REPUBLIC OF THE MARSHALL ISLANDS
MINISTRY OF EDUCATION
COMPREHENSIVE TECHNOLOGY PLAN

Submitted to:
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The Republic of the Marshall Islands (RMI) Ministry of Education (MOE) has the responsibility of providing young people across the nation with opportunities for basic education and to pursue both secondary and tertiary education. The MOE operates 77 elementary schools and 6 high schools to meet this responsibility. The RMI is committed to providing high quality education that responds to the needs of its young people.

As the RMI moves toward being a globally connected and information based society, the MOE has a responsibility to prepare the Republic's young people with the 21st Century skills necessary to be successful contributing members of society locally, within the Pacific region, and globally. These include problem solving, and the ability to participate in a global technology-based community as well as cultural competencies, language skills, mathematics, science, etc. The MOE also strives to improve its own effectiveness by taking advantage of the "best available" communications and technology tools.

The MOE envisions schools becoming an environment where all students and staff have ready access to the "best available" range of current technology, software tools, and applications. These schools will be places where students are engaged in a challenging curriculum and are comfortable using technology to contribute to and enrich their learning. A community where teachers have the knowledge and skills to integrate technology into a challenging and interdisciplinary curriculum which addresses students' specific needs, developmental levels and learning styles, and use technology to support learning across the curriculum. All administrators, teachers, and other Ministry staff will use technology on a regular basis to effectively help students attain high standards and prepare for tomorrow's world of work.

The MOE Comprehensive Technology Plan (MOECTP) serves as a road map for achieving this vision by 2015. The goals for technology within the RMI MOE include students, teachers, school leaders, MOE Headquarters (HQ) staff and the MOE "overall." The five goals are:

Goal 1. <u>Students:</u> All students in the RMI are technologically literate.

Goal 2. <u>Teachers:</u> All teachers in the RMI are technologically literate and have the knowledge and skills necessary use technology to broaden and enrich the learning experiences of their students as well as to further their own learning.

Goal 3. <u>School Leaders:</u> All school leaders are technologically literate and have the knowledge and skills to lead efforts to enhance teaching and learning through the effective use of the "best-available" technologies and increase management efficiencies.

Goal 4. <u>Ministry of Education Staff</u>: All staff at the MOE HQ are technologically literate and have the knowledge and skills needed to use technology in the course carrying out their job functions.

Goal 5. <u>Ministry of Education: Overall</u>: The Ministry reflects a 21st Century organization and supports its schools in providing a technology-enhanced management, teaching and learning.

The MOE is committed to facing and successfully addressing the many challenges before it as it undertakes implementation of the MOECTP. While all of the high schools and National Vocational Training Institute (NVTI) have electricity, computer labs, and some degree of Internet connectivity, elementary schools are very diverse. Although 61% of the elementary students live on either Majuro or Ebeye, approximately 72% of the public and private schools are spread over the remaining 20 inhabited atolls. There is a great degree of variability in the conditions of facilities, presence and use of computers, and access to Internet. While outer island schools benefit from closer connections to the communities they serve, communication and transportation present challenges and most are without electricity and currently

have no access to Internet. The MOE Headquarters itself will need to update and upgrade its systems if it is to serve as the backbone of 21st Century educational Personnel throughout the system will need extensive professional development (PD) to effectively function in the new environment. In addition, the MOE will need to coordinate and work closely with other agencies including the Ministries of Resources and Development and of Transportation and Communication who are responsible for infrastructure development, the Marshall Islands National Telecommunications Authority (MINTA) as the Internet service provider, and the College of the Marshall Islands (CMI) as the primary provider of pre- and in-service PD.

The MOECTP lays out specific activities to be carried out over a 5-year period to accomplish the ambitious effort. The primary foci for each year follow.

Year One (December, 2010 – September, 2011)
- Formation of the teams involved with implementation coordination and oversight.
- Development of Information and Communication Technology (ICT) standards for students, teachers, and school leaders and identification of key competencies for staff not "covered by" standards.
- Development of ICT/Internet-related policies and procedures.
- Conducting a Ministry-wide ICT equipment inventory and staff knowledge and skills surveys.
- Upgrading the MOE HQ systems, PD for all MOE HQ staff, and initial development of tools and resources for use by schools.
- Preparation of infrastructure and equipment for launch of high school standards implementation in SY 2011-12.
- Ensure that all elementary schools with power (Phase I) have a minimum of two functioning "updated" computers one of which is available to administrator and one accessible to teachers.
- PD, including basic literacy, for staff and teachers at all high schools and Phase 1 elementary schools.
- Initial implementation of high school standards (September, 2011).
- Reaching agreement with MINTA to provide schools sites with reliable Internet access and collaborate with CMI to design and implement phased-in PD program.
- Conducting and evaluating the One Laptop per Child (OLPC) Pilot and, based on the results of the evaluation, determining a specific plan for the remaining elementary schools.
- Designing and beginning implementation of a monitoring and evaluation plan.

Year Two (October, 2011 – September, 2012)
- Training and preparation of additional School support teams.
- Installation of computers for student use in Phase I elementary school sites.
- Implementation support for Phase I and II sites and follow-up support for high schools and Phase I elementary schools.
- Infrastructure development, including computers, in Phase II elementary schools. Phase II schools will include 1/3 of the elementary schools not participating in Phase I including some of whom will need solar power installed (September, 2012).
- PD, including basic literacy, for staff and teachers at all Phase II elementary schools and further PD for high schools and Phase I elementary schools (Summer, 2012).
- Continue high school standards implementation and begin elementary school standards implementation.
- On-line resources, instructional planning templates, and other tools are available to high schools.
- On-line data and information collection and reporting are fully implemented for secondary schools.
- Ongoing monitoring and evaluation.

Year Three (October, 2012 – September, 2013)
- PD, resources, and support for 21st Century libraries in the secondary schools including e-collection and resources and, if possible, establishing them as community centers. PD for librarians and other school-based resource personnel
- Infrastructure development, including computers for administration, teachers, and students and communication tools for Phase III elementary schools. Phase III schools will include 1/2 of the remaining elementary schools, some of whom will need solar power installed.
- Follow-up support for high schools and Phase I and II elementary schools.
- Inclusion of standards-aligned ICT courses incorporated in the offerings of CMI and USP as part of teacher preparation programs.
- High school students have access to on-line classes when a highly-qualified instructor is not on site or when specific courses to meet college and career readiness are not offered.
- On-line resources, instructional planning templates, and other tools are available to elementary schools.
- Ongoing monitoring and evaluation.

Years 4 and 5 will follow a similar pattern with the addition of Phase III and IV elementary schools and follow-up support the high schools and elementary schools that have begun implementation. The bullets below reflect additional foci for those years.

Year Four (October, 2013 – September, 2014)
- Full implementation of high school ICT standards for school leaders, teachers, and students by the beginning of SY 2014-15.
- PD, resources, and support for 21st Century libraries in the Phase I, II and III elementary schools including e-collection and resources and, if possible, establishing them as community centers. PD for librarians and other school-based resource personnel.
- On-line data and information collection and reporting are fully implemented for elementary schools.

Year Five (October, 2014 – September, 2015)
- Follow-up support for and high school and elementary schools.
- Elementary students have access to on-line classes to augment learning experiences available on the school campus.
- Full implementation of elementary school ICT standards for school leaders, teachers, and students by the beginning of SY 2015-16.

Beyond Year 5
- On-going support and ICT-related PD for educators throughout the RMI.
- Fiscal and human resources are allocated to maintain and, as necessary upgrade systems and provide training and PD.
- On-going monitoring and evaluation of systems, efficiencies, and attainment of standards.

It is assumed that the necessary fiscal and human resources are allocated to meet the annual targets described above. It is also recognized that developments within the MOE and the county as a whole will impact on implementation and will likely result in adjustments particularly in the later years. The results of the OLPC pilot and findings of the monitoring and evaluation activities are also likely to result in adjustments.

List of Abbreviations Acronyms

The following abbreviations and acronyms appear in this report.

AD – active directory
CIA – Office of the Assistant Secretary for Curriculum, Instruction, and Assessment
CMI – College of the Marshall Islands
ELE – Office of the Assistant Secretary for Elementary and Special Education
Elem – Elementary school
EPPSO – RMI Economic Policy, Planning, and Statistics Office
HS – High school
ISTE – International Society for Educational Technology
ICT – Information, Communication, and Technology
IHE – Institution of Higher Education
ILT – Implementation Leadership Team
IT – Information technology
kbps – kilobytes per second
LAN – Local area network
MINTA – Marshall Islands National Telecommunications Authority
MIS – Management and Information Systems Office
MOE – Ministry of Education
MOECTP – Ministry of Education Comprehensive Technology Plan
MOE HQ – Ministry of Education Headquarter in Delap
MRD – Ministry of Resources and Development
MS – Microsoft
MTC – Ministry of Transportation and Communications
NAT – Network address translation
NETS – National Educational Technology Standards
NVTI – National Vocational Training Institute
OLPC – One Laptop per Child
PEDMS – Pacific Education Data Management System
PD – professional development
PDO – Professional Development Office
PV – Photovoltaic
RICS – Rural Internet Connectivity System
RMI – Republic of the Marshall Islands
SEC – Office of the Assistant Secretary for Secondary Schools and Vocational Education
SPC – Secretariat of the Pacific Community
STT – School Training Team
UNESCO – United Nations Educational, Scientific and Cultural Organization
USP – University of the South Pacific, RMI Campus
VPN – Virtual Personal Network
VNC –

I. INTRODUCTION

A. Contextual Background

1. <u>Geography and Population</u>

The RMI is located between 4 and 14 degree north and between 160 and 173 degree east. This places the RMI approximately 2,300 miles west-south-west of Hawaii and just west of the International Dateline and north of the Equator. The republic consists of 29 coral atolls and five low islands which form two groups: the Ratak Chain and the Ralik Chain The islands stretch several hundred miles from north to south, covering approximately 700,000 square miles of ocean with a total land area of 70 square miles and a population of 64,500 (est. 2010) (Central Intelligence Agency [CIA], 2010). Although some islands are several miles long most are very narrow and few rise more than 10 feet above sea level.

Figure 1: Map of the Marshall Islands

(CIA, 2010)

Ninety-two of the population are indigenous Marshallese, spread across the 24 inhabited atolls and islands. The majority of the population is located on Majuro, Majuro Atoll (28,000 est.) and Ebeye, Kwajelien Atoll (10,000, est.) (Economic Policy, Planning, and Statistics Office [EPPSO], 2006) which are the republic's urban centers. The remainder of the population is spread across the other 22 more rural and remote outer island atolls. Majuro and Ebeye both have international air service. They also have access to electricity, water, and telephone utilities. The situation on the other atolls varies greatly with many without electricity or running water, and access to transportation is either by boat or occasional plane service. Infrastructure development on the remote atolls is a government priority involving a number of ministries and agencies. The Ministry of Resources and Development (MRD), with extensive support from a variety of aid agencies, is leading electrification efforts including photovoltaic (PV) systems for the less populated remote islands. Plans are in place to electrify 1,700 outer island households

and, in 2009, six elementary schools on the five atolls of Arno, Ebon, Mejit, Namdrik and Namu received stand-alone PV systems. The Ministry of Transportation and Communications (MTC) recently completed an Asian Development Bank funded Outer Island Transportation Infrastructure Project and is currently developing community centers which will provide solar-powered communications on many outer islands. MINTA also has a mandate and focus to continue to expand telecommunications and Internet infrastructure in the outer islands. MINTA has recently begun offering wireless 384 kbps Internet access to areas such as Gugeeguu, Arno, Rongrong, and the small islets in the Majuro and Ebeye lagoons.

2. Communications and Technology

The status of the communications and technology across the RMI is as diverse as the geography. Populations in the urban centers of Majuro and Ebeye generally have access to telephones, cell phone technologies, and, if they so wish, access to computers and Internet. This is also true for a number of the other atolls but in many other cases communications is limited to 2-way radios. Public telecommunications on most outer islands consists of high frequency single side band radio links. There are mini-satellite phones on various islands however there is no regular public access to these facilities. Overall the number of people with telephones, computers, and/or subscriptions to Internet is relatively low and lags behind other Pacific nations such as the Cook Islands, Fiji, Samoa, Tonga, and Vanuatu (EPPSO, 2004).

Table 1: Communication and Technology Summary

Telephone Lines (per 100 people): 7.3
Internet Users (per 100 people): 3.6
Mobile Phone Subscribers (per 100 people): 1.7
Personal computers (per 100 people): 9.1
Internet Subscribers (per 100 people): 1.3
International Internet bandwidth (bits/second/person): 29
Satellite Link: Yes
Submarine Fiber Optic Connectivity: Yes

(Secretariat of the Pacific Community [SPC], 2010)

The availability of satellite links and the activation of the submarine cable, which serves both Ebeye and Majuro, in early 2010 provides opportunities for increased connectivity for both the population centers and outer island communities. The cost of accessing services is likely to be a barrier to utilizing these opportunities to their full potential. As mentioned earlier, MRD, MTC, and MINTA are all moving forward with efforts to develop infrastructure particularly in the outer island communities.

3. National Information, Communication, and Technology Policy

MTC, in collaboration with a broad spectrum of other ministries and agencies, has developed a draft ICT Policy (Ministry of Transportation and Communication [MTC], 2010). Once finalized and approved, this document will guide the future development of ICT in the RMI. The policy establishes a vision calling for the RMI to be "a globally connected, competitive, knowledge and information based society where lasting improvement in social, economic, and political development, and environmental sustainability is achieved through effective use of ICT" (MTC, 2010). The document addresses the administrative framework, e-government, infrastructure, education and human resource development, social and economic development, the legislative framework, and the environmental framework. Specifically, the policy statements call for:

- reliable and affordable broadband ICT infrastructures throughout the RMI;
- the teaching of ICT at all levels of the formal education system starting in early elementary grades;
- the use of ICT in the information education sector;
- the use of ICT for research purposes and the delivery of distance education;
- online PD opportunities to build local capacity in all areas; and,
- the establishment of e- rate programs to support distance learning and to enable school connectivity and accessibility to the internet for all RMI schools and libraries, including higher education institutions.

(MTC, 2010)

The policy will have a profound impact on ITC across the RMI if and when it is enacted.

4. <u>Contextual Summary of the Schools</u>

The RMI MOE has the responsibility of providing young people across the nation with opportunities for basic education and to pursue both secondary and tertiary education. The MOE operates 75 elementary schools, 5 high schools, and the NVTI to meet this responsibility. The context and facilities of these schools are very diverse.

All of the high schools and NVTI have electricity, computer labs, and some degree of Internet connectivity – although the quality of access and the locations within the school with access varies greatly. Marshall Islands High School is the only campus with a wireless network which provides all teachers with connectivity from their classrooms. Many of the high schools have also recently benefitted from facilities upgrades and new buildings.

The context of the elementary schools varies greatly. Although 61% of the elementary students live on either Majuro or Ebeye, approximately 19% of the public and private elementary schools are located on Majuro, 9% on Ebeye, and the remaining 72% are spread over the remaining 20 inhabited atolls. Approximately half of the teachers are based in outer island schools. (EPPSO, 2005). Schools on Majuro and Ebeye tend to be larger (average enrollment 237 students) than outer island schools (average enrollment 60 students). Ebeye Elementary School, with an enrollment of 1,050, and Enijelar Elementary School on Ailuk, with an enrollment of 7 students, represent the extremes. In addition to size, there is a great degree of variability in the conditions of facilities, presence and use of computers, and access to Internet. While outer island schools benefit from closer connections to the communities they serve, communication and transportation present challenges and most are without electricity and currently have no access to Internet.

The MOE will be considered in more detail in others sections of this report.

B. The Rationale for a Ministry of Education Comprehensive Technology Plan

ICT has changed the way people and cultures view and participate in the world –locally, regionally, and globally. Computers and Internet access, as well as a variety of other technologies, have very rapidly led to new sets of skills necessary to function in the work place and required for continuing education beyond high school. These developments also necessitate and provide opportunities to consider new ways of teaching, learning, and understanding schooling.

Although the speed at which changes in ITC are occurring was somewhat unexpected, the importance of ITC and its impact on education has been recognized by for quite some time. *Vision 2018: The Strategic*

Development Plan Framework 2003-2018 (Office of the President, 2001) recognized the shift towards globalization and the importance of both the knowledge industry and ICT to the future development of the country. The framework also established education as the number one priority and called for development of quality human resources including technological literacy while maintaining the core values of being Marshallese. It further called upon the education system to be contextually and culturally suitable as well as internationally competitive. Finally, the plan called for computer science and information technology courses in all schools across the nation. The RMI MOE's Annual Report: Fiscal Year 2005 (EPPSO, 2006a) documents an increased awareness of the importance of technology within the MOE and at the school level and initial steps taken. RMI MOE's most recent plan, Strategic Plan 2007-2011 (Canney, et al, 2006), is aligned with Vision 2018 and calls for ICT to be used to increase organizational effectiveness and to continue to reach more schools and communities. The plan specifically calls for information literacy and ICT to be an integrated component of the curriculum from kindergarten through 12th grade and for all secondary schools to offer compulsory ICT courses.

In light of Vision 2018, the current MOE strategic plan, the emerging National ICT Policy, and recent installation of the submarine fiber cable, the RMI MOE was an opportune time to engage in the development of a Comprehensive Technology Plan. A plan to ensure that its students are prepared for college and careers in the 21st Century, to take advantage of the tremendous opportunities that are arising, and to do its part in ensuring that the RMI people are well prepared for the future and not disenfranchised by falling on the "losing side of a digital divide." The plan is intended to lead to a more efficient organization and better prepared young people in spite of limited resources by having a well thought out, coordinated plan that minimizes cost, maximizes outcomes, and leverages the efforts of other agencies and organizations across the RMI and internationally.

II. TECHNOLOGY AS A TOOL FOR MOVING THE MINISTRY OF EDUCATION FORWARD

As the RMI moves toward being a globally connected and information based society, the MOE has a responsibility to prepare the Republic's young people with the 21st Century skills necessary to be successful contributing members of society locally, within the Pacific region, and globally. These include critical thinking, problem solving, communication, collaboration, and the ability to participate in a global technology-based community as well as cultural competencies, language skills, mathematics, science, etc.

The MOE also strives to improve its own effectiveness and efficiency by taking advantage of the "best available" communications and technology tools. This includes: communication with the community; data collection for accountability, reporting, and decision making purposes; on-going professional develop for staff including in-service teachers; and, improving teaching and learning across the nation.

Investing in the development of technology will bridge the "knowledge gap" and differing "opportunities to learn" between schools across the Republic and between RMI and the world, providing learning opportunities that do not exist today. Information literacy is the sustaining force of the emerging global society and technology is a critical tool for participation. Technology literacy provides the ability to: communicate; access, collect, manage, integrate, and evaluate information; solve problems and create solutions; build and share knowledge, and improve and enhance learning. One who is technologically fluent can apply technology to real world experiences, adapt to the rapidly changing technologies; and, personalize technology to meet job-based and personal needs and interests.

A. The Ministry of Education's Vision, Mission, and Goals

The RMI is committed to providing high quality education that responds directly to the needs of its young people now and into the future. In the delivery of education, the MOE takes into account the historical and current economic forces, socio-cultural, technological advances and good governance issues.

Vision: "Our Students are the key to a peaceful and productive Marshall Islands"

Developmental Mission: "We aim to prepare all students to be literate and successful, reach their greatest potential, be critical thinkers and problem-solvers, and be culturally and globally competent and responsive. Thus, we are committed to developing effective partnerships with parents and the community, placing qualified teachers in all schools, creating safe and conducive learning environments, and equipping our schools with vital learning resources."

Goals of Education: The Education Act emphasizes the development of the "student" as the primary goal of education. The goals for the delivery of education in RMI are stated in the Education Regulations of the Education Act of 1991 and are summarized as follows:
1. The ability to think for one's self, assuming responsibility for one's own welfare in an unselfish manner.

2. The aspiration to be productive and recognize that each individual has a part to play in society and must be willing to do one's share towards contributing to the common good.

3. The realization that self-reliance requires communication and cooperation with others and is not a totally independent or isolated endeavor.

4. The recognition of the need for long term planning and the value of making immediate sacrifices to maximize future benefits and for the intelligent use of resources; understanding that the future is not really predictable and that the individual must develop skills and attitudes which enables him or her to adapt successfully to the changes that will occur in tomorrow's society.

5. The concern for an efficient return on one's labor and the realization of the economic potential of traditional subsistence skills.

6. The ability to critically evaluate various lifestyles, behaviors, customs and social mores, retaining traditional values whenever possible and modifying other behaviors to meet changes in society and the environment.

The MOE Strategic Plan 2007-2011 (Canney, et al., 2006) maps out the objectives, implementing actions, and desired outcomes to further attainment of the vision, enable it to carry out its mission, and to achieve its goals. The achievement of many of the objectives either necessitate or would be enhanced through well developed ICT policies, procedures, resources and tools, and infrastructure. Appendix C presents many of these "connections."

B. Vision for Technology Enhancing the Ministry of Education's Achievement of Its Mission

We envision schools becoming an environment where all students and staff have ready access to the "best available" range of current technology, software tools, and applications. These schools will be places where students are engaged in a challenging curriculum and are comfortable using technology to contribute to and enrich their learning. A community where teachers have the knowledge and skills to integrate technology into a challenging and interdisciplinary curriculum which addresses students' specific needs, developmental levels and learning styles and use technology to support learning across the curriculum. All administrators, teachers, and other Ministry staff will use technology on a regular basis to effectively help students attain high standards and prepare for tomorrow's world of work.

In addition, the Ministry's administrative functions, including those performed by instructional staff, are increasingly technology-based, thereby increasing efficiency and accountability. This will improve

Ministry operations and allow more of the school system's energy and resources to be focused on student education.

C. Goals for Technology Within the Ministry of Education

The goals for technology within the RMI MOE include students, teachers, school leaders, MOE HQ staff and the MOE "Overall". The five goals are:

Goal 1. <u>Students:</u> All students in the RMI are technologically literate.

> Students will demonstrate an understanding of technology concepts and be able to use a variety of technologies to communicate and work collaboratively to support their learning and the learning of others. They will also use technology tools to gather and use information to build knowledge, conduct research, create products, and solve problems. These students will also understand and apply appropriate behavior when using technology.

Goal 2. <u>Teachers:</u> All teachers in the RMI are technologically literate and have the knowledge and skills necessary to use technology to broaden and enrich the learning experiences of their students as well as to further their own learning.

> Teachers will demonstrate an understanding of technology and use a variety of technologies to communicate and work collaboratively to support their PD, including at a distance. They will plan, design and effectively implement appropriate technology-enriched learning experiences for their students. These teachers will understand and apply appropriate and ethical behavior when using technology and ensure that their students do the same.

Goal 3. <u>School Leaders:</u> All school leaders are technologically literate and have the knowledge and skills to lead efforts to enhance teaching and learning through the effective use of the "best-available" technologies and increase management efficiencies.

> School leaders, including principals and head teachers, will demonstrate an understanding of technology and use a variety of technologies to communicate and work collaboratively to support their PD and the learning of others, thus enhancing their productivity and improving their practice and that of their staff. They will use technology-based management tools to efficiently carryout the management and operation functions of the school. As school leaders, they will proactively support the integration of technology throughout the school community including curriculum design and teaching to enhance learning. Lastly, they will understand and apply appropriate and ethical behavior when using technology and ensure that their teachers and students do the same.

Goal 4. <u>Ministry of Education Staff</u>: All staff at the Ministry Headquarters (MOE HQ) are technologically literate and have the knowledge and skills needed to use technology in the course carrying out their job functions.

> MOE HQ staff will demonstrate an understanding of technology and use a variety of technologies to communicate and carry out their job functions. Professional staff will effectively use technology to work collaboratively, to support their PD and the learning of others, to increase productivity and efficiency, and to carryout management and operation functions. They will develop position-appropriate tools and resources to improve management efficiencies and to enable schools' to incorporate technology in teaching and learning. MOE HQ professional staff will lead efforts to enhance management, teaching, and learning through the effective use of the "best-available" technologies at the school level.

Goal 5. <u>Ministry of Education: Overall</u>: The Ministry reflects a 21st Century organization and supports its schools in providing a technology-enhanced management, teaching and learning.

The MOE will allocate the fiscal and human resources necessary to develop and maintain an effective infrastructure at its headquarters, support infrastructure development at all school campuses, and ensure that all MOE employees have access to the PD necessary to effectively implement the MOECTP. The ministry will also: support the development of policies and procedures that enable and promote the use of technology for management and operations, teaching and student learning; monitor and evaluate implementation of the MOECTP and use that information to inform decision-making as implementation moves forward; and, develop the collaborative relationships with other organizations and agencies necessary for the success of ICT efforts.

D. The Current State of Technology in the Ministry of Education

The current status of technology varies greatly but in general is aging, not standardized and the lack of policies, procedures, and the necessary PD have hindered the effective utilization of the currently available resources.

1. <u>MOE Headquarters</u>

An assessment of technology at the MOE Central Office found that, while there are a number of systems in place, there is a great need to update and upgrade the systems, standardize operating systems and software applications, and ensure that all staff receive the PD necessary to fully take advantage of efficiencies technology makes possible. An assessment of the current status at the MOE HQ found that:

- Active Directory (AD) is utilized to provide centralized authentication and authorization for network resources. AD increases control and eases management over access and permissions to client systems and network resources and services. Active Directory is robust and feature rich. Provides intuitive management over contacts, users, groups and devices. AD leverages controls to define network, security and system policies. Scalable to support the needs of growing organizations and large enterprise networks. Most external systems can be configured to authenticate via AD, thus tying all systems to one set of account credentials rather than usernames and passwords for each individual system.

- Staff at the MOE HQ have access to the Internet, however, use of this access varies greatly.

- Network file shares have been created for storing important documents.

- Documents, databases, and other files are backed up regularly to insure data integrity and reduce the impact and risks associated with hardware failures, inadvertent deletion of files or other complications which may cause data corruption or data to be otherwise inaccessible. Yosemite Tapeware, a common and widely used software, is currently implemented to accomplish this goal. Backups are written to tape.

- Managing raw data and information can be a daunting task. With the implementation of the Pacific Educational Data Management System (PEDMS), many of these challenges are eliminated. Information about student attendance and so forth are readily available and easily pulled from the database. These types of systems are very helpful. It is, however, important to implement maintenance schedules and custom systems like these need to be maintained over a period of time. Maintenance tasks could include, but are not necessarily limited to, bug fixes, requests for revision, and the implementation of additional functionality. The processes

and procedures for the timely collection of data from school campuses need to be reviewed.

- RMI has reserved the domain name rmimoe.net for the current web site and email service. A working group should be setup to review the current site and determine ways in which it can be better utilized as a tool for communicating with parents and community members, making documents and other resources available to both public and private schools, and serving as a management interface for process such as data entry by schools.

- A local area network is in place at the Ministry office for interactive communication and remote support. If systems were standardized, remote maintenance and updates would also be possible enabling the IT staff to more efficiently carryout their work.

- Network infrastructure, servers, and transport devices are out of date.

- Servers and networking devices should be mounted in a sound proofing server cabinet.

- The current email system (Exchange 2000) is out of date, and has many program and security issues.

- Network security is limited and not managed in house. Networks should be segregated to reduce the effects of worms and viruses, also improving methods of identification and isolation. Network segregation also reduces impact of inadvertent file deletion, by providing separation from systems where access is not required.

- The identification of viruses and other types of malware is extremely important. Malware is delivered through many avenues— e-mail, web browsing, flash drives, any other means by which a file is transferred or shared between two systems. Currently many systems lack antivirus protection.

- During the visit, the IT room air conditioner was out of order and, as a result, several systems were shut down to prevent overheating. The air conditioner must be functional and powerful enough to keep the room containing the equipment at appropriate operating temperatures.

- MOE HQ staff have very different levels of computer literacy with some being very proficient while others have minimal skills.

- Policies, procedures, and expectations for technology use are not clear and there does not appear to be a high degree of accountability which leads to "security" risks and decreased efficiency.

Since the MOE HQ will be the "backbone" of the overall network and technology implementation efforts, addressing these issues should be a priority.

2. Various School-Level Contexts

The information presented below was collected through a series of site visits and interviews. Although not all schools were visited, the comments reflect the overall situation across the RMI. Site visits included Jaluit, Laura, Northern, and Marshall Islands High Schools as well as Likiep Elementary School and elementary schools in Arno and Majuro; were carried out to assess the current state of technology and ways in which it is utilized to promote learning and office productivity. In addition to technology specifics, the team looked closely at facilities and how well they are equipped to support necessary technology. During the course of the visits, the team encountered a diverse range of individuals with varying levels of knowledge and interaction with past and current technology. In summary school visits found that:

- High schools have labs stocked with well maintained or new computers. In Laura, a wireless

network has been created connecting the lab computers.

- High school lab facilities are well constructed, providing protection from the elements and air conditioned.

- The high school technology instructors interviewed appeared knowledgeable and capable.

- Internet connectivity, however limited, was available at the high schools.

- Computer access and use varies greatly from one elementary school to another.

- Reliable Internet access is usually not present in elementary schools.

- Computer operating systems and versions of software applications varied greatly within and across both elementary and high schools.

High schools are all similar in that they have electricity, computer labs, some form of Internet connectivity, and staff with knowledge of computers and, to some extent, IT. As development of the MOECTP moves forward, the five high schools can be treated in a similar fashion. They will also be in a better position to begin implementation more quickly than the elementary schools. PD and "moving" the use of technology beyond the computer to teaching and learning across the campus and across the curriculum is likely to be a challenge.

Elementary schools find themselves in situations that vary greatly. Some have electricity and the potential for reliable Internet access, others have no electricity but the potential for Internet access, a third group have electricity but no current possibility of Internet access, and still others have neither electricity nor a current possibility of Internet access. The MOECTP plan will need to include ways of addressing each of these situations and of transitioning schools as electricity and Internet access become increasingly available. There will also be a need to address the "facilities" requirements needed to protect computers and other equipment from a generally "unfriendly environment". The life of equipment will be extended by ensuring that computer equipment, labs for example, are in well constructed and insulated rooms. Air conditioning and/or dehumidified cabinets need to be considered.

3. Personnel and Overall

The access to, understanding of, and ability to use a variety of technologies varies greatly throughout the MOE at all levels. This is not surprising but does point out the importance of establishing clear expectations (standards and competencies) for employees at all levels and ensuring that efforts are made to provide equitable access to technology to get extent possible given the current context in RMI. It also supports the case for professional develop as a major component of the MOECTP.

E. Related Efforts of Other Agencies and Organizations

The RMI Strategic Development Plan: Vision 2018 presents a development plan that included ICT infrastructure development and presents a role for technology across sectors so the MOE does not stand alone in its efforts. The following agencies have a key role in this process.

1. Ministry of Resources and Development

Ministry of Resources and Development (MRD) is the primary government organization responsible for agriculture, energy, trade, and investment in the RMI. The Ministry promotes and assists the development of these sectors through activities which foster sustainable food production, provide alternative energy resources and income-generating opportunities for the people of the Marshall Islands. MRD has a special focus to assist the outer-island communities in developing their agricultural, energy and economic sectors.

The Ministry's alternative energy initiatives and plans will impact on the implementation of the MOE Comprehensive Technology Plan.

2. Ministry of Transportation and Communication

The Ministry of Transport and Communications (MTC) is responsible for the overall regulation, promotion and development of transportation and communications in the Marshall Islands. Their efforts to improve communications, especially in outer island communities, will impact on the ability of schools access Internet for student learning, teacher PD, and reporting and school management.

3. Marshall Islands National Telecommunications Authority

MINTA is a private corporation with significant ownership by the National Government. It is the authorized provider of telecommunications services and is responsible for providing local and long distance voice, fax, data, and Internet services to the Marshall Islands (MINTA http://www.ntamar.net/ Oct 29 2010). MINTA, as the primary communications and Internet service provider (ISP), will play a key role in the implementation of the Comprehensive Technology Plan both through their continued infrastructure development and establishment of rates for access to their systems. MINTA currently offers Internet access through high speed lines on Majuro and Ebeye, dial-up access in a limited number of outer island communities and e-links (a point to point radio system that provides wireless services) in some other remote areas. The cost of such services is relatively high as is shown in the table below.

Table 2: MINTA High Speed Internet Connection Rates

Dial Up	$15.00	$39.95
Dial Up Plus (5 accounts)	$15.00	$49.95
Residential DSL 128 kbps	$89.95	$89.95 plus $0.01 per min.
Residential DSL 256 kbps	$139.95	$139.95 plus $0.03 per min.
Data Transmission Rate	Installation Fee	Monthly Charge
256 kbps	$250.00	$600.00
512 kbps	$250.00	$1,100.00
1 mbps	$250.00	$2,100.00
2 mbps	$250.00	$3,000.00
3 mbps	$250.00	$4,000.00

Source: Downloaded from www.ntamar.net on November 29, 2010.

4. Institutions of Higher Education

There are two institutions of higher education in the RMI: the CMI and the RMI Campus of the University of the South Pacific (USP). These institutions can inform and contribute to the implementation of the MOE Comprehensive Technology Plan including:
- identifying the technology related knowledge and skills necessary for college success.
- ensuring that students enrolled in pre-service teacher preparation programs meet the teacher ICT standards and are well prepared to provide standards-based ICT instruction in their classroom upon graduation.
- providing much of the in-service training that will be necessary for implementation of the plan.

a. *College of the Marshall Islands*

The CMI, a regionally accredited community college, serves students from Micronesia, particularly those from the Marshall Islands and is designated as the post-secondary institution for the RMI. CMI offers an associate degree program in elementary education and most degreed teachers in the RMI are graduates of that program. In addition, over the last several years, CMI has strengthened its computer science and IT capacity so the college is well positioned to provide effective sustained on-site PD for MOE staff at a variety of levels. CMI may also have the capacity to assist the MOE in maintaining its IT systems.

b. *University of the South Pacific-RMI*

The USP is a regional university serving 12 Pacific Island nations. The Marshall Islands Campus was established in 1993 and is located Majuro. The majority of students enrolled at the Campus are from Majuro and Ebeye however enrolments are increasing in the outer islands, with students on Aur, Jaluit and Likiep. Currently the Campus provides tutorials and face-to-face courses including coursework towards a Bachelor of Education-Early Childhood Education and Information Systems and Library. In addition to providing input related to the skills students need to "bring to" their programs in order to be successful, USP's experience with distance education could be beneficial informing the implementation of those aspects of the Comprehensive Technology Plan.

5. <u>One Laptop Per Child Initiative</u>

OLPC is a not-for-profit education project aimed at providing children ages 6 to 12 years in developing nations, particularly in rural and remote areas, with durable, inexpensive laptop computers. The initiative focuses on providing computers and software which will support "exploration and collaboration" as well as teaching and learning to further achievement of the core goal of basic education to develop numeracy and literacy for all children worldwide. OLPC's activities in the Pacific region are coordinated by Secretariat of the Pacific Community (SPC) primarily through their Rural Internet Connectivity System (RICS). (Note: RICS enables rural community to have full and safe Internet access and is implemented in the RMI through the MTC and MRD).

The MOE will conduct a pilot study and evaluation of OLPC at Woja Elementary School on Majuro and two outer island sites – Ine Elementary School on Arno and Jabor Elementary School on Jaliut. The results of this pilot study, particularly if the findings are positive, could significantly impact the implementation of the Comprehensive Technology Plan.

These organizations and initiatives will impact on the efforts of the MOE, thus regular communication, consultation, and collaboration is critical to the success of the ministry's efforts.

III. TECHNOLOGY-ENHANCED ADMINISTRATION, TEACHING, AND LEARNING
   WITHIN THE MINISTRY OF EDUCATION: A ROADMAP FORWARD ~ 2010–2015

The MOE is undertaking this effort with a clear understanding that this is a large undertaking which will involve many people at various levels in the ministry as well as representatives for other agencies and organizations. It is also realized that there are numerous initiatives and task within the MOECTP, some of which can happen concurrently and others that must occur in a carefully laid out order to be successful. Finally, this effort will require significant human and fiscal resources which need to "mapped onto" the initiatives and task so that these needs remain "reasonable".

The following pages map out objectives, activities, and timelines for the implementation of the technology effort that seem reasonable at this point in time but close monitoring and evaluation of the

implementation will be carried out and "results-based adjustments" made as necessary. The map reflects the educational and technological context of the RMI as well as the widely accepted principles for effectively using teaching to enhance teaching and learning presented in Table 3 below.

Table 3. Necessary Conditions to Effectively Leverage Technology for Learning
        (adapted from the International Society for Technology in Education [ISTE], 2008a)

Shared Vision	Proactive leadership in developing a shared vision for ICT among all stakeholders including parents, and the community.
Empowered Leaders	Stakeholders at every level empowered to be leaders in effecting change.
Implementation Planning	A plan aligned with a shared vision for school effectiveness and student learning enhanced by ICT and digital resources.
Consistent and Adequate Funding	Ongoing funding to support technology infrastructure, personnel, resources, and staff development.
Equitable Access	Access, including connectivity, for all students, teachers, and school leaders.
Skilled Personnel	Personnel skilled in the selection and use of appropriate ICT resources.
Ongoing Professional Learning	Technology-related professional learning plans and opportunities with time to practice and share ideas.
Technical Support	Consistent and reliable assistance for maintaining, renewing, and using ICT and digital resources.
Curriculum Framework	Standards and related resources that are aligned with 21st Century learning and careers.
Student-Centered Learning	Planning, teaching, and assessment centered on the needs and abilities of students.
Assessment and Evaluation	On-going assessment of teaching, learning, and leadership, and evaluation of the use of ICT.
Engaged Communities	Partnerships and collaboration within the community.
Support Policies	Policies, financial plans and accountability measures to support ICT initiatives.
Supportive External Context	Policies and initiatives to support schools and teacher preparation programs in effective implementation of ICT.

A. Coordination and Oversight

The scope and reach of this effort is such that careful planning, coordination, and monitoring from the very beginning is extremely important. The following teams–including recommended membership by roles and the groups' primary responsibilities–should be in place at or very near the outset of the project.

1. The Implementation Leadership Team

The MOECTP Implementation Leadership Team (ILT) will be responsible for the overall implementation and monitoring of MOECTP efforts including day-to-day oversight. The core leadership team should include the key decision makers within the MOE who will be involved in either initial design and implementation (i.e. staff responsible for IT, policy, elementary schools, secondary schools, and finance) and those with a critical role in the use of the systems (i.e. staff in the areas of curriculum, instruction,

assessment, data and information systems, media, and teacher training). Collectively the ILT will be charged with:

- Furthering the development of a shared vision ICT among stakeholders at both the MOE and school levels, across relevant agencies and organizations, and in the community.
- Building partnerships and collaboration to the effective implementation of the MOECTP.
- Establishing the policies and procedures that will guide the use of technology and ensure adequate funding is available to successfully implement the MOECTP.
- Ensuring that standards and competencies are developed for all students and MOE employees.
- Planning for and supporting "role-appropriate" PD and training across the ministry.
- Ensuring equitable access for schools, teachers, and students across the RMI. Although infrastructure development varies from one location to another, the ILT will oversee implementation so that all students have an opportunity to meet the established standards to the extent possible given the current infrastructure in the various communities.
- Monitoring the implementation of the plan, the use of technology, and evaluate the impacts in terms of school, teacher, and student performance as well as increased efficiencies within the organization.

Identification of specific responsibilities for each of the team members would be an early activity of the team but it is expected that they will vary according to job functions (i.e. the IT lead would be responsible for the software, hardware, and communication and power infrastructures; the policy lead would establish documents such as appropriate use policies prior to "deployment" at the school level; the teacher training representative would oversee the design and implementation of PD programs once standards are established; the data and information systems lead with coordinate the design and implementation of appropriate tools for data collection, reporting and accountability systems; and, the curriculum lead would oversee the identification and/or design and development of instructional resources perhaps including on-line courses.

It is recommended that the MOECTP ILT initially consist of: the Secretary of Education (although the secretary may choose to have another member serve as lead and chairperson) and the Assistant Secretaries for: Policy and Planning; Secondary and Vocational Education; Elementary Education; and, Curriculum, Instruction and Assessment. In addition, the MOECTP ILT should include as equal members the Directors of: IT, Management and Information Systems, PD, and Media. Lastly, it is critical that an appropriate member of the MOE Fiscal Management Team and the lead person responsible for the evaluation of the MOECTP effort are both members of the leadership team. Although the core of the management team would not change during the course of the project, it is likely that additional members might be added during the course of the project on an interim basis as appropriate. For example, the MOE Strategic Plan calls for libraries to assume a new role in schools and communities, and it would be beneficial for a library representative to serve on the team when those efforts are planned and implemented.

It is expected that the ILT would meet no less that monthly during the course of project, and it is likely that the group will meet on a weekly or biweekly basis as the project gets underway.

2. Advisory Group

The advisory group is intended to both advise the ILT and serves as collaborators and advocates for the MOECTP effort. It should include the agencies with a role in ICT mentioned earlier (MRD, MTC, and MINTA), those with a role in education (CMI, USP, and the National Vocational Training Center), and other stakeholders including a business representative, a school administrations, one or more teachers, one

or more parent, and one or more appropriate community members. It would be expected that this group would initially meet quarterly and, after the first year perhaps semi-annually. The groups represented on the advisory group interact with the project in differing ways so it is to be expected, in fact will be absolutely necessary, to have specific conversations with different members as the project progresses. For example, with MINTA regarding internet connectivity and, perhaps, with CMI and USP concerning PD.

The following three teams have more specific purposes within the project.

3. School Training Team

The School Training Team (STT) will be primarily responsible for working with schools as they "come on line." The team should consist of an IT specialist, a trainer well versed in both technology and the intended uses of the system in the school to increase efficiencies as well as teaching and learning, a curriculum and instruction specialist, a school administrator, at least one teacher, and at least one parent and/or community member. It would be advantageous to include a parent and community liaison.

When providing the training, it will enhance implementation if a "technologically inclined" teacher from the school site or a nearby high school is provided with the additional training necessary to serve as an on-site trouble shooter able to address the most common problems users and the local area network are most likely to encounter.

As implementation expands, it will be desirable to have multiple STTs.

4. Monitoring and Evaluation Team

A project of the scope of the MOECTP requires ongoing monitoring and both formative and summative evaluation. This is an important part of the project coordination and oversight and a more complete discussion of monitoring and evaluation appears in Section IV.

B. Standards and Professional Development

The existence of infrastructure, equipment, and appropriate tools and resources do not necessarily lead to enhance teaching, better prepared students, or a more effective and efficient organization. The identification of clear expectations through policy, procedures, and required competencies for staff and standards for staff and students is a critical component to success. Equally important is the opportunity to gain the knowledge and skills–PD and training for staff at all levels translated into technology-enriched learning opportunities for students across the RMI.

1. Standards

The MOECTP calls for the effective use of technology throughout the system–from the most remote school to the Office of the Minister. This will require the development of standards and identification of key competencies for students, teachers, school leaders, MOE HQ professional staff, and support personnel throughout the system.

The development of these standards should take place during the first six months of implementation.

a. Standards for Students

The MOECTP calls for all students to be technologically literate. In addition, the draft ICT Policy (MTC, 2010) and current MOE strategic plan call for technology to be an integral part of education from early elementary through graduation. The K-12 standards will call for students to:

- Demonstrate an understanding of technology concepts.

- Effectively use computer-based technologies for word processing, analyzing and displaying data using spreadsheets, preparing presentations, and communicating using e-mail and other tools.

- Use a variety of technologies to communicate and work collaboratively to support their learning and the learning of others, including at a distance.

- Employ technology tools to gather, evaluate, and use information.

- Use critical thinking skills to build knowledge and create products using technology.

- Apply thinking skills to carry out research, manage information, solve problems, and make decisions using technology.

- Understand and apply appropriate behavior when using technology.

As student standards are developed, it is very likely that there will need to be some differentiation depending upon the "best available" technology at various school sites. However it is anticipated that learning opportunities will provide all students with an opportunity to meet a majority of the standards even if they, for example, are using solar powered systems and/or have no Internet access. The standards will call for the integration of technology across the curriculum but it is anticipated that high school will offer "technology-focused" courses for students interested in pursuing related career pathways.

The National Educational Technology Standards for Students (NETS-S) (ITES, 2007), developed by the ISTE (www.iste.org), are widely recognized and will serve as a starting point for the development for the development of student standards and performance indicators. The United Nations Educational, Scientific and Cultural Organization's (UNESCO) Competency Standards Module (UNESCO, 2008) and other relevant materials will also inform the student standards development process.

b. Standards for Teachers

Teachers are the individuals who design and implement instruction that utilizes technology to enhance learning and provides students with the opportunity to develop the knowledge and skills necessary to meet the standards. In addition, teachers can use technology for their own PD, participate in learning communities with peers, and streamline some classroom/school functions.

The MOECTP call for all teachers to be technologically literate and have the knowledge and skills necessary use technology and appropriate tools to further their own learning and broaden and enrich the learning experience of their students. The teacher standards will call for all teachers to:

- Demonstrate an understanding of technology concepts and operations.

- Effectively use computer-based technologies for word processing, analyzing and displaying data using spreadsheets, preparing presentations, and communicating using e-mail and other tools.

- Use a variety of technologies to communicate and support their PD thus strengthening their teaching practice and productivity.

- Plan and design appropriate technology-enriched learning experiences for their students.

- Effectively implement curriculum plans that include methods and strategies for using technology to enhance student learning.

- Understand and apply appropriate behavior when using technology and ensure that their students do the same.

A subset of teachers will be called upon to have the additional skills enabling them to act as mentors for their peers and to troubleshoot problems with the systems at the school site.

Once again, ISTE's standards, the NETS for Teachers (ISTE, 2008b), describe the knowledge, skills, and attitudes needed in educational settings, will be the starting point for developing the teacher standards. The Competency Standards Module (UNESCO, 2008a, 2008b, & 2008c), UNESCO Asia and Pacific Regional Bureau of Education's ICT Transforming Education: A Regional Guide (Anderson, 2010) and other relevant materials will inform the development process.

c. Standards for School Leaders

All school leaders are technologically literate and have the knowledge and skills to lead efforts to enhance management, teaching, and learning through the effective use of the "best-available" technologies. This means that school leaders (including principals and head teachers) will:

- Demonstrate an understanding of technology concepts and operations.

- Effectively use computer-based technologies for word processing, analyzing and displaying data using spreadsheets, preparing presentations, and communicating using e-mail and other tools.

- Use a variety of technologies to communicate and to support their PD and the learning of others, thus strengthening their productivity and improving practice.

- Use technology-based management tools to efficiently carryout management and operation functions.

- Actively promote the integration of technology throughout the school community including curriculum design, technology-inclusive teaching to enhance learning, and management processes through effective leadership and by example.

- Understand and apply appropriate behavior when using technology and ensure that their teachers and students do the same.

Once again, ISTE's standards, the NETS for Administrators (ISTE, 2009), describe the knowledge, skills, and attitudes needed to educational settings, will be the starting point for developing the teacher standards. The UNESCO Asia and Pacific Regional Bureau of Education's ICT Transforming Education: A Regional Guide (Anderson, 2010) and other relevant materials will inform the development process.

d. Standards for MOE Headquarters Professional Staff

The MOE Strategic Plan and the MOECTP both call for the MOE HQ staff to lead and support schools in the implementation effort. This will mean the development of materials and tools for teachers as they bring technology to life in the classroom, as well as tools and processes for school leaders and teachers to streamline and become more efficient particularly in "management aspects" such as: recordkeeping, reporting, using data to inform decisions, and the implementation of school improvement efforts.

The development of the technology infrastructure as the plan is implemented will lead to increasing opportunities to provide online PD, support more equitable learning opportunities for students by offering online courses, and increasing the availability of a variety of resources, including locally developed materials, for students, teachers, parents, and the community. For this to become a reality, all professional staff at the MOE HQ will be technologically literate and have the knowledge and skills to lead efforts to enhance management, teaching, and learning through the effective use of the "best-available" technologies. This means that professional staff will:

- Demonstrate an understanding of technology systems and operations.

- Effectively use computer-based technologies for word processing, analyzing and displaying data using spreadsheets, preparing presentations, and communicating using e-mail and other tools.

- Use a variety of technologies to communicate and work collaboratively to carry out their work, support their PD, and support the learning of others.

- Use technology-based tools to increase productivity and efficiency and have the skills to develop position-appropriate tools and resources to improve teaching, learning, and management efficiencies.

- Have the skills to develop position-appropriate tools and resources to enable schools to incorporate technology in teaching and learning and improve management efficiencies. For example:

    – Information Management Systems office staff create and support the use of data collection and reporting tools for accountability and reporting.

    – IT staff have the knowledge and skills to develop and maintain an appropriate technology infrastructure. This includes MOE HQ as well as supporting schools.

    – Special Education and Curriculum and Instruction staff are capable of designing and delivering PD at a distance using available technologies, etc.

    – Secondary, Elementary, and Curriculum and Instruction staff assist school leaders and teachers in identifying technology-based resources and in designing high quality instructional plans that include using technology to enhance teaching and learning. They also have the knowledge, skills, and processes in place to evaluate and select appropriate software and programs to support and enhance teaching and learning.

    – Curriculum and Instruction staff increase the e-availability of important documents such as standards and curriculum frameworks, develop electronic resources to increase the availability of locally-focused materials, facilitate on-line learning communities, and collaborate with practicing teachers to develop and deliver on-line courses for teachers.

    – The Media Office, in collaboration with other sectors in the Ministry, further develops the MOE's web presence as a communication tool and a means of sharing resources electronically.

It has not been determined if there is need for a separate set of standards for this group of people but they clearly need to meet the teacher and school leader standards as well as have the knowledge and skills to carry out the types of tasks described above. This will result in a variety of PD needs.

e. Standards for Support Personnel

The MOE will become a 21st Century organization by ensuring that all staff, including support personnel, are technologically literate and have the knowledge and skills needed to use technology in the course carrying out their job functions. This means that support personnel will:

- Demonstrate an understanding of technology systems.

- Effectively use computer-based technologies for word processing, analyzing and displaying data using spreadsheets, preparing presentations, and communicating using e-mail and other tools.

- Use various technologies to plan and schedule meetings and appointments, organize and maintain electronic files, conduct research, and gather and share information.

- Create spreadsheets, compose correspondence, manage databases, and create presentations, reports, and documents using a variety of applications including desktop publishing software.

As with the professional staff described in section d, it has not been determined if there is need for a separate set of standards for this group of people but support personnel need the knowledge and skills to carry out the types of tasks described above. This will result in a variety of training needs.

f. Assessing Attainment of the Standards

The standards describe technology not as an end in itself but as a tool to reach certain identified ends—changes in teaching, student developed products, participation in "virtual communities. These are best measured through observing performance and reviewing "products".

The standards development group will design tools to document attainment of the standards for the various groups and at various levels but in general these will be performance based. For example:
- School leaders will document examples of teachers using technology in the course of their work including as part of classroom instruction.
- Teachers will maintain journals focused on how they have used technology and way in which it has contributed to their knowledge and practice.
- Teachers will develop a "technology portfolio" documenting their use of technology, particularly in the classroom, and the student learning and products which have resulted.
- Teachers will document examples of students using technology in the course of their work including as part of classroom instruction.
- Each student will maintain an "ICT journal" and develop a portfolio documenting their use of technology to further their learning and "produce products" and solve problems.

2. Professional Development

PD represents a critical component of the MOECTP—the infrastructure and equipment will not result in meaningful impacts without PD aligned with the standards/competencies for all MOE staff.

All MOE staff, at all levels and all sites including school campuses, will need to become computer literate. The standards and competencies identified in part 1 above makes the types of PD needed clear but to reiterates those needed by all. All staff will need the ICT literacy necessary to:

- Use computer-based technologies for word processing, analyzing and displaying data using spreadsheets, and preparing presentations; and

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- Communicate using e-mail, web-based conferencing, and other tools;

- Use various technologies to plan and schedule meetings and appointments, organize and maintain electronic files;

- Conduct research, and gather and share information; and,

- Meaningfully participate in a variety of on-line learning opportunities.

It is also worth again mentioning the need for teachers to use technology to gather information and resources and design and effectively implement technology-enhance learning opportunities for students. School leaders will need all of the above as well as the knowledge and to effectively use management tools developed by the MOE HQ and other sources to increase access to data for decision making and improving procedures and overall efficiency.

The lead IT staff within the MOE HQ and at secondary schools, all of whom will be maintaining their own systems and are likely to be called upon to support elementary school, will need to develop a very specific set of skills. They will need to be trained to support new systems and services including, for example, network protocols and services, remote access VPN, remote Desktop, VNC, Vmware consoles, and network maintenance and troubleshooting. Developing these specialized skills (as well as carrying out some of the network upgrades) is likely to require outside consultants. Once basic skills are in place, further skills and certifications can be obtained through on-line PD opportunities.

The CMI has significantly increased its capacity in the area of IT and the use of technology to enhance teaching and learning. As a result, it is anticipated that many of the PD needs can be met through courses and in-service programs developed in conjunction with the college. There will be instances where this is not the case and external providers and/or online resources such as the UNESCO Competency Standards Module (UNESCO, 2008a) will be called upon.

3. Standards and Professional Development Implementation

The implementation of the standards and provision of the associated PD will need to be aligned with the infrastructure development and the presence of ICT resources, particularly computers, on school campuses. PD is most effective when those receiving training immediately apply their new knowledge and skills. Therefore, specific timelines for both standards implementation and PD will need to align with infrastructure and the acquisition of and development of materials and tools development by the MOE HQ.

Secondary schools will be in a position where school leader, teacher, and student standards can be implemented beginning with the school year (SY) 2011-2012. A knowledge and skills survey of all staff will be conducted early in 2011 so that appropriate PD programs can de designed and ready for delivery during the summer of 2011. The standards should be able to be phased in during the SY 2011-12 and SY 2012-13 with full implementation at the beginning of SY 2013-14. It is anticipated that two of the biggest challenges will be the integration and use of ICT resources across the curriculum throughout the campus and the availability of reliable and adequate Internet connectivity. Although it is anticipated that many, but certainly not all, of the standards will be able to be addressed without such connectivity.

Elementary schools will need to be phased in over a period of time and will function in diverse contexts. Schools in Majuro have grid-power and available Internet access, while some other schools will initially have limited access to both power and Internet. PD and standards implementation will need to be adjusted accordingly. The target is for all elementary schools to have computers and other ICT resources available for use by school leaders and teachers by SY 2012-13 and for students by SY 2013-14. PD for elementary school leaders and teachers will be held during the summers of 2011, 2012, and 2013.

Participants will be identified based on the finalized MOECTP roll-schedule for elementary campuses. It should be noted that this will depend on the results of the OLPC pilot. Standards implementation will follow a similar staggered schedule but full implementation will take place by the beginning of SY 2015-16. The availability of Internet access on outer islands is beyond the control of the MOE, so as the elementary standards are developed those that students are expected to meet with or without Internet access will be identified.

C. Implementation at the Ministry Headquarters Level

The MOE HQ will be the hub for technology utilization and support in the schools. Vision, standards and direction will stem from here. In order to provide a strong ICT foundation and the backbone to the education system network, the MOE HQ must have highly trained personnel and adequate infrastructure. The implementation of the MOECTP will impact on all of the offices with the MOE–require their support and assistance as well as benefiting in their work. The analysis of the MOE Strategic Plan relative to ICT presented in Appendix D demonstrates the potential this opportunity presents.

In general the MOE HQ will:

- Work with other organizations and agencies to build support for the MOECTP and reach agreements with agencies such as MINTA and CMI to support and participate in the effort (Office of the Secretary).

- Identify and set aside the fiscal and human resources necessary to successfully implement the MOECTP (Secretary, Fiscal Management)

- Build and maintain a robust technology infrastructure able to meet its own needs and those of schools across the RMI (IT unit).

- Develop appropriate policies and procedures for the use of technology across the system including those at the school level (Policy and Planning)

- Develop ICT Standards for students, teachers and school leaders as well as standards or competencies for other MOE staff [Curriculum, Instruction, and Assessment (CIA), Secondary Education (SEC), Elementary Education (ELE), Professional Development Office (PDO)]

- Re-vitalize the MOE web presence so that it is a robust tool for communication with the community and a portal for the exchange of resources, information, data and reports between schools and the MOE HQ (Secretary, Media, and IT).

- Conduct a complete inventory of ICT equipment in the Ministry at all levels (Property, SEC, ELE).

- Conduct a survey to determine current ICT/computer knowledge and skills at all levels (MOE HQ, Secondary Schools, and Elementary Schools in the OLPC Pilot and Phase 1will be a priority) (MOE HQ)

- Plan and ensure delivery of high quality, ICT-aligned PD at all levels (CIA and CPO)

- Develop and implement e-tools for data collection and reporting [Management Information Systems (MIS)]

- Increase the electronic availability of documents including policies, curriculum standards and frameworks, and instructional resources (Policy and Planning, CIA, SEC, ELE, Media)

- Identify, purchase, and install appropriate "packaged software" to support teaching and learning (CIA, SEC, ELE, IT)

- Develop and disseminate additional e-resources including local instructional resources and tools for planning effective e-learning opportunities for students (CIA)

- Plan, design and deliver professional develop professional develop using distance learning tool and web-based applications (CIA, Professional Development, IT)

The tasks above appear somewhat daunting, however if carried out in an organized way over the duration of the plan are achievable. The first priority should be given to upgrading the IT systems in the MOE HQ and PD for MOE HQ staff so that the system and personnel are in a position to lead and support school-level efforts.

The MOE HQ IT systems need to upgraded and updated to current standards. It is vital that the Ministry maintain a system that is modern, frequently updated, functional and adequately staffed. The network should use commonly utilized software to provide network services. The Microsoft product line (e.g. Active Directory, Exchange and Windows file sharing) is the most common and widely supported. In addition:

- Old equipment should be replaced with new equipment. New equipment should have a three year warranty.

- The current systems should be virtualized and consolidated to provide ease of management and hardware independence. Software should be upgraded and so network services are provided by current industry standards, like Exchange 2007.

- Transport network devices, switches, routers and firewalls should be upgraded to current industry standards. These devices should carry warranty and support contracts. These devices should be leveraged to provide high availability and network security.

- Client machine hardware and software should be standardized whenever possible. Implementation of MS Windows 7and Office 2007.

- Package management and antivirus should be centrally managed by software dedicated to this purpose such as Landesk Management Suite.

- Antivirus software for all systems should be installed and upgraded regularly to insure prompt detection of infected files and programs.

- Network devices and servers should be monitored to ensure service availability and easy identification of network issues.

- Facilities for housing servers, etc., should be improved to ensure proper functioning and extend equipment life.

More specific information regarding critical system upgrades can be found in Appendix E. It is anticipated that IT staff will need technical assistance and training in conjunction with carrying out the updating and upgrading of the systems

PD of all MOE HQ is a second priority need. The new system will mean that many staff will need training to effectively use the new applications. There will also need to do job-specific training for staff in the various offices and various roles. This PD will begin as soon as possible and it is likely to be fairly intensive during the first 18 months of the effort. Less intense but consistent follow-up PD will occur throughout.

D. Implementation at the Secondary School Level

Most elements necessary for educational technology are already established in the high schools. Each of these schools should already have power, air conditioning and one or more rooms suited for this purpose. The high schools also have Internet access. The first step in moving forward will be to conduct several information collection activities including a thorough inventory of computers and other ICT resources as well as a survey of current teacher knowledge, skills and use of technology for their professional growth and to support instruction. It will be important to evaluate the functionality and reliability of these resources in order to insure dependability, some degree of standardization of operating system and applications, and availability during scheduled classes. For example, on Jaluit, a 64 Kbps connection exists, but is known to be shared by several businesses. This is an example of excessive division of service, and cannot be considered a viable solution for Internet connectivity. Laura High School has an adequate number of computers but there are at least four different operating systems and numerous different versions of software applications which make both maintenance and instruction more challenging.

High schools should all have a wireless local area network (LAN) for sharing information and resources as well as adequate and reliable Internet access. Computers recovered through the process of upgrading labs from PC to thin client machine should be divided between schools, to be provided for staff usage. These computers should be standardized along with existing faculty systems in terms of software, configuration and hardware.

- Internet access is now a fundamental part of computer education. It will be necessary to establish Internet connectivity to enhance learning, expand communication, and provide the foundation for future job skills. Because of the large number of computers involved, Network Address Translation (NAT) will be necessary to allow for consistent connectivity. Because the infrastructure of the Internet is not yet established in the RMI, it will be necessary to follow plans from the telecommunication provider to determine when and where they will be providing Internet access in the future.

- In order to simplify instruction, learning, and system support, a standard operating system and suite of applications should be implemented. These should be updated regularly and collectively.

- To simplify system management and reduce cost, computer labs should be upgraded to a thin client/server model. Thin client systems contain no operating system or file storage locally. All information is stored and processed on a centralized server. A thin client/server model provides system redundancies that improve the stability and dependability of the individual terminal.

- It will be necessary to implement controls over Internet browsing. This is best accomplished through the implementation of a local web proxy. A proxy server caches web content to improve the browsing experience, while providing the ability to limit which sites and content can be accessed.

- A LAN will need to be designed and implemented at each school location. This LAN should connect teacher, administration staff and computer lab machines, in order to share network resources. Network security mechanisms like firewalls, access control lists and virtual LANs must be implemented to segregate and control access to these resources. Wireless connectivity to every classroom will be necessary.

- Antivirus software must be installed and configured to protect lab and staff computers from malware. This software must be updated regularly with the latest virus and malware definitions to insure timely identification of infected files and programs.

Computers recovered through the process of upgrading labs from PC to thin client machines should be used to provide a computer in every classroom and the remainder allocated to elementary schools as part of providing every school with at least two computers for administrative and teacher use as soon as possible. These computers should be standardized along with existing faculty systems in terms of software, configuration, and hardware.

The infrastructure and equipment modifications above should be completed by December, 2011. In light of that, PD for secondary school staff at all levels will be a priority during summer 2011. Standards implementation should be underway during SY 2011-12.

E. Implementation at the Elementary School Level

The elementary schools present a very different situation than the high school and there is much greater diversity among the ICT-readiness of campuses. A mentioned earlier, schools in Majuro have grid-power and available Internet access, while some other schools will initially have limited access to both power and Internet. Elementary schools will need to be phased in over a period of time and will function in diverse contexts. PD and standards implementation will need to be adjusted accordingly. The target is for all elementary schools to have computers and other ITC resources available for use by school leaders and teachers by SY 2012-13 and for students by SY 2013-14. PD for elementary school leaders and teachers will be held during the summers of 2011, 2012, and 2013. Participants will be identified based on the finalized MOECTP roll-schedule for elementary campuses. Standards implementation will follow a similar staggered schedule but full implementation will take place by the beginning of SY 2015-16.

The first step in moving forward will be to conduct several information collection activities including a thorough inventory of computers and other ICT resources as well as a survey of current teacher knowledge, skills and use of technology for their professional growth and to support instruction. Once this is completed, all elementary schools with safe and reliable power should be provided with at least two computers for use by teachers and for administrative purposes (operating systems and applications should be standardized and schools where it is possible should have adequate and reliable Internet access. These sites should also establish a LAN and be equipped with wireless access on the campus. Leaders, teachers, and other staff should be targeted for PD during summer 2011.

Computers for students at these sites and the remaining schools will be phased in during SY 2012-13, 2013-14, and 2014-15. The exact nature of this implementation will depend in large part of the results of the OLPC pilot. As much as possible, implementation will be carried out in conjunction with infrastructure developments by MRD, MTC, and MINTA. However approximately 20 schools will be added per year. Schools being added will be determined by readiness, including the presence of electricity in some cases it will be necessary for the MOE to install solar power. As the elementary initiative moves forward, MOE HQ staff will need to develop materials, resources, and tools that will be useful and relevant at site with and sites without Internet access.

Additional pertinent information regarding the elementary school implementation follows.

- Identification of Computer Utilization Needs

    The number of computer terminals needed per school is dependent on the projected number of hours that the computers will be in use and the number of students that will need to use the computers concurrently. There is more than one way to determine this need. For example, you can empirically determine the number of hours that each child will be on a computer. If:

    c = the number of computers needed n = the total number of students

y = the number of hours each student is expected to be on the computer per week
z = the number of hours in the school week

then: $c = \dfrac{n(y)}{z}$

Example: If there are 150 students, each working on a computer 1 hour a day (5 hours per week), and there are 30 hours in their school week, then

Number of computers needed = $\dfrac{150(5)}{30}$ = 25 computers

Therefore, if computers were in use at all times during a 30 hour school week, then students could be batched into groups of 25 and a minimum of 25 student computers would be necessary to provide 5 hours per week of computer time for the entire student body. The number of students that will be using the computers concurrently must also be taken into account. For example, to provide the same number of student-hours to a larger group of students would require more computers. The amount of available instructor time is also a factor to consider. If the school week is 30 hours long, but an instructor for the computer lab is only available for 15 hours, then you would again need 50 computers to provide the same amount of student-hours on the computer, because the effective amount of time in the computer lab would be instructor-limited.

- Internet access is now a fundamental part of computer education. It will be necessary to establish internet connectivity to enhance learning, expand communication, and provide the foundation for future job skills. Because of the large number of computers involved, NAT will be necessary to allow for consistent connectivity. It will be necessary to follow plans from the telecommunication provider, and where they will be providing Internet access in the future.

- In order to simplify instruction, learning, and system support, a standard operating system and productivity suite should be implemented. These should be updated regularly and collectively.

- To simplify system management and reduce cost, a thin client/server model should be implemented for computer labs. Thin client systems contain no operating system or file storage. All information is stored and processed on a centralized server. A thin client/server model provides system redundancies that improve the stability and dependability of the individual terminal.

- It will be necessary to implement controls over Internet browsing. This is best accomplished through the implementation of a local web proxy. A proxy server caches web content to improve the browsing experience, while providing the ability to limit which sites and content can be accessed.

- A LAN will need to be designed and implemented at each school location. This LAN should connect teacher, administration staff and computer lab machines, in order to share network resources. Network security mechanisms like firewalls, access control lists and virtual LANs must be implemented to segregate and control access to these resources.

- Antivirus software must be installed and configured to protect lab and staff computers from malware. This software must be updated regularly with the latest virus and malware definitions to insure timely identification of infected files and programs.

- At the most basic level, a computer lab should consist of a secure, closed room, sealed from the elements, with safe and reliable electricity. If any of these elements are not available at a

location, they must first be acquired. High humidity, dust and heat can damage computer equipment and shorten its lifespan. It will be necessary to evaluate the availability, structure and climate control of rooms for computer labs. In some cases the construction of rooms dedicated to this purpose may be necessary. In certain situations, sectioning off a large room may be sufficient. Rooms may need to be equipped with dehumidifiers and/or air conditioning.

- A computer lab will need tables arranged in a configuration to facilitate the classroom environment. Whenever possible, computers should be arranged so that the instructor has a good vantage point of the students' screens.

- Larger computer labs with more computers will require wire management for safety and organization. This may include (but is not limited to) wiring conduits, wiring boxes, and patch panels.

IV. MONITORING AND EVALUATION

A project of the scope of the MOE MOECTP requires ongoing monitoring and both formative and summative evaluation. The monitoring and evaluation will address two key questions:

1) Is the CTP plan being implemented as intended?

2) Is the implementation resulting in the intended outcomes, furthering attainment of the established goals, and ultimately having a positive impact on teaching and learning as well as improving MOE "efficiencies?"

The specific methods used to answer these two questions will vary over the course of the project but in general the first will be answered by documenting the steps and actions taken by the MOE to further implementation. While the second will be answered by collecting evidence of changes in knowledge, skills, behaviors, and, in the case of the MOE HQ, the results of efforts to increase efficiencies, and the availability of data to support decision-making, etc. It is anticipated that some of the measures will change over time as the plan goes through stages of implementation with a stronger emphasis on foundational implementation steps in Year 1 and early Year 2 and on outcomes and impact in the later part of Year 2 and onward.

A. Implementation

Monitoring and evaluation of the MOECTP implementation will document the efforts and progress made in carrying out the activities as laid out in the implementation timeline. Typical questions will be:

- Have the necessary oversight committees been formed and are they carrying out their responsibilities?

- Has the infrastructure at MOE HQ been upgraded?

- Have school leaders and teachers in implementing school sites received the necessary PD?

- Do high schools have reliable Internet access?

- Have the appropriate policies and procedures been developed and disseminated?

- Does the MOE have agreements with MINTA in place to ensure cost-effective Internet services to schools? With CMI to provide appropriate PD?

- Has the MOE website been upgraded and kept up-to-date as a communication tool for parents and the community?

- Have e-resources been developed to increase the availability of local instructional materials?

The answers to these question will largely come from the documentation of the activities carried out and evidence that something occurred and/or was produced.

B. Outcomes and Impact

Monitoring and evaluating the impact of the implementation is both more challenging and, in many ways, more important than monitoring the implementation. This will involve a variety of strategies including: teacher and student portfolios, teacher and school leader journals, site visits to implementation sites, classroom observations, school and role-alike focus groups, examples and evidence MOE efficiencies such as the greater availability of data, and, ultimately, student achievement data documenting the impact of ICT-enhanced instruction. Typical questions will be:

- As a teacher, how has your teaching changed as a result of your school's ICT involvement? What are your students doing differently?

- As a student, how have you taken advantage of your school's ICT involvement? What were you able to accomplish that you may not have done in the past?

- As a school leader, in what ways has your school's ICT involvement impact on your ability to carry out your work? What have you done to be a proactive leader in the ICT effort on your campus?

- Are there significant differences in student achievement in schools involved in the ICT effort?

C. Carrying Out the Monitoring and Evaluation

There are a variety of possible ways to organize the monitoring and evaluation including:
- Hiring a consultant to conduct monitoring, formative, and summative evaluation.

- Conducting monitoring and formative evaluation "internally" and conducting an annual external review and evaluation.

- Conducting the entire process "internally."

The second choice is probably the most practical, involving lower costs but still having the unbiased perspective of an external individual/agency. If the evaluation is carried out using a combination of internal and external evaluation methods, it will be critical that MOE staff and the external evaluator work together from the outset.

Regardless of the decision in that regard, planning and beginning the implementation of a rigorous monitoring and evaluation plan is critical. Development of a strong evaluation plan and the tools to carry it out will be one of the first activities as the plan is carried out.

V. ANNUAL TARGETS AND TIMELINES

The following pages identify the projected key targets for each year of the five-year plan and a timeline for the overall effort. It is recognized that developments within the MOE and the county as a whole will impact on implementation and is likely to result in adjustments particularly in the later years. The results of the OLPC pilot and findings of the monitoring and evaluation activities are also likely to result in adjustments.

A. Year One (December, 2010 – September, 2011) Key Targets

Year 1 Key Targets include:

- Formation of the teams involved with implementation coordination and oversight.

- Conducting a Ministry-wide ICT equipment inventory.

- Conducting a Ministry-wide staff ICT knowledge and skills survey.

- Upgrading the MOE HQ systems.

- Development of ICT standards and identification of key competencies for staff not "covered by" standards.

- Develop ICT/Internet-related policies and procedures.

- PD for all MOE HQ staff including both basic literacy and customized role specific content.

- Initial development of tools and resources for use by schools. This is an on-going MOE HQ function.

- Reaching agreement with MINTA to provide schools sites with reliable Internet access. Support this access for all secondary schools and elementary schools where the service is available.

- Collaboration with CMI to design and implement phased-in PD program.

- Preparation of infrastructure and equipment for launch of high school standards implementation in SY 2011-12.

- Standards and competencies-aligned PD for staff at all secondary schools including basic ICT/computer literacy.

- Ensure that all elementary schools with power (Phase I) have a minimum of two functioning "updated" computers one of which is available to administrator and one accessible to teachers.

- PD, including basic literacy, for staff and teachers at elementary schools with computers and Internet access.

- Conducting and evaluating the OLPC Pilot and, based on the results of the evaluation, determining a specific plan for the remaining elementary schools.

- Fiscal and human resources are allocated to meet the annual target described above.

- Monitoring and evaluation activities.

B. Year Two (October, 2011 – September, 2012) Key Targets

Year 2 Key Targets include:

- Training and preparation of additional School Support Teams.

- Continued HS standards implementation with a focus teacher us of technology to enhance instruction and technology integration across the curriculum.

- Installation of computers for student use in Phase I elementary school sites.

- Implementation support for Phase I and II sites and follow-up support for HS and Phase I elementary schools.

- Infrastructure development, including computers for administration, teachers, and students and communication tools for Phase II elementary schools. Phase II schools will include 1/3 of the elementary schools not participating in Phase I including some of whom will need solar power installed.

- PD, including basic literacy, for staff and teachers at elementary schools with computers and internet access.

- Continue HS standards implementation and begin elementary school standards implementation.

- On-line resources, instructional planning templates, and other tools are available to HS.

- On-line data and information collection and reporting are fully implemented for secondary schools.

- Fiscal and human resources are allocated to meet the annual target described above.

- On-going monitoring and evaluation

C. Year Three (October, 2012 – September, 2013) Key Targets

Year 3 Key Targets include:

- PD, resources, and support for 21st Century libraries in the secondary schools including e-collection and resources and, if possible, establishing them as community centers. PD for librarians and other school-based resource personnel.

- Infrastructure development, including computers for administration, teachers, and students and communication tools for Phase III elementary schools. Phase III schools will include 1/2 of the remaining elementary schools, some of whom will need solar power installed.

- Follow-up support for HS and Phase I and II elementary schools.

- Inclusion of standards-aligned ICT courses incorporated in the offerings of CMI and USP as part of teacher preparation programs.

- HS students have access to on-line classes when a highly-qualified instructor is not on site or when specific courses to meet college and career readiness are not offered.

- On-line resources, instructional planning templates, and other tools are available to elementary schools.

- Fiscal and human resources are allocated to meet the annual target described above.

- On-going monitoring and evaluation

D. Year Four (October, 2013 – September, 2014) Key Targets

Year 4 Key Targets include:

- Full implementation of HS ICT standards for school leaders, teachers, and students by the beginning of SY 2014-15.

- Infrastructure development, including computers for administration, teachers, and students and communication tools for Phase IV elementary schools. Phase IV schools will include the remaining elementary schools including some of whom will need solar power installed.

- Follow-up support for HS and Phase I, II and III elementary schools.

- PD, resources, and support for 21st Century libraries in the Phase I, II and III elementary schools including e-collection and resources and, if possible, establishing them as community centers. PD for librarians and other school-based resource personnel.

- On-line data and information collection and reporting are fully implemented for elementary schools.

- Fiscal and human resources are allocated to meet the annual targets described above.

- On-going monitoring and evaluation

E. Year Five (October, 2014 – September, 2015) Key Targets

Year 5 Key Targets include:

- Follow-up support for and HS and elementary schools.

- Elementary students have access to on-line classes to augment learning experiences available on the school campus.

- PD, resources, and support for 21st Century libraries in the Phase IV elementary schools including e-collection and resources and, if possible, establishing them as community centers. PD for librarians and other school-based resource personnel.

- Full implementation of elementary school ICT standards for school leaders, teachers, and students by the beginning of SY 2015-16.

- Fiscal and human resources are allocated to meet the annual targets described above.

- On-going monitoring and evaluation

F. Beyond Year 5

Needs beyond Year 5 will include:

- On-going support and ICT-related PD for educators throughout the RMI.

- Fiscal and human resources are allocated to maintain and, as necessary upgrade systems and provide training and PD.

- On-going monitoring and evaluation of systems, efficiencies, and attainment of standards.

G. Implementation Timeline

A. Coordination and Oversight																				
Project Year	**Year 1**				**Year 2**				**Year 3**				**Year 4**				**Year 5**			
	2010	**2011**				**2012**				**2013**				**2014**				**2015**		
Activity	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Implementation Leadership Team (ILT)																				
Identification of the ILT	X																			
Identify and document the roles and responsibilities of the group and individual members	X	X																		
ILT Regular Meetings	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Finalizing the Master Implementation Timeline including school site timelines and identification of fiscal and human resources. Revisit semi-annually	X	X		X		X		X		X		X		X		X		X		
Development and occasional review of Policies and Procedures for ICT in the MOE	X	X	X				X				X				X				X	
Detailed IT school-by-school assessment and inventory including both equipment and IT skills among staff	X	X	X			X				X				X				X		
Review of monthly progress reports for the various implementation teams, semi-annual monitoring and formative evaluation findings, and the annual evaluation report	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Advisory Group																				
Identification of Advisory Group Members	X																			
Advisory Group Orientation	X																			
Advisory Group Meetings	X	X		X		X		X		X		X		X		X		X		
Advisory Group Review of the Plan/Monitoring Reports	X	X				X				X				X		X				X

A. Coordination and Oversight (Continued)																				
Project Year	Year 1				Year 2				Year 3				Year 4				Year 5			
Activity	2010	2011				2012				2013				2014				2015			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Implementation Team: MOE HQ																				
Identification of Team Members	X																			
Training of MOE HQ Team Members	X	X			X															
Implementation Team: School Implementation																				
Identification of Team Members	X			X				X				X								
Training of School Implementation Team Members	X	X		X	X			X	X			X	X							
Collaborative Arrangements																				
MINTA for Internet Access	X	X		X				X				X				X			X	
CMI to provide In-service Training			X	X	X			X				X				X			X	
CMI and USP to incorporate standards-aligned ICT as part of teacher preparation								X												

B. Standards, Competencies and Professional Development (PD)																					
Project Year	Year 1				Year 2				Year 3				Year 4				Year 5			
Activity	2010	2011				2012				2013				2014				2015		
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Standards																				
Development of Standards	X	X	X																	
Secondary Standards Review and Revision										X										
Elementary Standards Review and Revision															X					
Full Implementation of HS Standards												X								
Full Implementation of Elem Standards																	X			
Professional Development																				
PD for MOE HQ*		X	X	X																
PD for IT Specialist at HS and Elem Phase I*		X	X	X																
PD for HS and Elem Phase I School Leaders and Teachers*				X	X			X												
PD for Elem Phase II School Leaders and Teachers*									X											
PD for Elem Phase III School Leaders and Teachers*												X	X							
PD for Elem Phase IV School Leaders and Teachers*															X	X			X	X
PD for HS school library staff*								X												
PD for Elem school library staff												X			X				X	
Monitor, reevaluate and refine		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

C. Implementation at the Ministry Level																				
Project Year	Year 1					Year 2				Year 3				Year 4				Year 5		
	2010	2011				2012				2013				2014				2015		
Activity	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Upgrade MOE HQ Infrastructure and Systems																				
Upgrade IT "facilities"		X																		
Assemble rack and mount new equipment	X	X																		
Install and configure new server software and equipment	X	X	X																	
Migration of network services		X	X																	
Develop standard software package for administration staff and teacher work stations			X																	
Upgrade client software				X																
PD, systems training for IT staff		X	X																	
Develop a plan for ongoing training for IT staff	X	X																		
PD for both MOE HQ and HS IT staff		X	X	X			X				X				X					
Create a system for monitoring network services				X																
Evaluate system performance and upgrade as necessary			X		X				X				X				X			X
PD for MOE HQ Staff																				
ICT literacy and basic skills for all staff: survey	X	X																		
ICT literacy and basic skills for all staff.*		X	X																	
PD focused on job specific skills.*		X	X	X			X				X				X			X		
*Ongoing as necessary/desirable.																				
Tools, Resource, and Materials Development																				
MOE Website Upgrade and Development			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ensuring that existing instructional documents, materials, and teaching and learning tools and resources are available electronically.		X	X	X	X															
Development of e-resources including instructional materials and teaching and learning tools and resources.		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

C. Implementation at the Ministry Level (Continued)																				
Project Year	Year 1					Year 2				Year 3				Year 4				Year 5		
	2010	2011				2012				2013				2014				2015		
Activity	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Development of interactive on-line PD, learning experiences, and courses.					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Development of online data collection processes and tools.			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fully implement online data collection, processing, and reporting for secondary schools.							X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fully implement online data collection, processing, and reporting for elementary schools.															X	X	X	X	X	X
Monitor, reevaluate and refine			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

D. Implementation at the Secondary School Level																				
Project Year	Year 1				Year 2				Year 3				Year 4				Year 5		
	2010	2011				2012				2013				2014				2015		
Activity	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Detailed Inventory of HS ICT resources.	X	X																		
Detailed survey of HS staff knowledge and skills related to ICT.	X	X																		
Infrastructure																				
Identify components of, develop and install software package for HS lab desktops.		X	X	X																
Evaluate and upgrade Internet connections.		X	X																	
Configure virtual desktop server.				X	X															
Upgrade labs to thin clients.				X	X															
Configure web proxy system.			X																	
Evaluate system performance and upgrade as necessary					X				X				X				X			X
Professional Development																				
ICT literacy and basic skills for all staff.*		X	X	X																
PD focused on job/content area specific skills.*			X	X			X				X				X				X	
Phased-in implementation of the HS ICT standards					X	X	X	X	X	X										
Full implementation of the HS ICT standards										X										
On-line courses for student available									X	X	X	X	X	X	X	X	X	X	X	X
21st Century libraries in place										X										
Monitor, reevaluate and refine			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Project Year	Year 1				Year 2				Year 3				Year 4				Year 5			
Activity	2010	2011				2012				2013				2014				2015		
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Survey the current situation.																				
Detailed Inventory of elementary ICT resources.	X	X																		
Evaluate power needs, structural needs, and Internet connectivity.	X	X	X																	
Develop standard software package and virtual desktop configuration.				X																
Conduct OLPC Pilot Implementation and Study	X	X	X	X																
Phase I																				
Detailed survey of Phase I Elem school staff knowledge and skills related to ICT.	X	X																		
Identify components of, develop and install software package for school leader and teacher desktops.			X	X																
LAN wiring and wireless connectivity.			X	X																
Address structural needs.			X	X																
Build lab servers				X																
Setup thin client work stations.				X	X															
Professional Development																				
ICT literacy and basic skills for all staff.*			X	X	X															
PD focused on technology-enhance teaching and learning area.				X				X				X				X				X
PD on the use of management tools.				X				X				X				X				X
PD for one or more staff to serve in network maintenance and trouble shooting.			X	X																
Phase II																				
Detailed survey of Phase II Elem school staff knowledge and skills related to ICT.							X													
Detailed evaluation of power needs, structural needs, and Internet connectivity at Phase II sites.						X	X													

E. Implementation at the Elementary School Level (Continued)																				
Project Year	Year 1					Year 2				Year 3				Year 4				Year 5		
Activity	2010	2011				2012				2013				2014				2015		
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Address power needs.							X	X												
Address structural needs.							X	X												
LAN wiring and wireless connectivity.							X	X												
Build lab servers.							X	X												
Setup thin client work stations.							X	X												
Professional Development																				
ICT literacy and basic skills for all staff.*							X	X	X											
PD focused on technology-enhance teaching and learning area.								X				X				X				X
PD on the use of management tools.								X				X				X			X	
PD for one or more staff to serve in network maintenance and trouble shooting.							X	X												
Phase III																				
Detailed survey of Phase III Elem school staff knowledge and skills related to ICT.											X									
Detailed evaluation of power needs, structural needs, and Internet connectivity at Phase III sites										X	X									
Address power needs.											X	X								
Address structural needs.											X	X								
LAN wiring and wireless connectivity.											X	X								
Build lab servers.											X	X								
Setup thin client work stations.											X	X								
Professional Development																				
ICT literacy and basic skills for all staff.*											X	X	X							
PD focused on technology-enhance teaching and learning area.*												X				X				X
PD on the use of management tools.*												X				X				X

Project Year	Year 1					Year 2				Year 3				Year 4				Year 5		
	2010	2011				2012				2013				2014				2015		
Activity	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
PD for one or more staff to serve in network maintenance and trouble shooting.*											X	X								
Phase IV																				
Detailed survey of Phase IV Elem school staff knowledge and skills related to ICT.															X					
Detailed evaluation of power needs, structural needs, and Internet connectivity at Phase IV sites														X	X					
Address power needs.															X	X				
Address structural needs.															X	X				
LAN wiring and wireless connectivity.															X	X				
Build lab servers.															X	X				
Setup thin client work stations.															X	X				
Professional Development																				
ICT literacy and basic skills for all staff.*															X	X	X			X
PD focused on technology-enhance teaching and learning area.																X				
PD on the use of management tools.*																X				X
PD for one or more staff to serve in network maintenance and trouble shooting.*															X	X				X
Phased-in implementation of the elementary ICT standards							X	X	X	X	X	X	X	X	X	X				
Full implementation of the elementary ICT standards																X				
On-line learning experiences for student available													X	X		X	X	X	X	X
21st Century libraries in place															X					
Monitor, reevaluate, and refine							X			X		X		X		X		X		X

	Year 1				Year 2				Year 3				Year 4				Year 5		
F. Monitoring and Evaluation																			
Project Year	2010	2011				2012				2013				2014				2015		
Activity	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Finalize monitoring and evaluation framework.	X	X																		
Develop tools, processes and designate responsibilities.		X	X																	
Quarterly implementation and monitoring updates			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Annual evaluation reports					X				X				X				X			X

VI. APPROXIMATE COSTING

Approximate costing is "in process" pending several decisions regarding the details of the plan. Even after those details are clear, major unknowns will be:

- Arrangements with NTA and Internet Connectivity Costs
- Arrangements with CMI for PD
- Scenario for Elementary Schools depending on the results of the OLPC pilot

RMI MINISTRY OF EDUCATION CTP Possible Budget
TECHNOLOGY PLAN BUDGET

2011 - 2015
Summary

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Personnel						
Fringe benefits						
Travel						
Supplies						
Equipment						
Contractual						
Other						
PD, meetings						
Duplication and printing						
Communications						
Total other						
Total						

Appendix A. REFERENCES

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APPENDIX B: THE MINISTRY OF EDUCATION: STRATEGIC PLAN 2007–2011 HIGHLIGHTS

In order to further the achievement of its goals between 2007 and 2011, the MOE Strategic Plan established objectives for various sectors within the ministry. Those that specifically mention ICT or could be significantly enhanced by ICT are presented in the following table. It should be noted that the original numbering of objectives maintained but some not included because they were not applicable.

Administration and Human Resource Development :Personnel		
Objective	Relevant Implementing Actions	ICT/IT Implications
1. Improve staff capacity through clarification of roles and ongoing training support.	• Establish a training program for clerical support staff	• Ensure that the training program the use of e-communication tools, word processing, preparation for presentations and publications, and data management.
2. Improve the monitoring and evaluation of MOE staff and teachers.	• Ensure teacher certification and teacher management system are implemented and in place • Hire data entry clerks for each major Ministry division	• Ensure that the Office of Management Information Systems (MIS), including data entry clerks, have appropriate software and training to computerize.
3. Strengthen communication among MOE staff, both clerical and professional.	• Establish an annual retreat for the MOE administration and clerical staff as a review process to complement the production of the Annual Report, to review progress and goals. • Communicate regularly with divisions to address staff vacancies and training needs.	• Establish e-communication and document sharing tools, processes and procedures.
Administration and Human Resource Development :Professional Development		
Objective	Relevant Implementing Actions	ICT/IT Implications
1. Strengthen professional staff capacity through clarification of roles and ongoing training support to ensure quality leadership and instruction.	• Ensure professional development opportunities for educational planners and data managers. • Ensure professional development opportunities for teachers and senior staff and enforce penalties for in-service teacher dropouts. • Develop Teacher Training Programs for indigenous Marshallese elementary and secondary teachers. • Make training available for both public and private school teachers on multiple atolls and in Marshallese language. • Ensure teacher support through availability of	• Explore on-island, off-island, and online opportunities and allocated resources accordingly. • Develop and utilize teacher professional development databases within the MIS. • Develop and conduct web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM /DVD format for teachers in schools without Internet connectivity supplemented by radio training sessions. • Developed databases with web-based

	professional teaching resources such as internet access, professional journals, and regional media products. • Support Elementary school principals with ongoing training on management, community relations, consistent teacher evaluations and enforcement of attendance policies.	interfaces for weekly attendance reporting as well as teacher evaluation.
2. Improve the monitoring and evaluation of teachers.	• Develop computer based teacher testing system for all levels. • Implement testing system. • Track the result of the annual RMI teacher test to ensure ongoing training	• Develop on-line teacher testing system and an aligned database for tracking data. "Hard-copy" versions will be necessary until such time as all schools have connectivity. Data managers will need to be trained to enter information from results of hard copies.
3. Improve the coordination and communication of training opportunities.	• Publish a calendar of training opportunities. • Communicate calendar through media divisions and invite private school teachers. • Communicate with Division heads to identify training needs.	• Establish e-calendaring and tools and processes for communicating with the broader community including private schools.

Administration and Human Resource Development : Fiscal Management, Procurement and Budget /Grant Office

Objective	Relevant Implementing Actions	ICT/IT Implications
1. To improve communication and effectiveness in the procurement process and the application for and administration of grants.	• Implement a comprehensive tracking process to monitor/follow up on the procurement process. • Communicate budget and grant opportunities to all sectors.	• Develop tools and processes for an e-procurement system including forms and inventories. • Establish an electronic shared document system including grant application resources, requests for proposals, and applications. • Establish policies and procedures and develop tools for online grant administration and reporting.

Property

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Ensure that schools are maintained on a regular basis.	• Create School Maintenance Policy Guidelines and distribute to all schools.	• Acquire e-tools and establish procedures to maintain and share information such as property inventories.

2. Ensure that construction of new facilities continues as required to meet student and community needs.	• All schools will include library facilities and resources.	• Ensure that as library facilities are build they are setup for and equipped with one or more computers to enhance the library with e-resources in addition to "hard-copy" collections.

Information Technology (IT)

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Improve staff capacity through clarification of roles and ongoing training support.	• Establish ongoing training opportunities for IT staff.	• Explore on-island, off-island, and online opportunities and allocate resources accordingly. • Ensure the training results in the appropriate "certifications" for IT staff
2. Develop planning strategies to support the IT needs of the Ministry.	• Maintain the supportive role of IT for MIS and clarify this through policy. • Explore the possibility of funding IT Division by taking a percentage of several divisions' budgets. • Review IT policies and revise if necessary; Approve final IT policy and distribute. • Increase the IT staff to meet the growing IT needs of MOE, e.g. Jaluit High School, NIHS, etc. that are now using internet.	• Develop policies and procedures that the role of IT is clear and supportive of the various MOE needs. • Provide adequate funding for IT to support the MOE needs including effective and reliable networks and systems. • Identify and provide training for staff who can serve as "IT Aides/Troubleshooters" within the various units of the MOE and at the school level.
3. Establish and implement effective communication procedures for IT needs of the MOE.	• Communicate system concerns/protocols to all MOE IT users. • Communicate policy regarding new hardware and software requirements. • Communicate protocols regarding computer use, ethics, and security concerns at the MOE. • Maintain regular contact with national internet service providers (ex. NTA).	• Maintain system specifications, policies, procedures and other IT-related resources in a shared document system. These would include appropriate use policies for staff, students, and community members. • Establish and implemented mandatory security protocols for all MOE computers and systems. This would include role-related "differentiated password" accessibility, software, etc. • Establish protocols for regular communication with MINTA and other agencies including the identification of liaisons.

Media

Objective	Relevant Implementing Actions	ICT/IT Implications
1. To enable increased communication and coordination between the MOE administration, public and private schools, and the community at large to ensure efficient management of and national investment in education.	• Strengthen communication procedures across all sectors and schedule regular, consistent, interactions to ensure feedback. • Enhance communication between Ebeye/MOE and outer island schools and MOE • Strengthen communication between public and private schools, regarding curriculum, resources, etc. • Strengthen and schedule regular communication between schools and parents, especially outer island high schools with boarding students. • Extend regular communication/ interactions to tertiary institutions, private sector, all private schools, NGOs, and community at large. • Publish monthly newsletter which includes a calendar of main events, conferences, etc. • Calendar – Media division shall manage a comprehensive master calendar based on input from each division, regarding trainings, school events, etc.	• Establish e-communication and document sharing tools, processes and procedures. • Work with the IT section and other agencies such as MINTA to provide schools with reliable connectivity as soon as such services are available to improve communication. • Establish e-calendaring and tools and processes for communicating with the broader community including private schools. • Develop and maintain a MOE Website that includes calendars as well as information and resources for parents and community.

Policy and Planning

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Review and establish policies and procedures to support increased efficiency and quality across the Ministry.	• Review the Education Act with the intent to establish policy to extend equal access to all educational services for all students especially paying close attention to the needs of the most vulnerable students, particularly low socio-economic groups and those in remote and isolated areas. • Strengthen relationships between MOE and police regarding the procedures for reporting truancy and allegations of child abuse • Establish a Truancy Team to research truancy issues and recommend policy. Include	• Ensure that IT infrastructure development and access is included as both a component of "equal access to education" and as a critical part of the solution to current inequities. • Develop secured MOE databases to document truancy and allegations of child abuse. Consider way in which these databases could be appropriately shared with the police department and other relevant agencies. • Develop policies and procedures for the use

	representatives from the local media and the police department. • Establish a compliance policy on the establishment of school libraries at all public and private schools. (See library section) • Guided by the RMI Natural Disaster Plan, establish a MOE Natural Disaster Plan to direct school leaders on approved ways of responding to natural disasters that occur during school hours, such as wave actions, including power outages, and describing community use of school facilities.	of MOE e-communications systems in event of emergency.

Policy and Planning: Management Information System

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Strengthen the ability of MIS to collect, enter, and manage data for efficient tracking of Ministry objectives and performance.	• Continue to collect data at Elementary, Secondary and Vocational Levels to determine drop out rates. • Improve information management, data collection and management information systems for student and teacher performance and maintenance levels at Elementary, Secondary and vocational level. • Ensure public folder is updated annually, expand access to principals and increase data criteria for folder entries. • Explore training programs for MIS staff and selected MOE staff including yearly computer workshops • Review and revise MIS data access criteria • Establish priorities and procedures for the organization of the MIS office. • Improve communication by posting appropriate data in the MOE public folder • Explore further opportunities to communicate data with MOE staff, schools, and the public using the World Wide Web. (collaborate with IT)	• Develop databases to collect/report the necessary information including web-based data entry interfaces. • Provide training for those responsible data entry at the both central office and school levels. • Develop policies and systems to allow for secure, role-appropriate access to the data collected including an e-document sharing system. • Explore on-island, off-island, and online opportunities and allocate resources accordingly. • Collaborate with the IT and Media sections develop and maintain a website to meet MOE public reporting and accountability needs.

Curriculum Development and Testing

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Improve staff capacity to provide support for the curriculum and the nation's teachers through clarification of roles and ongoing training support.	• Explore alternatives assessment methods for cultural education, ex. student portfolio. • Curriculum Training: Help teachers learn how to teach the curriculum and distribute the resources required to teach it at all levels of education. • Train Curriculum and Instruction staff on training methods and strategies, and production of local resources • Mentors assist principals to encourage and utilize teacher teams to create model lesson plans and shared curriculum units at all levels of education. • Curriculum guides per grade will be developed by curriculum specialists/mentors as an effective means of training teachers to teach to the standards. • Improve Language arts by creating and supporting both Marshallese and English Language Arts materials, modeling instructional units and creating grade cluster teaching teams for support and collaboration. (Proposed Instructional Center for K-8) • Continue and implement a master schedule of projected mentor visits to encourage equal services among outer island schools.	• Ensure that teacher and administrator training includes the effective use of a variety of resources including e-resources and the integration of ITC in instruction. • Use computer-based resources to develop and disseminate locally developed resources and lesson plans including Marshallese materials. • Create online learning communities to strengthen teaching and learning including the resources mentioned above. • Utilize the e-master calendar established by the Media Unit to schedule school site visits and training. • Establish a well-resourced Instructional Center that includes a multimedia section and computers with access to both locally developed and online resources.
2. Develop effective means of monitoring the effectiveness of teacher mentoring to ensure meaningful teacher support services.	• Consider alternative means of training teachers to teach to standards, including the creation of curriculum guides per grade	• Utilize ICT to offer professional development via web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM /DVD format for teachers in schools without Internet connectivity supplemented by radio training sessions.
3. Integrate and incorporate local content into the current curriculum to provide a more holistic education.	• Incorporate life skills into curriculum from early childhood. • Strengthen the Family life component by	• Use computer-based resources to develop and disseminate locally developed resources and lesson plans including Marshallese

	mainstreaming life-skills into the secondary curriculum.	materials.
	• Strengthen Math, Health/Sex Education and Environmental education (all sectors).	• Ensure that schools have the resources and connectivity to teach information literacy and that teachers and administrators receive the professional development necessary to effectively incorporate information literacy across the curriculum.
	• Collaborate with National Training Council (NTC) to ensure vocational/life skills oriented programs are included as part of the national curriculum all at levels	
	• Strengthen Marshallese cultural knowledge, specifically health and environmental knowledge, (including language) skills into the curriculum (across all sectors).	• Ensure that schools have the resources and connectivity to address the information technology standards and that teachers and administrators receive the professional development necessary to provide students with learning opportunities to meet the standards.
	• Create professional quality cultural education resource materials, including a textbook and teacher's guide, to be printed and distributed for all grades.	
	• Align standards and benchmarks to ensure a clear linkage between early childhood, elementary, secondary sectors, and post-secondary sectors and employment.	
	• Information literacy is integrated and supported throughout the elementary and high school curriculum.	
	• Prioritize Marshallese Language Arts resource development by creating and distributing resources to all teachers, including a textbook.	
	• Implement and/or continue courses in Arts, Music, Physical Education, Health/Sex Education, Marshallese Studies, and Traditional Skills at all public high schools.	
	• An Information Technology (IT) curriculum (standards and benchmarks) will be developed for secondary schools.	
4. Establish regular and ongoing schedules to communicate curricular developments to all schools in the	• Strengthen communication among public and private schools regarding standards and benchmarks and related resources.	• Ensure that standards, benchmarks, and related resources are available electronically to teachers, administrators, and a variety of

| | • Ensure the distribution of the national curriculum standards and benchmarks (all sectors)
• Make sure English and Marshallese language versions of the standards and benchmarks are available in all classrooms. | other audiences. |
| RMI. | | |

Curriculum Development and Testing: Testing

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Review of the testing process and establishment of elementary and high school exit exams.	• Determine national assessment at Secondary Level, with schools responsible for tracking and implementing assessment based on finalized secondary curriculum. • Assess the appropriateness, purpose, administration, preparation, evaluation, and impact of the MISAT tests, particularly the 8th grade test. • Consider creating a national testing committee to select and outsource test administrators to eliminate the diversion of expert mentors/curriculum specialists from their primary responsibilities. Also consider other methods of improving the efficiency of the testing process, making it less of a drain on the Ministry. • Reconsider the teacher test regarding other subjects, including math, and Marshallese language and its role as the primary evaluation tool for teachers.	• Utilize technology to the greatest extent possible to improve the efficiency of conducting the national assessment including secure system of online teacher tests.
2. To improve communication of test results in a timely manner.	• Increase cooperation and coordination between Testing and MIS to expedite data collection • Propose a policy to ensure test results are disseminated directly to students, in addition to schools, and principals.	• Collaborate with the IT and MIS to develop systems to disseminate results in a timely manner as well as developing and maintaining a website to meet public reporting and accountability needs.

Early Childhood Education

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Enhance training and support opportunities for early childhood teachers.	• Continue to build skill profiles of Kindergarten teachers through ongoing summer school and establish "effective teaching skills programs" with	• Develop and conduct web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM

	Relevant Implementing Actions	ICT/IT Implications
	focus on improving teaching skills and instruction content.	/DVD format for teachers in schools without Internet connectivity supplemented by radio training sessions.
2. Enhance effective monitoring of students and teachers in the ECE program.	• Improve Information Management, data collection and management information system for curriculum development and needs of Early Childhood Education. • Ensure Kindergarten teacher certification and teacher management system are implemented and in place. • Manage and enforce Kindergarten teacher absenteeism and teacher performance. • Continue to collect data at Kindergarten Level to determine drop out rates. • Enforce truancy policy.	• Develop and utilize teacher professional development databases within the MIS. • Develop databases with web-based interfaces for weekly attendance reporting as well as teacher certification and evaluation.
3. Enhance communication among Kindergarten teachers, and between teachers and parents.	• Communicate school events to Kindergarten liaison	• Collaborate with the Media unit to develop and maintain a website that includes calendars as well as information and resources for parents and community.

Elementary

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Establish ongoing training and support services for all elementary teachers.	• Teacher training on the implementation of the elementary curriculum • Support teachers with regular communication, in particular, weekly radio communication between the MOE and outer island schools. • Continue to build skill profiles of Elementary teachers through ongoing summer school and establish "effective teaching skills programs" with focus on improving teaching skills and instruction content.	• Develop and conduct web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM /DVD format for teachers in schools without Internet connectivity supplemented by radio training sessions.
2. Enhance effective monitoring of students and teachers in elementary education.	• Improve Information Management, data collection and management information system for curriculum development, students, and teachers and the needs of elementary education Head Teachers and Principals need to track certification	• Develop processes, procedures and databases incorporating both student data and teacher qualification and professional development history.

	process and encourage continuing education in conjunction with teachers and personnel. • Manage and enforce Elementary teacher absenteeism and teacher performance. • Continue to collect data at Elementary Level to determine drop out rates	• Create online processes to identify school needs and their resolution. • Develop databases with web-based interfaces for weekly student and teacher attendance reporting and teacher evaluation.
4. Improve school communication with parents, the community, and MOE	• Develop handbooks for parents regarding the curriculum and other topics.	• Collaborate with the Media unit to develop and maintain a website that includes calendars as well as information and resources for parents and the community including handbooks.
5. Implement an effective truancy policy that includes community awareness campaign and collaboration with local authorities.	• Revise and enforce truancy policy	• Developed databases with web-based interfaces for weekly attendance reporting.

Elementary: Special Needs

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Expand the staff, development and support of special education teachers.	• Increase number of Special Education Teachers in elementary school • Develop Teacher Training Programs for Marshallese Special Ed teachers (locally-CMI or USP special ed. courses). • Continue to build skill profiles of Special Ed. Teachers through ongoing summer school and establish "effective teaching skills programs" with focus on improving teaching skills and instruction content.	• Develop processes, procedures and databases incorporating both student data and teacher qualification and professional development history. • Develop and conduct web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM /DVD format for teachers in schools without Internet connectivity supplemented by radio training sessions.
2. Improve and integrate monitoring systems for special education teachers and students	• Develop and align special education teacher certification procedures with the current teacher management system. • Manage and enforce Special Ed. Teacher absenteeism and teacher performance. • Improve information management, data collection and management information systems for Special Ed. teachers' and students' performance. • Integrate Special Ed MIS with MOE MIS to track	• Develop databases with web-based interfaces for weekly student and teacher attendance reporting, and teacher evaluation. • Integrate Special Education into current MIS databases including long-term tracking after completion of K-12.

	Special Ed. teachers. • A means of tracking students who depart the Special Ed. program needs to be envisioned to help document the successes of the overall program and argue for its continuation.	
3. Enhance the overall enrollment, inclusiveness and equity of services to special needs students	• Use alternative evaluations (other than testing) to determine high school entry for special ed. students. • Review the Education Act with the intent to extend equal access to all educational services for all students especially paying close attention to the needs of all vulnerable students, particularly low socio-economic groups and those in remote and isolated areas. (ex. promote electrification of all schools, open enrollment)	• Ensure that IT infrastructure development and access is included as both a component of "equal access to education" and as a critical part of the solution to current inequities.

Secondary

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Enable the efficient and effective management of secondary schools by ensuring teacher training and support opportunities and appropriate staffing of the Ministry.	• Identify a Logistics-Procurement Officer to take care of outer island secondary school supplies. • Teacher training on the implementation of the secondary curriculum • Continue to build skill profiles of Secondary teachers through ongoing summer school and establish "effective teaching skills programs" with focus on improving teaching skills and instruction content. • Provide training and developmental opportunities for Secondary school principals. • Manage and enforce Secondary teacher absenteeism and teacher performance. • Improve information management, data collection and management information systems for Secondary teachers' performance and student performance. • Continue to collect data at Secondary Level to determine drop out rates	• Develop and conduct web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM /DVD format for teachers in schools without Internet connectivity supplemented by radio training sessions. • Develop processes, procedures and databases incorporating both teacher and administrator qualifications and professional development history. • Develop databases with web-based interfaces for daily/weekly student and teacher attendance reporting.

2. Enhance effective monitoring of students and teachers in secondary education.	• Manage and enforce Secondary teacher absenteeism and teacher performance. • Improve information management, data collection and management information systems for Secondary teachers' performance and student performance. • Continue to collect data at Secondary Level to determine drop out rates	• Develop processes, procedures and databases incorporating both student data and teacher qualification and professional development history. • Developed databases with web-based interfaces for weekly attendance reporting.
3. To increase enrollment, reduce truancy and increase retention rates of secondary students.	• Revise and enforce truancy policy • Enhance current counseling program to include career and work options as well as personal and academic counseling continuing from 9th grade. • Develop and implement a comprehensive counseling program in all secondary schools (career and personal). • Include students involvement in retention plans and identification systems for at-risk students (ex. a student representative on the truancy team)	• Developed databases with web-based interfaces for daily/weekly attendance reporting. • Explore on-island, off-island, and online opportunities for counselor professional development and establish the connectivity for students to access online career planning tools and allocate resources accordingly. • Develop or identify existing risk identification/intervention tools (i.e. National High School Center) and establish an online database, perhaps through MIS.
4. Revise secondary curriculum to provide a holistic education.	• Identify and purchase textbooks and curriculum materials for secondary education • Continue to implement Sr. Practicum, Teacher Academy, and Health Academy at MIHS and Aquaculture and Agriculture practicum at JHS, Agriculture at NIHS and LHS. Expand the teacher academy at LHS. Expand the teacher and health academy programs to all high schools by 2011. • Create and use a Marshallese Language Arts textbook. • Ongoing revision , standardizing and reformatting of secondary school curriculum with standards and benchmarks for math, English, science, social studies, computer technology, health and Marshallese Studies. • Ensure private secondary schools are aware of	• Collaborate with Media to make standards and benchmarks readily available to teachers, students, and the community. • Develop and conduct web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM /DVD format for teachers in schools without reliable connectivity. • Develop standards-based IT courses as well as strategies and tools to integrate the use of technology to enhance teaching and learning across the curriculum. • Ensure that schools have the resources and connectivity to address the information technology standards and that teachers and administrators receive the professional

	MOE Secondary Standards and Benchmarks • Review what has been completed and determine the direction and needs/standards for Pre-Nine program by implementing the March 2006 Success Academy Framework document, produced collaboratively by PREL and MOE. • Information Technology (IT) will be integrated into the secondary curriculum.	development necessary to provide students with learning opportunities to meet the standards.
5. Enhance community involvement in secondary education.	• Expand cluster PTA to LHS and MIHS; explore PTA models for boarding schools. • Explore contracting NGOs to provide services and centers for at-risk youth in conjunction with an expanded counseling program. • Extend library hours and improve facilities and resources for community students after school. • Ensure staff management of library after hours.	• Collaborate with the Media unit to develop and maintain a website that includes calendars as well as information and resources for parents and the community including handbooks. • Ensure that library facilities are setup for and equipped with one or more computers to enhance the library with e-resources in addition to "hard-copy" collections as well as Internet access to online information and materials.
6. Strengthen communication between the schools, parents, and MOE.	• Develop handbooks for parents • Communicate events, meetings, conference, training opportunities to MOE media division for distribution/dissemination	• Augment "traditional" communications methods by developing a parent and community component with the MOE website.
Post-Secondary		
Objective	Relevant Implementing Actions	ICT/IT Implications
2. Improve accountability of all post-secondary programs providing in-servicetraining for MOE teachers	• Establish methods of evaluating programs offered by CMI, USP, BYUH, SDSU and other institutions that provide in-service training for Marshall Islands' teachers in order to ensure accountability to MOE priorities.	• Implement online professional development portfolios for teachers including a mechanism to evaluate courses and in-servicetraining.
4. Expand curricula and improve outcomes for teachers in training	• Investigate the establishment of a local/distance ed. pre-service BA education degree through collaboration with various Post-Sec institutions and agencies • Explore means of better articulating MOE secondary curriculum with CMI curriculum	• Explore on-island, off-island, and online opportunities and allocate resources accordingly. • Develop and conduct web-based training modules for teachers and administrators. Materials can be disseminated in CD-ROM

	• Explore the development of Teacher Training Programs for Marshallese Special Ed teachers (locally-CMI or USP special ed. courses)	/DVD format for teachers in schools without reliable connectivity. • Ensure that students in teacher preparation programs develop the knowledge and skills to meet the ICT teacher standards and to implement the teaching necessary for students to meet the ICT standards.

Scholarship

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Improve returning student retention and services.	• Enable scholarship office to better enforce its policies and penalties for non-returning students, particularly the reimbursement of funds. Consider working with Foreign Affairs to prohibit passport renewal. • Disseminate all scholarship information to all high schools, and utilizing the Asst. Sec. for Ebeye for Kwajalein schools. • Align scholarship database with MIS to better manage and track scholarship students' attributes and successes.	• Include scholarship awardees in the MIS databases.

Technical Vocational Education and Training

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Improve the training and support of vocational instructors	• Teacher training on the implementation of the secondary and NVTI curriculum (2007)	• Augment on-island training opportunities with online training including certification programs.
2. Collaborate with planning, monitoring and TVET curriculum development in light of a developing national framework for TVET	• Improve information management, data collection and management information systems for student performance and maintenance levels at vocational level.	• Include TVET students and courses in the MIS student databases.

Non-Formal Education

Objective	Relevant Implementing Actions	ICT/IT Implications
1. Collaborate with community organizations to provide non-formal education services.	• Collaborate with the National Training Council to establish a "one stop center" on Ebeye for access to educational, work, and post-school opportunities.	• Utilize technology to provide users with access to Internet-base resources and planning tools.

Library Resources and Information Technology		
Objective	Relevant Implementing Actions	ICT/IT Implications
1. To establish libraries in all schools as well as modern computer facilities in order to facilitate direct internet use for research purposes and to actively promote learning through the media and public libraries.	• The Ministry will issue a compliance policy for all schools to have properly built school libraries both for private and public schools. • All secondary schools will offer compulsory information technology subjects. • The Ministry will work with the government to investigate the possibility of introducing pubic libraries equipped with up to date computer facilities with appropriate research links at centralized places as community learning centers. • The Ministry to work collaboratively with the RMI USP center, the CMI and NVTI to coordinate learning resources in the area of Special Education, Early Childhood, Elementary, Secondary and Post Secondary, including TVET. • All libraries (where telecommunication lines are accessible) will be equipped with computers in order to disseminate educational programs via the Ministry's Media section for schools and communities.	• Develop standards and, if necessary courses, that specifically address information and research leitercy. • Ensure that as library facilities are build they are setup for and equipped with one or more computers to enhance the library with e-resources in addition to "hard-copy" collections including Internet connectivity to access online information and resources.

Appendix C. RECOMMENDED INITIAL MOE SYSTEM UPGRADES

Based on the findings of the initial site visits and needs sensing within the MOE HQ and the site visits described earlier, it recommended that immediate efforts focus on improvements which will position the MOE to move forward with technology-enhanced management and enhance their ability to use of technology and support schools, teachers, and students as the overall MOECTP is completed and implemented.

Specific recommendations include:

- Network infrastructure, servers and transport devices are past their "useful life" and a number are not operational. Update the network infrastructure including servers and routers to increase reliability and functionality.

- MOE network security is currently limited to the protection provided by NTA at the ISP level. MOE network security could be improved and controlled by establishing firewalls and other protections within the MOE network.

- Install "stronger" and up-to-date virus protection on all network systems and individual workstations throughout the MOE central office.

- The network equipment and IT room are inadequate with challenges such loud equipment that should be in noise-lessening cabinets, insufficient server racks, and air conditioning which is not working-something likely shorten server life and/or lead to equipment failure.

- Upgrade the current email system which is out of date and unstable.

- Computers in the MOE central office have a variety of operating systems and software applications. Communication, sharing documents, etc., and network troubleshooting and maintenance would be easier and more effective through standardization including an updated e-mail application.

- There is a need to update the ministry-wide inventory of computers, printers, and other technologically-related equipment.

- As new systems are installed, IT staff will need training and professional development.

- Training and professional development for MOE central office staff to ensure they have the knowledge and skills to use the network effectively including e-mail and other software applications intended to increase productivity.

These concerns can be addressed by taking the following steps:

- Acquiring 3 new servers, two w/dual processor, one w/single processor three year warranties, configured to virtualize, consolidate and replace old server equipment.

- Implementing VMWare Vsphere, on two dual processor servers, to provide a reliable, easy to manage platform for this virtualization.

- Protecting the network perimeter with an enterprise class firewall with intrusion protection capabilities. The recommendation would be a Cisco ASA 5510 with IPS bundle.

- Mounting servers in a rack which provides sound suppression.

- Installing package management, remote system management and antivirus protection for the network and workstations. LanDesk is recommended to provide all three.

- Standardizing server operating systems on Windows Server 2008 with 160 CAL(client access

license)

- Standardize operating systems and software applications within the MOE central office to Windows 7 Professional and either Microsoft Office 2007 or 2010. Approximately 75 computers will need to be upgraded.

- Upgrading the Exchange email server to version 2007 with 300 CAL.

- Upgrading network switches should be to Cisco 3560G.

- Seeking on-site implementation support and new system training for MOE IT staff.

- Providing professional development for all MOE central office staff on the use of Windows 7 and Microsoft Office applications and productivity tools including Outlook.

Appendix D. THIN CLIENT TECHNOLOGY

In simplest terms, thin client/server-based computing describes a shift away from the complexities of the typical modern personal computer (PC)-based network. While the PC started out as a simple tool which enabled individuals to increase their personal productivity, it has in fact become a rather complicated and bloated device. New PC hardware and software are constantly being released, creating an endless stream of compatibility issues, both small and large. Just when you think you have your PCs working perfectly, new applications, devices, device drivers, Internet access, etc., are required, and each desktop computer needs to be individually upgraded, reconfigured, or even completely replaced. As a result, what started as a simple personal computer evolved into a rather complex "fat client" network device. Thin client computing is a response to this constant PC desktop upgrade and maintenance cycle with its high cost and high manpower requirements disrupting the flow of business. A thin client is a "display-only" device, meaning it displays applications that run on dedicated servers rather than on the computer.

The server, in taking on the whole processing load of several clients, forms a single point of failure for those clients. This has both positive and negative aspects. On the one hand, the security threat model for the software becomes entirely confined to the servers: the clients simply don't run the software. Thus, only a small number of computers need to be rigorously secured, rather than securing every single client computer. On the other hand, any attack against the server will harm many clients: so, if one user crashes the system, everyone else loses their volatile data.

While the server must be robust enough to handle several client sessions at once, the clients can be made out of much cheaper hardware than a fat client can. This reduces the power consumption of those clients, and makes the system marginally scalable: it is relatively cheap to add on a couple more client terminals. The thin clients themselves in general have a very low total cost of ownership, but some of that is offset by requiring a robust server infrastructure with backups and so forth. This is also reflected in terms of power consumption: the thin clients are generally very low-power and might not even require cooling fans, but the servers are higher-power and require an air-conditioned server room.

Since the clients are made from low-cost hardware with few moving parts, they can operate in more hostile environments than conventional computers. However, they inevitably need a network connection to their server, which must be isolated from such hostile environments. Since thin clients are cheap, they offer a low risk of theft in general, and are easy to replace when they *are* stolen or broken. Since they don't have any complicated boot images, the problem of boot image control is centralized to the central servers.

Source: Adapted from Wikipedia, downloaded from http://en.wikipedia.org/wiki/Thin_client, on November 29, 2010