits from the countries involved. DepED has actively participated in both.

CURRENT ICT INITIATIVES FOR TEACHER DEVELOPMENT

The following initiatives for ICT teacher development are currently being implemented:

CHED Standards for Undergraduate Teacher Education

Policy support for ICT4E has also come from the Commission on Higher Education with its Revised Policies and Standards for Undergraduate Teacher Education Curriculum. These standards provide for the inclusion of six units (two 3-unit courses) of education technology (mainly ICT) in the teacher education curriculum.

Commission on ICT

The iSchools- eSkwela - Community eCenter Project previously mentioned in the preceding section provides for the training of computer laboratory managers and selected teachers on a Web-based learning management system (LMS), the Web Board.

Intel Teach to the Future Program

Intel Technology Philippines Incorporated (ITPI) is contributing to ICT for teacher development through its Intel Teach to the Future Program (consisting of 10 modules on the use of ICT in teaching and learning). This undertaking is made up of three components: an Enhancement Workshop for Selected Regional and Master Trainers; Training for Master Trainers of Selected Schools; and an Administrators Strategic Planning Workshop of Selected Schools (i.e., effective and efficient management of technology environment in the school). The 80,000 public secondary school teacher-recipients of the Program were mainly from the DepED Computerization Program (Batches CY 1996 – 2002) and DTI PCs for Public Schools Project Batches 1 (CY 2002) & 2 (CY 2004), where the said teachers teach 20 other teachers (school-based training) after completion of their trainers training course.

World Links – FIT-ED Instructional Design Workshop

World Links (Philippines) and the Foundation for Information Technology for Education and Development (FIT-ED) is also implementing two training programs: Instructional Design Workshop on Web-enhanced Learning; and Teacher Training on Telecollaborative Learning.

Partners in Learning – PBSP

On the other hand, the Partners in Learning (PiL) and the Philippine Business for Social Progress (PBSP) have initiated the SMART Schools Program. Under SMART Schools, two teacher training courses are being conducted: the Teacher Resource Center Laboratory Technician Training; and the 21st Century Leadership Training on ICT for Education (ICT4E).

Incentives for outstanding teachers who have demonstrated best practices in using ICT in teaching and learning were in the form of Innovative Teachers Leadership Awards that included a PC unit for each national winner, participation in a team building course, and the top five national winners vying for top awards among ASEAN and APEC counterpart countries held in Singapore and in Seoul, Korea. Moreover, the "Potensyal", which is a national search for outstanding schools divisions, schools, and teachers who have exhibited leadership, innovation, openness to technology, and the drive to further school/ community empowerment, is an annual initiative by PiL through PBSP in support of the DepED's Schools First Initiative. Thus, the thirty finalist schools divisions (i.e., ten each from Luzon, Visayas, and Mindanao island groupings) received two million pesos each; while the top three schools divisions (i.e., one each from these island groupings) further received another ten million pesos for teacher training and technology support.

DepED – Oracle Database Technology Program

Recently Oracle Philippines extended assistance to DepED in terms of public-private linkage partnership in an 8-week online training of 60 teachers from 30 pilot secondary schools nationwide who are spending an average of 2 hours per week on teleconferencing with 24/7 on-call USA trainers, and an hour per weekday on user-friendly interactive web-based lessons/quizzes on topics such as database structure, design, modeling, programming, etc which the teachers later on can integrate in designing prototype lessons in TLE (Entrepreneurship) III & IV and Computer Science I & II for regular and science-oriented high schools, respectively.

This Database Technology Program culminates in a 5-day face-to-face (F2F) program in Makati High School where instructional design on web-enabled tryout database lessons will be the focus of sharing good practices and minds-on and hands-on learning experience.

CURRENT ICT INITIATIVES FOR GOVERNANCE AND ADMINISTRATION

The Department of Education is currently maintaining the Basic Education Information System (BEIS). In the design and development pipeline are the Management Information Resources System (MIRS); the Human Resources Information System (HRIS); and the Financial Information System (FIS). The BEIS, in particular, runs on a Microsoft Excel platform using a Visual Basic front-end. Data is provided by the national, regional, divisional, and district DepED offices. A team of computer science students from the Asia-Pacific College, Makati City, is currently designing the HRIS.

DepED maintains a website, www.deped.gov.ph, which addresses the information needs of internal users from the Department and external users from the public. Another service called the DEText is an interface of texting services with Web services.

Both systems are supplemented by the DepED Monitoring Network or MONET, which was developed and uploaded by the Partners in Learning and Microsoft Philippines. MONET provides a forum for organizational communication, horizontally, across offices and bureaus and vertically, across national, regional, divisional and district levels. Announcements, memoranda and updates are regular features of MONET. The Educational Information Division is the main client of the system.

Additionally, almost every project executed and implemented by the DepED and funded by the World Bank, the Asian Development Bank, USAID and AusAID has an ICT component. More often than not, the ICT component includes an MIS element that provides information service support to the specific project. To satisfy sustainability requirements, the project designs almost always specify an MIS, which may eventually be adopted by the Department. The Third Elementary Education Project (TEEP), for instance, has developed a sophisticated Web-based system powered by MSSQL that integrates learning management with administrative systems. The adoption of such a system by the Department, however, poses structural and policy issues that the design has failed to take into consideration. The fact remains, however, that many such "integrated" or centralized packages have been and are being developed for DepED and may, in fact, be used as modules should a service-oriented architecture (SOA) be adopted systemically. In SOAs, functionality is grouped around work processes and packaged as interoperable services, allowing different applications (such as learning management systems and student records databases) to exchange data with one another enabling a loose coupling of services with operating systems, programming languages and other technologies which underly applications (Newcomer and Lomow, 2005). SOA is ideal for large complex organizations that require a seamless integrated system but already have existing legacy systems, which have developed independently from one another. It would be most appropriate for DepED.

Strategic Framework Initiatives

With assistance from the NGO sector and the CICT, DepED has embarked on strategic planning for ICT4E. It may be said that this strategic plan has evolved organically within the Department, since its people provided the substance of the Plan.

NSPI. In 2004, a National Strategic Planning Initiative (NSPI) for ICTs in Basic Education was spearheaded by the Foundation for Information Technology for Education and Development (FITED), the Commission on ICT, and DepED. A series of consultative meetings involving the Bureau of Elementary Education, the Bureau of Secondary Education, and the Bureau of Alternative Learning Systems was conducted with resource persons coming from CICT and the ICT industry. The NSPI resulted in the National Framework Plan for ICTs in Basic Education (Tinio, 2005). The Plan was supposed to be submitted to then Secretary Butch Abad for endorsement. However, Secretary Abad's untimely resignation from the Department delayed immediate action on the Plan. Eventually, the Plan was formally transmitted in July 2005 to then OIC Secretary Ramon Bacani by: Dr. Fe Hidalgo, then Undersecretary for Programs and Projects; Dr. Emmanuel C. Lallana, CICT; and Ms. Victoria Tinio, Executive Director of FIT-ED.

Continuing Initiatives

Work on a strategic plan on ICTs for basic education did not stop with the official transmittal of the National Framework Plan. In October 2005, a Framework for an ICT Strategic Plan was drafted

by the DepED ICT Consultant based in the Technical Services Division and circulated among the staff of OPS.

The National Framework Plan itself went through a couple of transformations. It has been rehashed as the ICTs in Basic Education Framework Plan (2005-2010) then as the Master Plan for ICT in Basic Education (2006-2010) (Department of Education, 2005). The elements of a Strategic Framework for ICT4E presented herein were derived from these two documents. These elements include: the Vision and Mission Statements; the Goal Statement; the Strategic Thrusts; and the Programs. The elements have been situated within a Strategic Framework or StratFrame matrix.

Preliminary StratFrame

Table 1 provides the basic elements of a proposed ICT4E Strategic Framework that may be used both for advocacy and planning purposes subject to validation:

Table 1. *Preliminary StratFrame*

VISION/ MISSION STATEMENT	The Department of Education envisions an ICT-supported system of quality basic education for all. It is committed to the appropriate, effective, and sustainable use of ICTs to broaden access to and improve the quality and efficiency of basic education service delivery.	
GOAL STATEMENT	The overriding goal of ICT4E in the Philippines is to improve the efficiency of the education system, enhance the teaching-learning process and skills and ensure equity in basic education through the use of ICT.	
STRATEGIC THRUSTS	**STRATEGIES**	**PROGRAMS**
1. Use ICTs to broaden access to basic education	Strengthen the use of ICTs to improve delivery of ALS curriculum. Harness ICT resources of community to support ALS curriculum delivery. Deploy appropriate ICT equipment, hardware, peripherals, & connectivity for ICT-supported ALS to augment community resources. Conduct research & special studies on ICT-supported ALS.	Infrastructure Devt Curriculum/ Materials Staff Development M&E
2. Use ICTs to improve the quality of learning	Promote good practice in ICT-supported learning in basic education, in both the formal and alternative learning settings. Integrate ICTs into special basic education programs & projects, as appropriate. Provide ICT-enhanced learning resources for elementary & secondary schools & for alternative learning programs, when appropriate. Deploy appropriate ICT equipment, hardware, peripherals, & connectivity based on national guidelines for ICT integration & in support of ICT integration pilots. Develop national standards for ICT-supported learning. Conduct research and special studies on ICT-supported learning at the elementary and secondary school levels, as well as in alternative learning environments.	Infrastructure Devt Curriculum/ Materials Staff Development M&E
3. Use ICTs to enhance the quality of teaching	Develop ICT-supported professional development programs & ICT-based resources to enhance the subject area knowledge, pedagogical content knowledge, & learning management skills of teachers and instructional managers. Improve in-service training in ICT-curriculum integration. Provide systematic support for ICT-enhanced teaching at all levels. Include ICT competencies in formulation of National Competency Standards	Infrastructure Devt Curriculum/ Materials Staff Development M&E
4. Use ICTs to improve educational planning and management	Harness various forms of ICTs to improve communication w/in DepED & stakeholders. Design & implement overall ICT architecture to guide ICT systems selection & development. Augment ICT facilities for educational planning & management at all levels. Identify, develop, & deploy software applications that promote quality educational planning and management at the national, regional, division, and school levels. Develop and implement professional development programs on the appropriate and effective use of ICTs for educational administrators, non-teaching and support staff.	Infrastructure Devt Curriculum/ Materials Staff Development M&E

ISSUES AND CONCERNS

In spite of the developments described above, ICT4E in the Philippines faces a number of issues and concerns, some of which may be deemed contentious.

Technical Issues

Concerns that related to the technical aspects of ICT4E included: readiness; cost-effectiveness; and standardization.

Was the public school system ready for computerization? Perhaps this can be answered in the affirmative among the network of national high schools and science high schools in the country. But for the majority of public schools, particularly elementary schools in far-flung areas, readiness is still an issue. The inadequacy of the infrastructure is evident in the poor condition of classrooms, not to mention the lack of classrooms. The lack of utilities is evident in the lack of electricity in many areas, not to mention landlines for dial-up services. As of last count, 69 to 72 percent of public secondary schools now have computer facilities. But are these actively operational computer laboratories or merely glorified word processors used by teachers, or worse, office decorations kept under lock and key only to be gazed at and not used by learners?

Related to readiness is cost-effectiveness. Although hardware and bandwidth is getting cheaper by the day, software is getting more expensive. The combined costs of hardware, software, bandwidth and services is still relatively high vis a vis other educational products and services. The current per capita investment on basic education may have to be doubled to achieve widespread computer/ information literacy/fluency, something that cannot be possibly done in the foreseeable future given the current state of affairs. This is further complicated by the fact that the return on investment on ICT4E is neither tangible nor immediate.

A related issue is the bandwidth costs incurred by the DepED. Should DepED be utilizing commercial Internet service providers for its bandwidth when the larger portion of the spectrum for the Internet is non-commercial? Within this non-commercial spectrum is a backbone reserved for education and research. In the Philippines, this backbone is used by the Philippine Research and Education for Government Institutions Network administered by the Advanced Science and Technology Institute of the Department of Science and Technology. The backbone has been made available to the PREGINET through Asia Pacific Advanced Network (APAN).

APAN is a non-profit international consortium established in 1997 designed to be a high-performance network for research and development on next generation applications and services. APAN provides an advanced networking environment for the research and education community in the Asia-Pacific region, and promotes global collaboration. Its objectives are: to coordinate and promote research and development (R&D) activities on networking including technology, applications and services, and to provide an advanced networking environment for research and education communities in the Asia-Pacific region.

On the other hand, the Asian Internet Interconnection Initiatives (AI^3) is a regional research consortium among research institutes in the Asian region that aims to develop leading edge technologies for the Internet, such as the Internet Protocol Version 6 (IPv6), World Wide Web (WWW) caching and replication mechanisms, multimedia communication mechanisms, and applications for the advanced usage of the Internet.

Both consortia have access to the research and education Internet backbone allotted by the World Wide Web Consortium (W3C) for R&D, education, and distance learning use.

Lastly, under technical considerations, there is the issue of standards. The choice for the more common information technology applications such as office suites, databases and Web tools are ruled by de facto standards. With the clampdown on software piracy, these de facto standards

are costing fortunes for licensing and hardware key fees. However, running a giant of a bureaucracy such as DepED, which has a mandate over one of the most critical sectors in society, would require standards both for governance/ administration and for instruction. Should DepED adopt open source software versus proprietary software under its department-wide ICT4E standards? There are clearly advantages and disadvantages to each option. Proprietary software are perceived to be more stable, more user friendly, more readily available, more accessible to technical support, and more compatible with other systems. They are also more expensive. Open source software is cheaper, but is perceived to be less stable, less user-friendly, incompatible with most systems, and inaccessible to technical support. Clearly, a combination of open source and proprietary software may be considered as a viable option.

Content Issues

A more debatable issue is the need for content. A decade of ICT4D experience underscores such a need. Past investments on technology (i.e., hardware, software, connectivity) without content have many times led to systems unpopulated by data.

> *At the turn of the century (or the millennium, rather), there transpired a concerted effort among many forward-looking development agencies to build up their ICT infrastructure. Today, many of these agencies have their infrastructure in place, some employing multiple networks. However these networks run the risk of becoming electronic white elephants because there is not enough substantive content within them.*
>
> *During the First National Partners Meeting of the Philippine Research and Education Government Infrastructure Network (PREGINET), this concern was whispered among many of the participants who now had access to broadband and wireless technology but had comparatively little appropriate content to feed into their networks. Note that the Internet (the infrastructure) would not have flourished as much without the World Wide Web (Flor, 2003).*

Networks thrive on content. Without it, systems are useless. After the first decade of ICT4D, a major lesson learned by the development assistance sector, particularly the UN agencies and the World Bank, is that investments on content and capability building should be significantly larger than investments on infrastructure (Walsh as quoted in Flor and Kamol, 2006). According to some estimates, for every dollar invested on ICT4D, ten cents should go to infrastructure. Another ten cents should go to software. Still another ten cents should go to training. But the remaining 70 cents should be spent on content development.

On the other hand, there is a school-of-thought, Resource Based Learning (RBL) that submits that all the content that one would ever need may be found in the World Wide Web (http://www.city.londonmet.ac.uk/deliberations/rbl/index.html). As discussed in the previous section, some of the participants suggest that DepED should not invest in content development but more on instructional design. Given the current Web 2.0 paradigm, which espouses a philosophy of shared ownership, authorship, development and use of Web content, several institutions including the Massachusetts Institute of Technology, now adhere to the open courseware model (http://ocw.mit.edu/OcwWeb/web/home) and have uploaded entire curricular courseware and content in the Web for sharing. With the variety of high quality content available, the main task of today's instructional designer would be to identify available content and design curricula revolving around the existing resources instead of developing new content to build or populate new curricula.

Indeed, the World Wide Web is potentially the only source one would ever need for general information. For instance, one search engine alone, *Google*, claims to have access to sixteen billion Web pages as of December 2005. The challenge facing the learner is to navigate through

this maze of information. It has been argued that the instructional designer should assume the responsibility of facilitating/ guiding through this navigation instead of designing content.

Nevertheless, instructional design is part and parcel of curriculum development. In the same vein, identifying and collating Web pages, or compiling metadata, are part and parcel of content development. Hence, one cannot do away entirely with curriculum and content development in spite of the World Wide Web. In the same manner that one cannot do away with teaching guides in spite of the presence of textbooks in basic education.

Furthermore, there is the question of appropriateness of content. Does information contained in the Web conform to the standards and specifications of the approved Basic Education Curriculum? Is it suitable for the Filipino grade school or high school user? Is it packaged for learning purposes? These questions lead us to the next category of concerns.

Utilization Issues

Appropriateness is not only a content issue but a technology issue as well. A common inaccuracy among practitioners is to consider ICT as exclusively digital. And yet, historically, ICT ranges from low end to high end, from the analog to the digital.

The first educational communication technology project in the Philippines funded by the World Bank was the Communication Technology for Rural Education (Flor, 1995). The project made use of AM radio. Traditionally, communication technology referred to overhead, opaque and slide projection hardware, demonstration media, two-way radios, closed circuit television, small format video, and open broadcast radio and TV. Nowadays, it encompasses personal computers, cellular telephony, imaging technology, cable television, digital photography and videography. However, ICTs still encompass the older, more traditional media.

Given existing realities and imperatives, there are specific ICTs that are more appropriate in the Philippine rural setting. The current situation merits an acceptable use or appropriate use policy for ICT that situates a specific educational application within the low-end, high-end spectrum.

Program Issues

Then there are concerns related to current ICT4E program rationale and design. What are the determinants of the elements of a program design? Are these based on assessed needs or are these donor-driven? Are these determined by a social agenda or are they technology driven?

Many of the bilateral ICT4E projects currently being undertaken may indeed be described as technology driven or donor driven. They are not based on a prioritized listing of real or user-felt needs, but on a technology-provider's or donor's agenda. There is nothing wrong with such projects particularly if they are funded by grant money and not development loans. However, the relevance and sustainability of these undertakings would be immensely enhanced if the impetus for the project came from real and felt needs.

Structural Issues

The Department of Education, being one of the largest line departments in the government bureaucracy, is made up of several well-entrenched bureaus and offices. The three bureaus – the Bureau of Elementary Education, the Bureau of Secondary Education, and the Bureau of Alternative Learning Systems make up the largest complement in the Department, extending their line of authority from the national, to the regional, then to divisional and down to the district offices. Critics of DepED from Congress and civil society describe the bureaus as fiefdoms, whose operations follow a tradition-bound protocol having been least affected by decentralization and devolutionary initiatives of the government (Tinio, 2005). Bureaucracies have their merits such as

clear accountabilities and pronounced lines of authority. Unfortunately, however, they tend to undermine networking processes and principles.

Networks are the natural structures of living systems. And living systems perform three critical functions in order to survive: the exchange of materials; the exchange of energy; and the exchange of information (Talisayon, 1983). Organizations are considered as living systems and thus need uncluttered communication flows in order to survive. Information and communication networks provide such communication flows within the organization. But ideally, these information and communication networks should also be naturally-occurring or organic within DepED and should be parallel to the host organization's structure. Considering DepED's bureaucratic organizational structure, however, it may be expected that information and communication flows would become stymied as a consequence, instead of flowing freely horizontally, vertically and radially. Casual observation of communication flows within and among DepED bureaus support this argument. Information, be it in electronic form or otherwise, may flow freely from top to bottom, but the flow is hampered laterally as well as upwardly. This is particularly true with the case of memos from Undersecretaries, Assistant Secretaries and Bureau Directors. Section chiefs and unit heads would be copied into these memos but the rank and file is aware only of memos that pertain directly to them. Similarly, the Department's top management may not be aware of the most critical concerns of the rank and file (DepED, 2005).

One of the three prerequisites of knowledge management is an organizational culture conducive to information sharing and reuse (Leibmann as quoted in Flor, 2001). Does the DepED possess the organization readiness for information sharing and reuse? Without a change in its organizational culture supplemented by supportive policies, the answer would be a "No."

Political Issues

Related to structural issues are political issues. At present, ICT is mostly regarded as operational elements of individual offices instead of as a cross-cutting concern. Information units are lodged in several offices, independently functioning from one another. The Technical Services Division of the Office of the Secretary used to act as the lead unit but most of its staff has now been transferred to other offices. The DepED Rationalization Plan has not fully addressed this issue. Its pending implementation offers little prospects of improving the situation.

DepED is yet to establish an integrative platform or a coordinating office that is responsible for an overall ICT program. Given the situation, the tendency for key units and key players to compete for prominence and the furtherance of their respective agendas is but expected, considering the current ICT4E portfolio and the resources that are being infused into it particularly by external sources.

An immediate alternative would be to form a Departmental ICT4E working group that cuts across bureaus and offices. Such a body, called the ICT Technical Committee (ICT-TC), has been formed very recently. The ICT-TC is under the direct supervision of the Undersecretary for Programs and Projects with the following responsibilities:

1. recommend policies, standards and guidelines on the use of ICT in basic education;
2. conceptualize, implement, coordinate and monitor ICT programs and projects;
3. establish a database on ICT programs and projects;
4. conduct research and development studies on ICT in education;
5. evaluate ICT programs and projects proposed by other government organizations and non-government organizations, and recommend actions to be taken thereon; and
6. network with government and nongovernmental organizations on the implementation of ICT programs and projects in basic education.

Eventually, the ICT Technical Committee should be constituted a regular office within the DepED. An additional function of this proposed office will be to serve as a Clearinghouse for future ICT4E undertakings. As such, it may screen ICT4E projects to assess their priority and to see how and where they fit in the overall strategic framework. The clearinghouse may offer suggestions on how these projects may be redirected to ensure their relevance and sustainability and to ascertain that their impetus are not merely technology or donor driven. The office may be headed by DepED's "Information Czar," a position that requires at least an assistant secretary post. The proposal for this post was initially lodged by the World Bank-funded Third Elementary Education Project in 2002. The office will thus follow a model adopted by leading corporations and organizations, which employ a Chief Knowledge Officer or, as in the case of the Asian Development Bank, a Vice-President for Knowledge Management. It should be noted, however, that the proposed Information Czar would focus on ICT for governance and administration, not on ICT for pedagogy or teacher training.

POLICY AND PROGRAM OPTIONS

The preceding section discussed issues and stakeholder perceptions related to ICT4E. This section presents a set of policy and program responses to address the foregoing issues and concerns.

To review, technical issues revolve around concerns of readiness, cost-effectiveness and standardization. These concerns will be addressed by: formulating an Appropriate Use Policy for ICT based on relevance and sustainability; adopt a networking approach that enables the Department to tap networking synergies and avail of free bandwidth; and establish systems standards on ICTs for instruction, governance and administration. Content issues involve the choice between investments in content and investments in instructional design. A content development program should be implemented that enables the bureaus to make full use of available content without prejudice to the development of new content appropriate for the BEC.

Utilization issues concern the appropriate use of information and communication technology on a situation to situation or case to case basis. Again this will be addressed by adopting an Appropriate Use Policy based on an expanded definition of ICT. Program issues involve donor driven or technology driven projects, which may be remedied by the adoption of an ICT4E Strategic Framework and by formulating a Donor Coordination and Harmonization Policy.

Structural issues pertain to the organizational readiness of DepED for information sharing and reuse. The appropriate response to this concern is the adoption of a knowledge management approach. Finally, political issues revolve around the interfacing of agendas and overall coordination. This requires the establishment of an ICT4E Clearinghouse and the appointment of an Information Czar.

Table 2 provides a matrix of policy and program responses to the issues raised:

Table 2. *Policy and Program Response to Issues*

MAJOR ISSUES	SPECIFIC CONCERNS	POLICY AND PROGRAM RESPONSE
Technical Issues	Readiness Cost-effectiveness Standardization	Formulate an Appropriate Use Policy Adopt a Service Oriented Approach Establish Systems Standards
Content Issues	Content Development and Instructional Design	Adopt a Content Development Program
Utilization Issues	Coverage of ICT Appropriate use	Adopt an Expanded Coverage of ICT4E Formulate an Appropriate Use Policy
Program Issues	Donor driven projects Technology driven projects	Adopt an ICT4E Strategic Framework Formulate Donor Coordination Policy
Structural Issues	Organizational readiness	Adoption of Knowledge Management
Political Issues	Interfacing and coordination	Establish an ICT4E Clearinghouse Appoint an ICT Czar

Policy Response

Policy Response 1. Defining the Coverage of ICT4E

ICT refers to digital technologies (hardware, software, etc) that have resulted from the convergence of computers and telecommunications. By definition, the coverage of ICT does not include the array of conventional information or communication technologies that have been, are being, or may still be used. Although we cannot change the scope of ICT, we can take liberties with the acronym ICT4E to include conventional media.

Taking a cue from UN agencies, the ICT4E movement in the Philippines should define the coverage of ICT4E in the Philippines as inclusive of both low-end and high-end technologies, digital and analog devices. Thus, ICT4E will have elements of both the old and the new; the conventional and the sophisticated; the analog and the digital. Conventional media include analog AM and FM radio, VHF and UHF television, the print media, video, cinema, and indigenous communication media. Digital media cover mobile phones, personal computers, the Internet, email, imaging technology, digital audio-video, and digital broadcasts, even cable television (Flor, 2002).

Hence, for DepED's purposes the coverage of ICT4E would include as any tool or procedure - traditional or electronic, analog or digital, conventional or non-conventional - that contributes to pedagogy, teacher development, and the provision of educational services. Indeed, there may be a shift to full digital terrestrial TV and satellite radio in the future. However, some of these tools or procedures may never be classified as digital, such as indigenous media or hard-copy print media.

Policy Response 2. Appropriate Use Policy

With the adoption of the above definition, what logically follows is an Appropriate Use Policy that sets efficient and effective utilization guidelines for ICT4E with due consideration given to technological, ethical, proprietary and humanistic issues.

An "appropriate use" policy may be differentiated from the conventional "acceptable use" policy in the sense of "appropriate technology." The Policy should be considerate of the primary, secondary and higher order impact of specific technologies to be employed on individual stakeholder groups as well as communities. The use of technology should be guided by practicality, cost-effectiveness and sustainability. Other criteria that may be used in deciding which types of ICT solutions to use include: accessibility; replicability; dependence on electricity; durability; planned obsolescence.

Policy Response 3. Donor Coordination and Harmonization

ICT4E is a subset of ICT4D or information and communication technology for development. ICT is drastically changing the development assistance environment in terms of donor thrusts and implementation guidelines. Basic education should exploit this environment by coordinating and harmonizing donor's initiatives and situating these within a coherent framework that best serves the education sector.

With the variety and diversity of ICT4E initiatives and donors, with their attendant interests, a donor coordination and harmonization policy should be implemented by DepED to make it more adept in exploiting opportunities for cost-effective use of ICT. This policy begins with the tacit agreement that one unified framework should be adopted and that ICT initiatives in the education sector should be guided and situated accordingly by and within this framework. A DepED ICT Clearinghouse should be established to enforce the coordination and harmonization policy. The Clearinghouse may be staffed by the members of the current DepED ICT technical working group and will be chaired by a DepED Information Czar who may occupy an Assistant Secretary's position in the Department's organizational hierarchy.

Policy Response 4. Public Private Sector Financing

A policy on public-private sector financing for the ICT4E movement should be enforced. The private sector should be sensitized to the fact that supporting ICT4E would pump prime the ICT industry. This is based on the assumption that an information literate workforce will stimulate the demand for ICT products and services.

CONCLUSIONS AND RECOMMENDATIONS

Based on the preceding analysis, this paper concludes that indeed, ICT4E programs tend to be technology driven and donor driven. However, social realities necessitate appropriate use. The current thinking, decision-making and institutional actions on ICT for basic education has not been based on specific and explicit policies nor are these guided by a coherent framework or plan to address these social realities.

In spite of dynamic and fast-paced developments in ICT4E, it is a relatively new concern. Thus, the Department of Education has not had the opportunity to adopt an explicit policy or strategy on ICT4E nor has it established an office to coordinate activities within its scope. Except for those initiated by the Commission of Information and Communication Technology for DepED, much of the prevailing initiatives on ICT4E is either technology-driven or donor driven.

Understandably, there is a distinct sense of urgency among ICT4E champions for DepED to chart a definite direction and to adopt a strategic framework. There are now several ongoing ICT4E initiatives coming from the international development assistance, government and private sectors spawning a wide array of stakeholders including industry, civil society, and even politicians.

The National Framework Plan for ICT in Basic Education (Tinio, 2005) states that the transformative power of ICT is more likely to be realized when it is introduced in the context of radical system-wide reform. In the same manner, the optimum approach for using ICT as a delivery mode is through learning management systems (LMS) instead of using it on a piecemeal basis. ICT components bundled up in a system, profit from the synergy produced by operating from one digital platform. For instance, the whole Microsoft Office Suite is greater than the sum of its parts primarily because each application's output can be used/ imported/ embedded by other applications within the Suite. Bundling indeed produces greater value since this is a prime characteristic of systems as provided for in General Systems Theory (Kincaid as quoted in Flor, 1986).

As to approaches in content development and utilization, the selection criteria are relevance and contextualization. Furthermore, the development of ICT systems has always followed an evolutionary prototyping approach, not experimentation and trials.

So far, much of DepED's expenditures on ICT have been allotted to equipment procurement. A more strategic approach for DepED is to allocate and use its available resources for institutional strengthening or capacity building on managing ICT4E.

Institutional Strengthening of the DepED

Institutional strengthening for ICT4E at DepED should follow a two-pronged approach: programmatic and structural. Programmatic refers to the charting of directions and adopting specific policies and plans leading to strategic goals.

Adoption of a Revised Strategic Planning and Advocacy Framework

The major elements of a strategic framework are: the vision statement; the mission statement; the goals, the strategic thrusts; and program priorities. As gleaned from the preceding situation analysis, a strategic plan for ICT in basic education has already evolved organically within the Department of Education (Tinio, 2005). Since the development of strategic frameworks form the initial stage in the design of strategic plans, it may be said that the ICT4E strategic framework has already found grounding in the National Initiative for Strategic Planning for ICTs in Basic Education.

Hence, some of the critical elements of the ICT4E strategic framework have already been endorsed in past consultative meetings organized under NISP. These include the vision and mission statements (Tinio, 2005), the goal and the strategic thrusts (Department of Education, 2006). With regard to the latter, it is recognized that the thrusts should closely correspond with the overall strategic thrusts of the DepED.

Mission and Vision Statements. The mission and vision statements came from the National Framework Plan for ICT in Basic Education (Tinio, 2005). It was slightly refined during the validation process to read as follows:

> *The Department of Education envisions an ICT-supported system of quality basic education for all. It is committed to the appropriate, effective, and sustainable use of ICTs*

> *to achieve nationwide information fluency and broaden equal access to and improve the quality, equity and efficiency of basic education service delivery for all.*

It should be noted that the mission and vision statements focus on the provision of quality as well as to appropriate, effective and sustainable utilization of ICT. It is consistent with the language used in Education for All as well.

Goal Statement. The goal statement initially lifted from the Master Plan for ICT in Basic Education (Department of Education, 2006) was changed to the following:

> *The overriding goal of ICT4E in the Philippines is to transform the teaching-learning landscape through: computerization of all DepED workflows at the national, regional, divisional, district, and school levels; seventy percent connectivity among all public schools by 2010; seventy percent information fluency among basic education graduates; and one hundred percent information fluency and ICT literacy among school teachers all of which will be achieved by 2010.*

It should be noted that the new goal statement has concrete and time-bound targets as suggested by the participants in the validation workshops.

Strategic Thrusts. The strategic thrusts closely correspond to the overall thrusts of DepED: broaden access; improve quality of learning; improve quality of teaching; and improve planning and management. Thus:

Strategic Thrusts 1. Use ICTs to broaden access to basic education. This thrust employs the following specific strategies reordered as per suggestion of key stakeholders:

1. Deploy appropriate ICT equipment, hardware, peripherals & connectivity for basic education including ALS
2. Harness ICT resources of community to support basic education curriculum delivery.
3. Strengthen the use of ICTs to improve basic education.
4. Conduct research & special studies on ICT-supported basic education delivery systems.

Strategic Thrusts 2. Use ICTs to enhance the quality of learning. Under this thrust are six strategies:

1. Promote good practice in ICT-supported learning in basic education, in both the formal and the alternative learning settings.
2. Integrate ICTs into basic education programs and projects, as appropriate.
3. Provide ICT-enhanced learning resources for elementary and secondary schools and for alternative learning programs, when appropriate.
4. Deploy appropriate ICT equipment, hardware, peripherals, and connectivity based on national guidelines for ICT integration and in support of ICT integration pilots.
5. Develop national standards for ICT-supported learning.
6. Conduct research and special studies on ICT-supported learning at the elementary and secondary school levels, as well as in alternative learning environments.

Strategic Thrusts 3. Use ICTs to enhance the quality of teaching. This thrust involves the following strategies, likewise reordered as per suggestion:

1. Provide systematic support for ICT-enhanced teaching at all levels.
2. Improve in-service training in ICT-curriculum integration.
3. Develop ICT-supported professional development programs & ICT-based resources to enhance the subject area knowledge, pedagogical content knowledge, & learning management skills of teachers and learning managers.

4. Use ICTs to enhance the quality of teaching
5. Include ICT competencies in formulation of National Competency Standards

Strategic Thrusts 4. Use ICTs to improve educational planning and management. Lastly, this thrust involves the following specific strategies, logically reordered by the validation workshop participants:

1. Design & implement overall ICT architecture to guide ICT systems selection & development.
2. Identify, develop, & deploy software applications that promote quality educational planning and management at the national, regional, division, district, and school levels.
3. Harness various forms of ICTs to improve communication w/in DepED & stakeholders.
4. Use ICTs to improve educational planning and management
5. Augment ICT facilities for educational planning & management at all levels.
6. Develop and implement professional development programs on the appropriate and effective use of ICTs for educational administrators, non-teaching and support staff.

*Revised StratFrame***.** Found below as Table 3 is the proposed ICT4E StratFrame Matrix: incorporating the proposed changes in the elements of the framework as well as an additional columns for proposed policy instruments. Hopefully, the Strategic Framework for ICT4E would serve as the platform for the New Master Plan for ICT in Basic Education and would guide future planning undertakings. It may also serve as a frame of reference from whence future ICT4E projects may be situated.

VISION/ MISSION STATEMENT	The Department of Education envisions an ICT-supported system of quality basic education for all. It is committed to the appropriate, effective, and sustainable use of ICTs to achieve nationwide information fluency and broaden equal access to and improve the quality, equity and efficiency of basic education service delivery for all.		
GOAL STATEMENT	The overriding goal of ICT4E in the Philippines is to transform the teaching-learning landscape through: computerization of all DepED workflows at the national, regional and district levels by 2015; seventy percent connectivity among all public schools by 2015; seventy percent computer literacy among basic education graduates by 2015; and ninety percent information fluency and computer literacy among school teachers all of which will be achieved by 2015.		
PARAMETERS/ STRATEGIC THRUSTS	**STRATEGIES**	**POLICY INSTRUMENTS**	**STRATEGIC FOCUS**
1. **ICT for Pedagogy**. Use ICTs to broaden access to basic education	Deploy appropriate ICT equipment, hardware, peripherals & connectivity for basic education including ALS Harness ICT resources of community to support basic education curriculum delivery. Strengthen the use of ICTs to improve basic education. Conduct research & special studies on ICT-supported basic education delivery systems	Defining ICT4E scope Appropriate use Public-private sector financing	Strategic targeting Upscale CICT pilots
2. **ICT for Pedagogy** Use ICTs to improve the quality of learning	Promote good practice in ICT-supported learning in basic education, in both the formal and alternative learning settings. Integrate ICTs into basic education programs & projects, as appropriate. Provide ICT-enhanced learning resources for elementary & secondary schools & for alternative learning programs, when appropriate. Deploy appropriate ICT equipment, hardware, peripherals, & connectivity based on national guidelines for ICT integration & in support of ICT integration pilots. Develop national standards for ICT-supported learning. Conduct research and special studies on ICT-supported learning at the elementary and secondary school levels, as well as in alternative learning environments.	Defining ICT4E scope Appropriate use Public-private sector financing	Strategic targeting Upscale CICT pilots Expand ASEAN/ APEC participation eLearning viability
3. **ICT for Teacher Development.** Use ICTs to enhance the quality of teaching	Provide systematic support for ICT-enhanced teaching at all levels. Improve in-service training in ICT-curriculum integration. Develop ICT-supported professional development programs & ICT-based resources to enhance the subject area knowledge, pedagogical content knowledge, & learning management skills of teachers and instructional managers. Use ICTs to enhance the quality of teaching Include ICT competencies in formulation of National Competency Standards	Appropriate use Public-private sector financing	Develop standards Strategic targeting Upscale CICT pilots
4. **ICT for Governance and Management.** Use ICTs to improve educational planning and management	Design & implement overall ICT architecture to guide ICT systems selection & development. Identify, develop, & deploy software applications that promote quality educational planning and management at the national, regional, division, and school levels. Harness various forms of ICTs to improve communication w/in DepED & stakeholders. Use ICTs to improve educational planning and management Augment ICT facilities for educational planning & management at all levels. Develop and implement professional development programs on the appropriate and effective use of ICTs for educational administrators, non-teaching and support staff.	Appropriate Use Public-private sector financing Donor coordination	Develop/ Upscale databases Explore use of TEEP modules Invest in M&C Invest in KM feasibility study

Table 3. *Proposed StratFrame for Planning and Advocacy*

Establish Mechanisms

Institutional strengthening of DepED on ICT4E does not involve merely programmatic interventions but structural interventions as well. The mechanisms for ICT4E should be well-established within DepED. We learned in the preceding analysis that at present, a Technical Committee takes charge of the ICT for basic education. There is no one office, center or unit directly responsible and mandated for this. At the regional and provincial levels, ICT Coordinators have been designated as additional assignments.

This strategy paper recommends that the ICT Technical Committee and the designated ICT Coordinators be formalized into an ICT Center or Clearinghouse that would initially perform the functions outlined for the ICT-TC, i.e., to recommend policies, standards and guidelines on the use of ICT in basic education; to conceptualize, implement, coordinate and monitor ICT programs and projects; to establish a database on ICT programs and projects; to conduct research and development studies on ICT in education; to evaluate ICT programs and projects proposed by other government organizations and non-government organizations, and recommend actions to be taken thereon; and to network with government and nongovernmental organizations on the implementation of ICT programs and projects in basic education.

ICT for Pedagogy

The key features of ICT that make this class of technologies important to basic education in the Philippines are: its ability to transcend geographical barriers; its novelty, particularly in remote and rural areas; its versatility; its ability to replicate materials at almost no cost; and its programming languages. The lack of classrooms in remote and rural areas may be remedied by ICT delivery modes, i.e., distance learning. The cost of reproduction of audio-visual aids will be drastically lowered with the use of ICT-generated and projected materials.

Computer Literacy

Computer literacy is the ability to communicate with computers. It is the capacity to operate computer hardware and run computer software. Information literacy, on the other hand, is the ability to use the wide range of information tools as well as primary sources in modeling information solutions to problems encountered (Zurkowski, 1974). People trained in the application of information resources to their work are information literates. Information literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." Information literacy competency focuses on five broad abilities: to recognize the need for information; to know how to access information; to understand how to evaluate information; to know how to synthesize information; and to be able to communicate information (Isbell and Hammond 1993). Once a moderate degree of information literacy is attained, an individual is said to be information fluent.

Significance and Relation to Other Basic Skills

Computer literacy is an aid to both functional literacy and numeracy and thus leads to the fulfillment of other learning objectives. In other words, it has become a basic competency that an individual is supposed to acquire in order to progress up the ladder of formal education and to the world of work. Given the new learning environment and the global workplace, computer literacy is an essential skill.

Current Approaches

The current approaches to acquiring computer literacy are: self-study; enrollment in formal and nonformal courses on the most common computer applications (i.e., word processing,

spreadsheets, databases and presentations); and the integration of courses on computer applications into the basic education curriculum.

Cost Effectiveness within the Philippine Setting

With access to the appropriate hardware/ software and with the adequate incentives to learn, the most cost-effective approach to computer literacy is self-study. Without these pre-conditions, however, integrating computer applications into the basic education curriculum is inescapable, especially if the Philippines intend to make its workforce globally competitive.

Specific Recommendations

Given the preceding analyses, the following specific recommendations on ICT for Pedagogy are forwarded:

Firstly, the DepED Computerization Program inclusive of the DTI PCs for Public Schools Project should shift to strategic targeting. Beneficiaries of these programs should be prioritized in the following order: regional science and science-oriented high schools; special education schools; voc-tech schools; national high schools; and, finally, public elementary schools. Regional DepED offices should prioritize beneficiary provinces.

Secondly, Commission on ICT pilot projects on ICT for basic education should be upscaled. These initiatives include iSchools, eSkwela, and Community eCenters. CICT has recently prepared a Consolidated Proposal for the 2006 ICT4BE Program. DepED need not invest into the activities enumerated under this proposal since funding will be made available under the eGovernment Fund Request. However, it should coordinate closely with CICT and invest in the upscaling of the aforementioned projects on a strategic targeting basis nationwide.

Thirdly, participation in the ASEAN SchoolNet and APEC ICT Model School Network Project should be expanded. This is deemed strategic since costs are minimal and impact is significant in terms of attracting foreign assistance.

Lastly, DepED should invest on a feasibility study of eLearning for basic education.

ICT for Teacher Development

A computer literate workforce can only be produced by an information and computer literate teaching complement. Currently, we may situate the Intel Teach to the Future Project, World Links and FIT-ED's teacher training courses, the PiL-PBSP SMART Schools initiative and the CICT Web Board under ICT for Teacher Development. A unified curriculum participated in by these stakeholders should be compiled.

ICT and the Teaching Profession

Teachers should adopt ICT not only as a tool for teaching and as a subject matter area to teach but as a means for professional development as well. As the CHED minimum standards for teacher education provides, computer literacy is a must in the teaching profession. The minimum level and scope of computer proficiency appropriate for teachers would be limited to the following applications: word processing; desktop publishing; spreadsheets; presentations; messaging and collaboration; and Web browsing. Intermediate skills should include: database applications; online teaching and facilitation; and multimedia skills. Advanced skills involve: programming; and hardware maintenance.

Teacher Training

Teachers should acquire this proficiency by: self-learning; short-term training; and enrolling in formal and nonformal computer courses, including courses offered in the distance mode. A targeted approach to teacher development on ICT involving all three methods should be implemented first involving teachers from regional science and science-oriented high schools and special education schools, followed by voc-tech high schools, national high schools, and then public elementary schools.

Teacher Training Needs

During the regional validation workshops, the following teacher training needs surfaced: basic computer applications; Web browsing; and the design, development and utilization of ICT-enhanced instructional materials. It was likewise apparent that much of the ICT teacher training currently being undertaken does not consider the entire basic educational teaching complement as a system with strategic nodes. Teachers who may generate the most multiplier effect are not targeted.

ICT for Pedagogy and Teacher Training

In this case, it should also be underscored that the transformative power of ICT is more likely to be realized when it is introduced in the context of radical system-wide reform. ICT for teacher development should be linked with ICT for pedagogy so that one will draw synergy from the other. Thus a systems approach to ICT4E is more strategic and cost-effective in the long run.

Specific Recommendations

Given the preceding analyses, the following specific recommendations on ICT for Teacher Development are forwarded:

Firstly, the CHED standards for pre-service teacher education should be fully enforced. Furthermore, DepED should invest in the development and implementation of National ICT Competency Standards for Teachers. DepED should dovetail CICT efforts along this line.

Secondly, DepED should shift to *targeted* participation in: Intel Teach to the Future Program; World Links – FIT-ED Instructional Design Workshop; Partners in Learning – PBSP TRCL Technician Training/ Leadership Training on ICT4E; and CICT Web board Training.

ICT for Governance and Management

ICT for Governance and Management brings together all past, present and future initiatives dealing with the improvement of management and the provision of educational support services. Situated under this program are the BEIS, MRIS, the FIS, and the HRIS. As mentioned in the earlier part of this document, information and communications technology will provide major benefits to DepED as an organization, in particular, and the education sector, in general, by contributing to: efficiency of operations; transparency of transactions; speed of service provision; effectiveness of evaluation; and accuracy of advocacy thrusts.

Integrating ICT in DepED's Institutional Development

ICT cuts across all horizontal and vertical dimensions of operations and it should be integrated in all aspects of the organization. ICT should support a decentralized decision-making process by providing the communication infrastructure within the organization. From a functional standpoint, DepED should acquire the following capacities: systems maintenance; messaging and collaboration; database applications; Web browsing and publishing; documents management. It may outsource: systems design and development; content development; and multimedia

production. More importantly, DepED's capability to manage and coordinate ICT4E should be built and strengthened.

ICT for School-Based Management, Quality Assurance and Budget Reform

School-based management would profit immensely from: database applications; sharing and reuse of instructional materials; template provision and assessment of School Improvement Plans; and messaging and collaboration. Quality assurance may also be enhanced by: database management; messaging and collaboration. Similarly, budget reform may be supported by: computerization of financial records and transactions leading to transparency; and monitoring and evaluation systems.

Prioritizing Applications

Once again, it should be stressed that the transformative power of ICT is more likely to be realized when it is introduced in the context of radical system-wide reform. Information systems should be integrated rather than fragmented. Prioritizing applications may not be advisable since by nature, information systems profit most from the synergy produced by parallel applications and networks. However, a sequencing of system modules may be followed.

Build up Strategy

The "build-up" strategy should not be on a piecemeal, component or modular basis but on a targeting and scale basis. The first step is to conduct an information resources audit of the entire DepED. This study will reveal the existing information resources, knowledge resources and systems availability. This activity will take from three to six months beginning with the conduct of a survey administered in all DepED bureaus at all levels. The available resources and systems should be analyzed and configured for integration.

Existing systems that are deemed useful such as the Basic Education Information System should be upgraded and upscaled. The Management Resources Information Systems (MRIS), the Human Resources Information System (HRIS), and the Financial Information System (FIS) should be designed, developed and tested. The implementation of these systems should follow an evolutionary prototyping approach beginning with alpha versions and beta release versions. Modules developed by projects such as the Third Elementary Education Project should be reassessed for possible use in the above.

Employing a service oriented architecture, the interfacing or integration of these diverse systems should then be explored without disrupting existing systems operations. Finally the capability of DepED offices for data entry, use and maintenance of both modular and integrated systems should be built beginning with the national down to the provincial, district, divisional and school levels.

Linking ICT for Pedagogy, Teacher Training, Governance and Management

ICT for pedagogy and teacher training should be integrated with ICT for governance and management. We recommend an integrated system employing service-oriented architecture (SOA) that links learning management systems with management information systems (Newcomer and Lomow, 2005).

ICT for Governance and Management should cover not only monitoring and evaluation but the entire gamut of concerns under ICT for governance and administration. The DepED itself is one of the largest bureaucracies in the public sector with the attendant tendencies for paper trails, inefficiencies and corruption. An integrated system may address these problems leading to: a paperless office; transparency of transactions; efficiency of operations; speed of service provision;

and effectiveness of evaluation. This brings us to the current debate about the merits and demerits of an integrated system.

Many of the information systems adopted by offices within DepED have developed independently from one another. For instance, the payroll and procurement system has very little to do with the Basic Education Information System. Obviously, scrapping these systems in favor of a newly designed integrated system would not be an option considering the expense that was put into these so-called legacy systems. Furthermore, they are still being actively utilized. The situation requires a solution that would interface these fragmented systems without disrupting them. In other words, we are proposing a service-oriented architecture (SOA) that makes use of data warehousing (Newcomer and Lomow, 2005). Additionally, this meta-system should go beyond the provision of information but should focus on knowledge management. The knowledge management approach provides material and non-material incentives for information sharing and reuse, thereby transforming the organizational culture of DepED.

ICT and DepED's Institutional Culture

Corporate cultures have indeed changed because of the interplay of quality assurance, knowledge and ICT. This interplay is known as knowledge management or KM. DepED's institutional culture may be changed by KM transforming it into a genuine knowledge organization.

Specific Recommendations

Given the preceding analyses, the following specific recommendations on ICT for Governance and Management are forwarded:

Firstly, DepED should develop, upgrade or upscale its planned or current databases: the Basic Education Information System; the Management Information Resources System; the Human Resources Information System; and the Financial Information System. It should upgrade and upscale DEText, www.deped.gov.ph, and PiL/ Microsoft Monitoring Network (MONET).

Secondly, DepED should explore the utilization of system modules that developed by the Third Elementary Education Project.

Thirdly, DepED should invest in a department-wide Messaging and Collaboration Module to achieve a "paperless bureaucracy."

Lastly, DepED should invest in a feasibility study for an integrated Knowledge Management System. This study would involve the technical viability and organizational acceptability of such a system. The technical design of such a system should employ a service-oriented architecture (Newcomer and Lomow, 2005).

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