Multi-Perspective Integration of ICT’s into Island Schools in South-West Thailand

A Thesis submitted to the University of Manchester for the degree of Doctor of Philosophy (PhD) In the Faculty of Humanities

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The University of Manchester

Aumnat Tongkaw

Doctor of Philosophy

Multi-Perspective Integration of ICT's into Island Schools in South-West Thailand

Abstract

The major part of the island school groups in South-West Thailand is comprised of remote areas, which are under development and lack facilities and basic needs. Most people on the islands are poor Thai gypsies living in temporary shelters or small boats. They have distinctively different origins, cultures and languages. Developing the infrastructures in this area is a low priority on the government's list. Only a marginal percentage of the budget is being spent in the development of gypsy people, especially on their education. This has in turn become a major hurdle for the acceptance and implementation of the new Information Communication and Technology (ICT) in the island school’s group sector. The schools generally have an inappropriate infrastructure, inadequate teachers and huge limitations in education resources. ICT implementation has been carried out by the Ministry Of Education (MOE) to assist in teaching, learning and school administration. In examining the ways in which ICT integration has been administered and used in island schools, the study investigated the roles of two different levels of the educational system: 1) The Satun Education Service Area (Satun ESA), located on the mainland; and 2) an island school group, located in the Andaman sea. The Linstone’s Multiple Perspectives Model provided a framework for data collection and the organisation of results in a qualitative study. Data was collected by interviewing the Director of the Office of Satun Educational Service Area, the head teachers, teachers, parents and students in the island schools. Data from interviews, observations and documents was analysed using a template analysis approach (King, 2004). The findings of this study were interpreted in three dimensions: ICT benefits, ICT barriers and ICT sustainability. Sustainability is key to the effectiveness of a remote ICT project. Therefore, it is important to understand the concepts and categories associated with ICT project sustainability in rural areas. The categories of sustainability, including infrastructure, policies, politics, culture, management, human resources, co-operation and finance factors, need to be considered in the implementation of ICT projects in island schools or other projects in remote areas. The outcome of this study is a framework that clarifies the process of effective ICT implementation in the island context, which provides an additional valuable source of knowledge for local education policy makers in Thailand and other developing countries.

Keywords: Information and communication technology, island school, developing country, multiple perspectives, sustainability.
Declaration

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The Author

Aumnat Tongkaw attained a Bachelor’s Degree in Electrical Engineering (Communication) from Rajamangala University of Technology, Bangkok, Thailand. He attained a Master of Science from University Utara Malaysia. Before pursuing a Ph.D. study, Aumnat began his career in 1998 teaching and training teachers at Songkhla Rajabhat University (SKRU) until now. He was a Research Assistant in the area of research and development (R&D) for remote school projects in the South of Thailand. His responsibilities were: planning and installing ICT equipments in schools and to be a software and hardware trainer for school teachers.

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Aumnat also participated in this following paper:


In addition, Aumnat had been a member of Center of Development Informatics (CDI) since 2008 and he had presented parts of his Ph.D. thesis at CDI event for the Centre for Development Informatics on 14th May, 2009 at University Place, the University of Manchester. He also attended several seminars and workshops organised by CDI and Manchester Business School.
**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ANT</td>
<td>Actor Network Theory</td>
</tr>
<tr>
<td>APEC</td>
<td>Asia-Pacific Economic Cooperation</td>
</tr>
<tr>
<td>APIDP</td>
<td>Asia-Pacific Development Programme</td>
</tr>
<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
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<tr>
<td>CAT</td>
<td>Communication Authority of Thailand</td>
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<tr>
<td>CDI</td>
<td>Center of Development Informatics</td>
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<td>DCs</td>
<td>Developing Countries</td>
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<td>EdNet</td>
<td>Educational Network</td>
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<tr>
<td>ESA</td>
<td>Education Service Area</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<tr>
<td>IICD</td>
<td>The Independent International Commission on Decommissioning</td>
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<tr>
<td>IS</td>
<td>Information Systems</td>
</tr>
<tr>
<td>ISOC</td>
<td>The Internet Society</td>
</tr>
<tr>
<td>ISP</td>
<td>Internet Service Provider</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>ITU</td>
<td>The International Telecommunication Union</td>
</tr>
<tr>
<td>LDC</td>
<td>Least Developed Country</td>
</tr>
<tr>
<td>MICT</td>
<td>Ministry of Information and Communications Technology</td>
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<tr>
<td>MOE</td>
<td>Ministry of Education</td>
</tr>
<tr>
<td>MOI</td>
<td>Ministry of the Interior</td>
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<tr>
<td>NEA</td>
<td>National Education Act</td>
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<tr>
<td>NECTEC</td>
<td>The National Electronics and Computer Technology Center</td>
</tr>
<tr>
<td>OECD</td>
<td>The Organisation for Economic Co-operation and Development</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>ONEC</td>
<td>Office of the National Education Commission</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>SAO</td>
<td>Sub-district Administrative Organisation</td>
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<tr>
<td>SchoolNet</td>
<td>School Network</td>
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<tr>
<td>SITES</td>
<td>Second Information Technology in Education Study</td>
</tr>
<tr>
<td>SKRU</td>
<td>Songkhla Rajabhat University</td>
</tr>
<tr>
<td>STS</td>
<td>Socio Technical Systems</td>
</tr>
<tr>
<td>TOT</td>
<td>Telephone Organization of Thailand</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational Scientific and Cultural Organization</td>
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<td>USO</td>
<td>Universal Service Obligations</td>
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1. CHAPTER ONE: INTRODUCTION

1.1 Introduction

Information and Communication Technology (ICT) has become a major consideration in driving social and economic growth in developing countries. Implementing ICT in schools has been cited as a means to improve learning, increase accountability, power school reform, and bridge the digital divide. Therefore, ICT should be used as a tool to support educational objectives such as skills for searching and assessing information, cooperation, communication and problem solving, which are important in the preparation of children in order to create a knowledgeable society (Drent & Meelissen, 2008; Gibbs et al., 2009; Loveless et al., 2006). However, the implementation of ICT in developing countries is not simply concerned about a “digital divide” between black and white and rich and poor, but rather has become the basis of the discussions about educational technology and the need to design a system to ensure equitable and substantial access. There are particular concerns about the equal implications of educational technology in remote areas, where minorities and low-income populations already face serious educational disadvantages as they seek to enter the new economy (Srisai & Thongthamachat, 2005).

Thailand generally has an inappropriately high class size in schools, a lack of teachers and some parts of Thailand also have huge limitations in education resources. Therefore, the whole picture of education in Thailand is similar to an incomplete jigsaw. Island schools, especially, are located very far away from the mainland. Local people in the islands have never had adequate facilities for everyday life. They are, in general, poor and have a different culture and language compared to other areas in Thailand. The research tries to investigate the question: How can ICT implementation be sustainable for island schools? Several factors are relevant to the development and progress of ICT in rural areas such as the infrastructure, policies, politics, management, human resources, co-operation, finance, society and culture. This study also investigates the benefits of ICT use in the island schools’ group, and identifies the barriers of ICT implementation in these island schools. The results will be useful for decision makers in order to invest in the future of education.
This research focuses on a group of island schools in South-West Thailand who have twice implemented ICT for the purposes of school administration, teaching and learning. These island schools also provided information access for people who want to communicate with the mainland.

The next paragraph in this chapter will outline the chapters of the thesis and briefly describe this research study including the context, significance, contributions and scope of the study, as well as outlining the research objectives, questions and methodology.

1.2 Research Context

During the past decade there has been an exponential growth in the use of Information and Communication Technology (ICT) and this has made a pervasive impact both on society and on our daily lives. It is thus not surprising to find an increasing interest, attention and investment being put into the use of ICT in education all over the world.

ICT in Thai education has become a mainstream educational focus. In 1999, the Thailand National Education Act paved the way for major actions to be taken to promote the utilization of technologies for education as follows: (a) the establishment of organisations; (b) the development of policies and plans; (c) the development of infrastructure and networking systems; (d) the development of materials and other technologies for education; and (e) the development of educational personnel and learners (MOE, 2002).

In 2000, the Thai Learning Technologies 2010 Master plan was developed. The first phase was initiated between 2001-2006 and the second phase between 2007-2010. In 2003, the island schools in South-West Thailand set up an Internet infrastructure for the purpose of school administration and for communication with the education provincial sector. Twelve island schools received an ICT system for educational purposes and each package included one desktop computer, one printer, one Internet satellite and a solar cell power system. All ICT equipment was sent from the Ministry of Education (MOE). However, only three schools successfully installed and used the Internet system. Some of the remaining nine schools did not have enough teachers with experience in ICT, and therefore could not make
the system work properly. Some schools did not even take the equipment out of the boxes (Chareonrit et al., 2005).

In 2005, the Thai Ministry of Education (MOE) provided a budget for a second project to integrate ICT into the island school group (the twelve schools mentioned above) in the remote areas of South-West Thailand. This second project aimed to implement the use of computers for teaching and learning and to provide at least one computer room in each school.

The project was run by the Satun Education Service Area (Satun ESA) and Songkhla Rajabhat University (SKRU), which is the principal training college for primary and secondary school teachers in Songkhla province. SKRU is responsible for educational training in three provinces, Songkhla, Patalung and Satun. Satun Province is where the island schools group is located. In addition, the Rajabhat (slave of the King) foundation has one university in each of forty-one provinces out of seventy-eight in Thailand. These universities are commissioned by the King of Thailand to provide education for families who could not otherwise afford it. Furthermore, there is no limit to the age or circumstances in which a person can study, which makes education open to all.

This research was commissioned by Songkhla Rajabhat University to examine the first and second phases of implementing ICT in to the island school. The researcher, also supported by the university, was responsible for implementing the project, including installing hardware, software and training teachers. The author of this research understands that the integration of information technology into education is a complex issue. This includes the integration of ICT into the administration of education and into teaching, learning and other purposes.

The education system in Thailand generally has a huge gap between schools in the city and schools located in remote areas. There are inappropriately large class sizes in all schools and, along with the lack of teachers, some parts of Thailand have huge limitations in education resources. Another problem in the Thai education system is politics. In the previous education reform, the government shifted the responsibility for compulsory education to the Local Administrators of the Ministry of the Interior, MOI. However, in the
three years before 2008 there was a political reversal that attempted to reverse the law and return 90% of the responsibility for education back to the Ministry of Education, MOE (Prasopsuk, 2008). The present government is still trying to do this but has not succeeded.

There are twelve schools serving fifty-one islands in the Andaman Sea, most of which are under government support. They are managed by the Satun Education Service Area Office (under MOE) and the Sub-district Administrative Organisation (SAO) (under MOI), both located in Satun province. The Office of the Satun Education Service Area is responsible for 208 schools throughout the whole province. The twelve island schools provide a basic compulsory education for nursery, primary, and secondary levels. All of the island schools are located very far away from the mainland but some are even more remote than others (see Figure 1.1). The major obstacle for development is the time taken to get to the remote islands (up to 8 hours) and the limited transportation available during the monsoon season from May to October (Wongbusarakum, 2005). All of the islands are located within the area designated by the government as vulnerable to a tsunami and have early warning systems (Appendix E1).

The island school group is a complex organisation providing education to nomadic pupils. Almost all students in the island schools come from island families and most of them do not have sufficient resources to support higher education. It is multi-cultural in terms of location and language, with influences arising from travelling nomads from Indonesia, Malaysia and Thailand (Appendix E2). Most parents of the students are uneducated and this is accentuated by the fact that many families are still nomadic because of the nature of their work. Therefore, it is not surprising that the student academic achievement, as measured by provincial exams, is below average and lower than that of students located on the mainland. The basic career path for children after finishing school is to follow their parents in fishing or general employment.
1.3 Significances of the research and the research objectives

The first significance of this research is:

Her Royal Highness Princess Maha Chakri Sirindhorn has always recognised that education is a foundation of sustainable development and IT for Education, a programme under the Initiatives of Her Royal Highness, was launched in late 1995. The programme focuses on the dissemination of IT to students in rural areas in order to improve their access to higher-quality education. Implementing ICT into remote schools may help to solve the problem of insufficient resources such as teachers, books and other educational media. This research is needed to assess the level of success of ICT implementation in these remote schools.

The second significance of this research is:

Only a quarter of schools (three of twelve) successfully installed and used the ICT system, therefore this research is needed to identify the differentiating factors between the
successful and unsuccessful schools. Until the causes of the problems are identified, it is unlikely that future similar projects will be successful.

The third significance of this research is:

The island schools in South-West Thailand are unique in terms of location and culture. The schools are small and rather isolated from mainland influences. Little is known about education, especially about ICT education, in this context. There has been little research performed in this particular context before. Therefore, these schools provide a valuable setting for this type of research.

The research objectives are:

- Exploring the potential benefits of ICT implementation in an island school context in order to promote the use of information and communication technology in education, and to provide a great opportunity for educators and students.
- To investigate the barriers and challenges that occurs during and after ICT implementation in island schools.
- To propose a sustainable framework for implementing ICT in island schools. This framework illustrates the concept of sustainability and its evaluation dimensions, which can then be assessed in terms of their relevance to ICT implementation in remote area schools.

1.4 Research Questions

This study investigates the complex and multilayered nature of the Thai education system and its impact on ICT integration. To investigate island schools in South-West Thailand, the research study includes assessment of ICT for education systems, relating to ICT implementation for school administration and teaching and learning. In addition, the study tries to identify the main benefits and barriers of implementing ICT into island schools. These aims are accomplished by addressing three research questions.

1. What are the benefits of ICT implementation in island schools in South-West Thailand?
This question will be addressed through the role of schools in adopting ICT as viewed by the stakeholders related with island schools and the observed ICT benefits for school administration and teaching and learning.

2. What are the barriers of ICT implementation in island schools?
Answering this question will involve addressing institutional, technological and societal barriers as well as additional barriers from the government and from the island school people.

3. How can ICT implementation be sustainable for island schools?
Answers to this question will come from the stakeholder’s experience with ICT, and from the perspective of the people at provincial and school levels.

1.5 Research Methodology

The purpose of this research is to gain a better understanding about the benefits and barriers during and after implementing ICT into the island schools. Moreover, the research attempts to propose a framework for sustainable ICT implementation in island schools for local educational decision or policy makers.

According to Myers (1997, p. 241), qualitative research involves the use of qualitative data, such as interviews, documents, and participant observations and to understand and explain social phenomena. This research employed an interpretive case study method to understand these phenomena. The case study used interviews and participant observations to investigate the implementation of ICT into the island schools.

Based on suggestions by Yin (2003), a case study can be used to gain insightful understanding of a phenomenon in an individual organisation. In this research, the case study data was collected from three schools: Ban Koh Adang school, Ban Koh Sarai school and Ban Tan Yong Ka Boey school. These were represented as a case study of island schools. Furthermore, the schools were selected by the Satun ESA in phase two because there were teachers in the schools who were experienced in ICT and supportive head teachers.
In addition, Patton (1990) pointed out that a case study satisfies at least three principles of qualitative inquiry; describing, understanding, and explaining. For the current study, the case study approach has been deemed most appropriate for comprehending the complexity of ICT integration within the complex educational system of Thailand.

Subjectivity in qualitative research in general and in case studies in particular could be overcome in several ways. Yin (2003) suggests three remedies: using multiple sources of evidence, establishing a chain of evidence, and having a draft case study report reviewed by key informants.

A multiple-perspective model can be seen from technological, organisational and personal perspectives (TOP) (Linstone, 1981). The model was advanced to help the systems practitioner bridge the gap between analysis and action and between models and the real world. In previous research, the TOP Model has never been used for understanding ICT implementation in island schools. The model also did not focus on sustainable implementation. For this research, interpretive case studies used TOP as a tool for collecting data, and the contribution in terms of implementing sustainable ICT in developing countries was made in the analysis. Policy makers can learn key points on how to successfully and sustainably implement ICT in future projects from this theoretical framework.

Multi-perspective methods require deep personal aspects from key stakeholders. This research collected rich data from five stakeholders including: directors, head teachers, teachers, students and parents. The analysis and interpretation of all data types increases the understanding of the practices that influence the effectiveness of future projects. The researcher employed template analysis as proposed by King (2004) to handle the various data types including interviews, documents and participant observations.

1.6 Scope of research study and Contribution

First, the researcher focused on literature reviews relating to implementing ICT in education, which started from the general to the specific: ICT implementation in developing countries, ICT implementation in Thailand and, more extensively, on ICT
implementation in island schools. This research study was initiated from the top down; from Satun provincial education service area (SEA located on mainland) to the island school group located in Andaman sea, South-West Thailand.

Second, the researcher studied theories, models and frameworks that are relevant to ICT implementation in education. The researcher believes that the TOP model should be used to explain the main issues to be studied. The theoretical framework was adapted by the researcher from the TOP model (Technical, Organisational, Personal) integrated with the viewpoints of five stakeholder groups who played an important role as a lens to consider each component of the TOP model. The Technical perspective includes the infrastructure, the hardware and the software. The Organisational perspective includes the procedures, the processes, the policies and the politics and the Personal perspective includes the leadership, the staff skills and the social culture.

Third, the researcher collected data by fieldwork and long-stay participation in the island schools. The data collected included interviews, participant observations and documents.

Fourth, the researcher analysed data using a qualitative template analysis to derive patterns or perspectives of ICT integration in island Schools. Template analysis was selected because it can work well with multiple perspectives of different groups within a specific context.

Fifth, the researcher examined the rich results and then discussed and also proposed an ICT sustainability framework for island schools.

This study should be of particular interest for those policy makers at Satun province, at both an education level and an individual school level, who intend to successfully adapt ICT in a sustainable way to enhance the teaching and learning in their schools. This study also presents a practical model, which promotes the adoption of specific strategies over the others. The recognition and adoption of a particular model and subsequent strategies by an institution would certainly be of significance to the staff and students at that school.
This research expanded the knowledge of education administrators, and stakeholders on effective uses of technology for educational improvement. The research is providing theoretical guidelines so that the ICT implementation has a greater possibility of sustainable success. The results clearly show a process that could be used to implement ICT into other island schools. The research is a valuable source of knowledge for local education policy makers in Thailand and other developing countries.

1.7 Chapter Outline

Chapter 1 presents an overview of the study, research context, significances of the research and the research objectives, research questions, research methodology, scope of research study and contribution.

Chapter 2 contains the literature reviews related to this study: a) Thai Education Reforms, The Problem of Thai Educational Reforms, ICT in education in Thailand, ICT Opportunities in island schools Context; b) The large amount of relevant research that has been done on the use of ICT in education and c) Information Systems in developing countries.

Chapter 3 discusses the theoretical framework of all previous research that is relevant to implementing ICT in organisations, including in education. It critically discusses why the models may be appropriate or inappropriate and the last section chooses the model that supports this study.

Chapter 4 presents the methodology and research methods chosen for this study; the difference between qualitative and quantitative research, an explanation of interpretive research, a review of the types of qualitative research, the rationale behind the selection of a case study for this research, the research context within the Thai Education system, the context of the island schools, techniques and procedures of data collection, a description of the interviews and a description of the stakeholders and their characteristics, how to carry out the observations and how to collect data from written documents, how to handle the data using template analysis, the validity reliability and confirmability of the data, and finally ethical considerations.
Chapter 5 extracts information from the interview data using the multi-perspective method introduced in this chapter. The information was stored in a coded grid as described above. The table extracts, annotates and organises the interview data into a Technical perspective, an Organisational perspective and a Personal perspective (TOP) according to each stakeholder group. This table was also subjected to scrutiny based on the research questions to explore what the various stakeholders might be saying in relation to the benefits of ICT [BE], the reported barriers [BA] and the potential for ICT to become integrated in a sustainable fashion [SUS]. This data was then fed into three diagrams by a template analysis in preparation for a fuller discussion in chapter 6.

Chapter 6 is a full discussion of the results of this research. Each of the diagrams was discussed one by one by adding more information from the interview scripts, additional academic and literature observations and adding to the data the richer aspects of the written documents and the participant observations. This chapter prepared the way to draw the conclusions. This chapter also attempts to identify a sustainable framework for future integration of ICT into the island schools.

Chapter 7 presents the general research conclusions, the special contribution of this research, the limitations of this research and suggestions for any further research. The special contribution of this research is the suggestion of a framework for sustainable ICT in the island schools.
CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews previous research that has been done in the area of ICT implementation in developing countries and the educational field. The chapter is divided into three main sections: (a) Thai Educational Reforms which includes the island school context, (b) ICT Integration in Education, and (c) ICT in developing countries.

2.2 Thai Educational Reforms

2.2.1 Problem of Thai Educational Reforms

Current educational reforms in Thailand (1996-2007) have been initiated in response to the urgent needs of human resources development in a society which has been rapidly changing through the impact of globalisation, advancement of science, and Information and Communication Technologies (ICTs). Through the process of globalisation, and the advancement of ICT, new socio-economic patterns have emerged which have been called knowledge-based, information-based, technology-based, or technology-driven. To deal with the demands of this new economy effectively, it is essential for Thailand to possess knowledgeable workers who are well-trained, computer literate and who possess abilities such as problem-solving, analytical thinking, critical thinking, and creative thinking (Fry, 2002; Pillay, 2002; Stamper, 2002). In addition, Thai graduates need knowledge of and competence in English and ICT (Prapphal, 2008).

In some educational reform documents (ONEC, 1999), the Thai government pinpointed the weaknesses of human resources which inhibit the development of the country, and which are regarded as resulting from inefficiencies of education management and administration, lack of quality in education, and inequity of access to quality education (Atagi, 2002; Parkay et al., 1999).

The Thai educational system has been highly centralised, which has been both ineffective and inefficient, especially in terms of budget and personnel management. Atagi (2002) also reports that the Thai government has not provided enough funds to significantly improve
the quality of teachers. As for quality of education; teaching practices, especially at the secondary level, are predominantly teacher-centred: that is, the teacher speaks, and students listen. One important influence here is the National University Entrance Examination, which continues to focus on reproduction of subject matter and consequently encourages teacher-centred practices. In its reform the Thai government has given priority to teaching science, mathematics and English because these subjects are essential in order to advance in a hi-technology and information-based society. However, the quality of teaching in all three subjects has been found to be inadequate. There has also been a problem in providing equity of access to quality education, particularly for those who live in rural areas on low incomes. Schools in rural areas have less developed infrastructure and fewer well-qualified teachers compared to schools in Bangkok and other urban areas (Atagi, 2002).

The 1999 National Education Act (NEA) was introduced in order to meet the requirements of the 1997 Constitution, and represents the legislation of educational reform (ONEC, 2001). Provision of education aims at the full development of Thai people in all respects, including physical and mental health, intellect, knowledge, morality, integrity and desirable ways of life which will enable them to live in harmony with other people. The provision of education is based on a life-long education for all, participation by all sectors in society, and a continuous development of knowledge and learning processes (ONEC, 2003). In order to ensure a basic education, the NEA specifies that all Thai citizens have equal rights and opportunities to receive at least 12 years free basic education of which 9 years are compulsory from grades 1 to 9, and 3 years optional from grades 10 to 12. Notably, since May 2004, two further years of pre-primary education have served to extend free basic education to 14 years in total (MOE, 2002).

Formal education in Thailand is divided into two levels: basic education and higher education. As outlined in Table 2.1 below, basic education includes 14 years, from two year pre-primary level, primary level (grades 1 to 6), lower-secondary level (grades 7 to 9), and upper-secondary level (grades 10 to 12). Higher education is divided into two levels: diploma and degree. Higher education is provided in universities, colleges and other institutions (ONEC, 2003).
The last decade has seen vast changes in the Thai educational system such as the extension of compulsory education in remote areas through the primary grades and the attendant need for teachers, the movement towards a comprehensive secondary school and a corresponding inclination of the schools towards manpower development, the transfer of responsibility for compulsory education to the Department of Local Administration of the Ministry of the Interior and the reorganisation of the Ministry of Education. However, in the three years before 2008 there was a political reversal so that 90% of responsibility for education was returned to the Ministry of Education, MOE (Prasopsuk, 2008).

Educational records are not clear about the details of budget provisions and personal promotions during the changes to a ninety percent oversight by the MOE and a ten percent oversight by the MOI. Many teachers nationwide were strongly resistant to oversight by the MOI. However, the decision to transfer back most of the oversight to the MOE at that time was still not firm. In the provinces the situation is still very confused.

Therefore, all budgets from the government (including ICT budgets) are divided into two sections: MOI and MOE. Unclear authority in distributing budgets for remote schools affects the process of implementing ICT because the Head teachers cannot decide which budgets they can request from where. However, the current Thai Prime Minister (PM...
Abhisit) has a new vision that every school can choose between being under either the MOI or MOE authority.

2.2.2 ICT in education in Thailand

In 2001, the ICT in education master plan implemented an infrastructure for all schools simultaneously around Thailand. In Thailand the integration of ICT in schools is encouraged and has been driven by several projects and initiatives in line with national ICT policies, for example, EdNet, SchoolNet, ICT Master Plan (2002-2006) and Thai Learning Technologies 2010. At the same time, an island schools kick starting project has been run by various government organisations. Previous research in ICT in education has been done in several institutions but most of them focused on cities and urban areas.

To make the education system more responsive, the newly established school curriculum standards, in eight key learning areas, incorporate ICT as a tool to support the shift to student-centred approaches. The integration of ICT in the curriculum is encouraged and has been driven by several projects and initiatives in line with national and local ICT policies, e.g. EdNet, SchoolNet, Teacher Support System and ICT Training Centre Schools. At the same time, administrative measures at the ministerial level have been mandated to facilitate the operation of responsible units at departmental levels in the development of ICT educational resources, e.g. e-Learning, e-Book, on-line testing systems and educational multimedia to support teaching and learning in all subject areas. Several special task force committees have been established to move these activities forward.

However, integration requires effective coordination and communication among the decentralized administrative structures, within and outside the MOE. This has been rather difficult to handle at this stage because of frequent staff transfers of personnel in the responsible units. Current efforts focus on the implementation of a school-based management approach in a number of pilot schools to prepare them for responsibilities in the areas of policy, budget, curriculum, professional development, research, and general affairs.
The MOE’s ICT in Education master plan focuses on the use of ICT as a major tool for education reform, consistent with ICT strategies in the ICT master plan of the Ministry of Information and Communications Technology (MICT) in e-Education, e-Society and e-Government. The e-Education and e-Society strategies provide for the use of ICT infrastructure for accessing information and knowledge to upgrade the basic capacity of Thai society, reduce the digital divide and promote learning in Thai society. The country’s telecommunications network still has to be further developed and improved to provide services at affordable costs. ICT will be utilised for educational development and services (e.g. content development, curriculum resources and media development, distance learning via satellite or Internet). These strategies support the MOE 2004-2006 mission to improve the quality and effectiveness of student learning, the development and production of ICT personnel, and the distribution of an ICT infrastructure for education. The e-Government strategy, utilizing ICT for good governance, emphasizes improvement and development of the administration and management systems in all government organisations. This strategy supports the decentralization of the MOE administration and management, from the ministerial level to the level of schools and educational service areas.

However, in recent times the Thai government has been unstable with five different prime ministers in only four years and each time there have been changes in education policy and a new master plan has followed each new party. The changes have typically involved cancelling projects and bringing in new ones. Furthermore, broadcasting and telecommunications systems in Thailand have long been controlled by state monopoly policies (Anantho, 2001). Furthermore, the real situation of the island schools is still inferior to the mainland schools and the implementation of ICT in island schools has not been successful (Chareonrit et al., 2005). A successful application of ICT is highly dependent upon the unique circumstances or context of the school and there is a need for awareness of the problems that make a negative impact on the integration of ICT into schools in developing countries and the effects they can have on effective teaching and learning (Elaine Van et al., 2003). The education technology community should start thinking with a different perspective and approach when implementing information and communication technology in schools.
The SchoolNet Thailand started in 1995, with an initial plan to facilitate a pilot program of 50 schools, who were ready to try out the Internet in schools. The second stage was during 1998-2000, with a capacity to serve 1,500 schools nationwide through the use of the “Golden Jubilee Network”, which was constructed to celebrate His Majesty the King’s 50th Anniversary for the Accession to the Throne. During this phase, schools were given free Internet access, teachers were given training on the Internet and participation in the “local content development community”. Through computer network and knowledge sharing, the Thai language contents were made available to every school. In 2001, the government gave an additional boost to expand the service to 5,000 schools to mark the third phase of SchoolNet. In 2003, the SchoolNet Thailand project was handed over to the Ministry of Education to run it as a normal production service.

SchoolNet achieved several milestones in raising the country’s readiness for ICT in education. In 1999, mechanism to manage the network was presented at the Internet Society’s ISOC 1999. In 2001, the project was mentioned in the UNDP Human Development Report. In 2003, SchoolNet Thailand is now a model used by UNESCO to set up the “Asian SchoolNet Program” in neighbouring economies. Other citations can be found in the APEC and the New Economy Report (2001) and the ITU World Summit on Information Society “success stories”. One notable creation was the software distribution called “Linux School Internet Server” or Linux-SIS, through which a school can simply install and manage using web-based system management tools in the Thai-language. The other important asset is the website “SchoolNet Digital Library” (www.school.net.th/library/) where nearly 10,000 web pages containing useful articles and pictures produced by schoolteachers all over the country are accessible for free use. SchoolNet Project is a kind of virtual community where the active members meet face-to-face about once a year to share their experience, to exhibit school achievements and to be benchmarked in order to gain awards and recognition from NECTEC.

In Thailand, ICT initiatives with NECTEC, TOT and CAT have brought benefits to the SchoolNet project, resulting in free Internet dial-up access from anywhere in Thailand at the cost of a local telephone call at three Baht per hour. However, the telephone network does not cover all areas, particularly the remote areas and the island schools.
With regard to UNESCO (2007) the Thailand SchoolNet has so far focused on establishing Internet connectivity in schools, while the Malaysian SchoolNet, which has a different policy environment and has fewer challenges in terms of connectivity, has focused on providing teachers with access to learning materials in the national language, Bahasa Malayu.

The convergence of telecommunications, information technologies, and electronic media has made possible new forms of study that are becoming characterized as e-learning. Telecommunication infrastructure can be used as a pipeline for education to the rural areas. Therefore, access to Information and Communications Technologies is one of the most important keys to success in today’s education. As far as the education gap is concerned, improving connectivity has been a high priority in rural areas. However, access to ICT remains much more limited in South-East Thailand and particularly the three Southern Border Provinces are not sharing in the communication revolution, since, in the past, they lacked policies that promoted equitable public participation in the information society.

With regard to providing telecommunication services in rural areas, the Universal Service Obligations (USO) project aims, based on installation of advanced technologies, at data gathering on technical and social factors to enable the formulation of rules and provisions which will be applied to remote rural villages throughout Thailand within 2009. Supporting the rural services, the Universal Service Obligations (USO) provided a telecommunication infrastructure which is being utilised to promote the development of rural communication and education. While USO is not always commercially viable, it is very much socially desirable. At the beginning, the use of telephone services will be free of charge for emergency cases. Other services, in the future, will be at affordable charges through public telephones.

2.2.3 ICT Opportunities in Island School Context

The primary goal of ICT in education in island schools is to create an educational system in which students leave school as confident, creative and productive users of new technologies, including information and communication technologies, and understand the impact of those technologies on society. The Thailand Education Ministry aims to
implement mechanisms so that learners are able to develop skills in using ICT as early as is feasible, so that they can continue to use technologies for lifelong learning. Many schools have integrated ICT in school administration systems, and have taken steps toward building capacities for ICT competency, literacy and curriculum content.

In 2003, the first Internet project of the MOE in the island schools in remote areas was to setup an Internet infrastructure, solar power and also one computer and one printer for use by the school administrators and to communicate with the education provincial sector. The island schools were also provided with an ICT system for education purposes. This included: one desktop computer, one printer, one Internet satellite and solar cell power (Appendix E3). All ICT equipment was sent from the MOE to these remote schools. However, only a quarter of island schools completely installed the Internet systems. If the schools did not have an ICT teacher, the system would not be workable and, in some schools, ICT equipment was still found unused in the postal packaging (Chareonrit et al., 2005).

In 2005, for the second project, the Thailand Ministry of Education (MOE) provided a budget for integrating ICT into the island schools. The project was run by Satun Education Service area (ESA) and Songkhla Rajabhat University (SKRU) which has responsibilities for teaching and training primary and secondary school teachers. The project implemented computers for teaching and learning and each school had at least a computer room.

In 2008, Her Royal Highness Princess Maha Chakri Sirindhorn visited these island school groups with plans to raise funds for the construction of school buildings and to set up a foundation for computer hardware and software in these island school groups (Appendix E4). The remote geographic location of the islands created problems for communication with the outside world and there was a lack of variety of learning resources in the community. The growth of the tourism industry brought some influence from outside cultures on the community way of life which, incidentally, had an adverse effect on the natural resources and environment. The islands also lack of electricity and drinking water and the lack of adequately trained personnel was also a major problem. One school was in need of teachers in some specific majors. Teachers did not get up-to-date academic information. All the teachers came from other areas and could not speak the Chaw-lay
language. There were the problems of welfare and support of teachers and the budget was insufficient. In these cases, the Princess’s IT projects aim to use technologies to enhance the quality of life and improve the education and employment opportunities of the disadvantaged group of children in island schools.

2.3 ICT Integration in Education

2.3.1 The benefits of ICT in education

Today, computers have become an integral part of education. It is generally known that education is the development of knowledge, skills, ability and character by teaching, training, studying or experience. Therefore, computers and other technologies need to address these components by increasing knowledge, using skills, and providing experience and training that will push onwards to life-long learning. General received wisdom of the benefits of using computers and technology in the classroom include: (a) containing information and resources; (b) producing productivities and motivations; (c) increasing the variety of classroom instructions; and (d) improving communication. It is thus not surprising to find that there is increasing interest, attention and investment being put into the use of ICT in education all over the world. In addition to efforts in employing ICT to improve learning, the emergence of the knowledge economy has also brought about, in recent years, a much greater emphasis on education. It is widely believed that students in this age will require not just the possession of a larger set of data or repertoire of specific skills, but also the capacity to readily acquire new knowledge, and to employ creativity and critical thinking in the development of novel approaches to solving existing and unprecedented problems. In response to this, schools are shouldered with the responsibility to help students to develop life-long learning abilities and to equip them to cope with the challenges of the 21st century. Thus, the emphasis and promotion of ICT application in schools has become an integral part of educational reforms in many countries around the world.

The following section discusses the three main benefits of ICT in education which are; the benefits in teaching and learning, benefits in the administrative roles and the wider community benefits within the schools.
2.3.1.1 Benefit of ICT on Teaching and Learning

ICT is now at the centre of education reform efforts that involve its use in coordination with changes in curriculum, teacher training, pedagogy, and assessment. Due to the wide access by individuals or organisations to ICT tools and ICT in the education field, it is necessary to build a meta-database at the national level containing electronic books, journals, reports and general reference information which can be accessed for the benefit of students, teachers and researchers to gain consistent information in their area of research (Imran & Gregor, 2005; Thajchayapong et al., 1997).

In addition technology should become a tool available to students to aid in the learning process and should be used as a problem-solving tool in open-ended learning environments, not just as a substitute for presenting material to the students (Morrison & Lowther, 2002). Therefore, technology should be seen as a tool that supports and extends student understanding, providing a means to authentic, hands on inquiry related to a problem or issue (Moersch, 1995). In addition, students need to achieve technological literacy through their educational process (Dugger et al., 2003).

Technology in the classroom can also help the students learn how to learn. Teachers who have skills in ICT can help students learn how to find information on their own and can provide students with valuable ICT skills. Acquisition of these skills is perhaps more important than any factual knowledge imparted to students (Morrow et al., 2002). It has been noted that technology can provide students with opportunities to discover and create new knowledge and thereby permit teachers to better take on the role of facilitator. Technology appears to enthuse children and releases time to spend practicing important academic skills (Mandell et al., 2002).

The potential of technology to help people learn has not been largely observed until recently. Educators are beginning to comprehend the potential for technology to help students construct meaning for themselves based on learning activities. Technology is quickly becoming more than just a tool for acquiring content or skill more efficiently and effectively (Mills & Tincher, 2003).
Cuban (1993) comments that technology appeals in three ways: (1) the desire to prepare students for the transition into an increasingly technological workforce; (2) the potential for technology to provide a vehicle for self-directed learning; and (3) the perception that technology use in the classroom will increase productivity. Technology can and does matter, but it is highly dependent upon the context in which it is used (Avgerou, 2001).

White, Ringstaff, and Kelley (2002) point out two different uses of technology in the classroom—learning “from” computers and learning “with” computers. Learning from computers occurs when the technology functions as a tutor directing the student through a learning process. Learning with computers occurs when students take a more active role exploring the Internet and using email.

ICT can be powerful in driving and managing new approaches to learning that involve more student interaction, more connections among schools, more collaboration among teachers and students, and more involvement by teachers as facilitators; thus facilitating self-study, distance education and e-learning (Voogt et al., 2008).

Marina (2001) suggests that new technologies will be widely used in schools and that students must have access to computers and other technologies in the classroom so that students can increase their abilities in ICT which is an important feature of career preparation; others see equally important outcomes in relation to civic participation. The teaching and learning process has been dramatically altered by the convergence of a variety of technological, instructional, and pedagogical developments in recent times (Bonk & King, 1998; Marina, 2001; R. Smith, 2002).

Clarke notices a link between advances in ICT and “… new and innovative teaching strategies” and these challenge the boundaries of the educational structures that have helped and supported learning for a long time.

Teaching in schools consists of helping students to acquire information from textbooks and acting as an additional source of expertise. “Teachers may be forgiven if they cling to old models of teaching that have served them well in the past. All of their formal instructions and role models were driven by traditional teaching practices” (Clark, 2000).
Clarke recognises that it is risky to break away from traditional approaches to teaching but also that this is necessary at this time because technology is having such a deep impact on society. He notes that “…technology has changed the nature of work, of communications, and our understanding of the development of knowledge” (Clark, 2000).

Many are predicting that new technologies will bring about several benefits both to the learner and the teacher. Wheeler (2001) identified these benefits including sharing resources and learning environments as well as the promotion of collaborative learning and a general move towards greater learner autonomy.

The Internet is a wealth of learning materials in almost every subject and a variety of media can now be accessed from anywhere at any time of the day and by an unlimited number of people. Teachers can research any topic on the web to gather information for a lesson. The Internet provides students with access to investigate worldwide problems and issues. Computers and the Internet provide a student with an unlimited resource that is available at all times for curricula and classroom activities. Internet information is available at all times, twenty-four hours a day. Students also benefit from computers and technology. These benefits include group collaboration; a place to exchange information; paced learning; access to world resources; and improved computer skills (Capper, 2003).

According to Hofmann (2002), educational opportunities are now accessible to students who in the past lacked opportunities due to such restraints as geography, time, family and money. Additionally, the use of emerging technologies has enhanced distance learning (Marina, 2001). Distance learning is now considered the backbone of continuing education and is enabling educators to reach populations that would be otherwise inaccessible (McEwen, 2001). It is very important for the remote area services. Currently, there are greater opportunities for accessing up-to-date content, as updating information on the web can be done faster and more easily than with textbooks. In addition, educators can make choices as to what technologies to integrate into their classroom situations from the large pool of resources available, such as CD-ROMs, DVD-ROMs, application software, multimedia applications, and communications applications. Those who advocate technology integration in the learning process believe that it will improve learning and
better prepare students to effectively participate in the 21st century workplace (Marina, 2001).

Teachers must recognise that information is available from sources that go well beyond textbooks and mass media. Teachers help their students to understand and make use of the many ways in which they can gain access to information. Teachers must also employ a wide range of technological tools and software as part of their own instructional collection. Teachers should help students follow their own inquiries, making use of technologies to find, organise and interpret information, and to become reflective and critical about information quality and sources (NCATE, 1992).

Technology has, no doubt, become an integral part of education enabling students to access information visually and rapidly. Web-based instructional resources like electronic textbooks are fast making their way into the education system. These resources, like the web-based texts, give readers a feeling of engaging in real time and face-to-face interaction through the use of interactive programs (Ahern & El-Hindi, 2000).

Wheeler (2001) states that with the inevitable proliferation of information and communication technology in the classroom, the role of the teacher must change. The changes affect classroom teaching, tools for presentation, assessment methods and attitudes to future careers.

Boser et al. (1998) and Keeler (1996, Spring) also reported that students felt positive about using computers, had a positive attitude towards the use of computers in the classroom, and students enjoyed having some instruction on computers.

According to White et al. (2002), if technology is to improve student learning, then the teachers’ beliefs must be consistent with this integrated use of technology in teaching and learning. Much work remains to be done in regard to both acknowledging the role that belief plays in the integration process and assisting teachers to adapt their beliefs to accommodate technology in the classroom (Albion & Ertmer, 2002).

Computers provide a source of communication enabling teachers to collaborate with other teachers and students by email or web application. ICT, when used for communication, is
very important for remote areas such as islands. Most island schools are located very far from the mainland and so the biggest obstacle to development is the limitation of transportation as in some seasons access to the sea is closed. Internet technology could allow remote students to be in contact with their teachers and colleagues when they are isolated from the mainland. Moreover, the Internet could bring information from the mainland to the island schools in a more convenient way.

Although computers are seen as essential in the world today, the significance of computers in schools needs to be examined particularly for schools which lack infrastructure such as island schools. Computers could transform communications and the economy and every child should be exposed to this technology in order to understand the significance of this technology. In remote schools teachers should, at least, know how to use a computer and the Internet, understand how a computer works, and have some grasp of how to find information on the Internet. Moreover, teachers should generally know how to deal with the poor infrastructure in which computers are used by business sector, schools and people on the island.

2.3.1.2 Benefit of ICT on Administrative Roles

ICT allows administrators to keep many different types of information such as the curricula, the budgets, personal information about students and teachers and information about school activities and school administration which can all be integrated together using spreadsheets, word processors, small databases and special accounting software to reduce unnecessary and repeated data input (Hepp et al., 2004). ICT is also a good medium for informing community members (parents, politicians, and researchers) about educational news and policies through web sites and with regular well-designed information sheets. These same authors note that the Internet can help link the school with, for example, the Ministry of Education office, to make the transfer of documents, new regulations and queries more efficient throughout the entire provincial system.

These authors also note that ICT has the great benefit of allowing teachers to keep student marks and lesson plans up to date and that makes it easier to edit these documents and distribute them to students and colleagues. These ICT benefits should be introduced during
the process of teacher-training but, before those benefits become useful, teachers need to first become familiar with ICT technology outside the classroom.

Policy-makers may need to consider introducing ICT at all educational levels (classrooms, schools, systems) to provide the opportunity to acquire and to distribute information throughout the system from the general public to the classroom teacher. A coordinated effort could achieve economies of scale and compatibility of information processes and flows at all levels.

Administrative software is a tool for administrators to manage classroom instruction, student record keeping, lesson planning, preparing handouts, tutorials and slides, preparing exams papers, marking papers and recording results, performing some type of statistical analyses on marks, and so on. Administrators are also involved in a variety of work that requires technology, such as the computation of school performance for a certain year, keeping of records of employees, and preparation of the school budget. Technology can therefore become an extremely useful tool in handling a number of administrative tasks (Jhurreev, 2005).

There are a number of software packages for use at all these levels which should be carefully evaluated by the teachers and the school administration to assess the completeness of their content, their adaptability to the real situation in the school as well as the level of support offered by the software vendors.

Furthermore, for technology to become a core component of a teachers’ instructional repertoire “… they need time to explore, reflect, collaborate with peers, and engage in hands-on learning” (Sandholtz et al., 1997).

Technological literacy has fast become one of the basic skills required in teaching. “The sheer increase in the availability of electronic resources in schools and classrooms makes it important for teachers to be prepared to effectively integrate technology into their instructional practices” (Lawless & Pellegrino, 2007).
2.3.1.3 Benefits of ICT for school society

During the past decade there has been an exponential growth in the use of Information and Communication Technology (ICT) and this has made pervasive impacts both on the society and on our daily lives. Integrating ICT into schools may improve the quality of life because ICT brings knowledge to individuals. UNESCO recognised that the process of reducing poverty in developing countries needs the implementing of ICT. Therefore, UNESCO points out that the United Nations has established its Millennium Development Goals for 2015 in the light of education that promises to implement free education for every child (UNESCO, 2007). Therefore, ICT can play a significant role in pushing the development process in most developing countries. In addition, educators need to ensure that Information and Communication Technology (ICT) is being used to achieve the Millennium Development Goals as universal primary education by 2015.

In addition, Voogt et al. (2008) notes that ICT can increase access to education through distance learning in which it enables a knowledge network for students, training for teachers, and broadens the availability of quality education materials. Furthermore, at the World Summit on the Information Society, the United Nations (2005) notes that the potential of ICT includes expanded access to quality education in order to boost literacy and increase universal primary education, to open up an information and knowledge based society, and to facilitate the learning process. The Internet is the major driver of information technology (IT) and many Internet users communicate with one another by using personal computers. As a result, personal computers have also become the major tools of communication and this is especially useful for remote areas.

Further, different cultures have different views about ICT and their readiness to help their children acquire these skills. Parents in developing countries may have an inadequate income to pay the cost of their children’s ICT needs in school. In Thailand, however, in remote areas the school ICT fund support is partially derived from the government but not on a regular basis (Srisai & Thongthamachat, 2005). According to Chareonrit et al. (2005), none the people in the island group have ever made a telephone call and appear to lack the ability to communicate, leaving the remote areas on the island still poor and isolated and lacking the basic means to participate in the global society. Remote areas also lack any ICT
framework, policy and regular financial support which, collectively, prevent the sustainable implementation of ICT in remote areas. Education and knowledge are the essence of the modern age and also can be strategic resources and lifelines for sustainable development in developing countries (Hamel, 2005).

Implementing ICT in remote areas holds great promise for development, by connecting people with higher accuracy and helping to obtain up to date sources of information and knowledge. The island school is the knowledge distributor on the islands and thus the school is the source for generating and distributing new knowledge to the people in the island society. However, the evidence so far agrees that “... the benefits accrued from the utilisation of ICT have been inequitably distributed with most developing countries facing the prospect of being marginalised” (Ahmed, 2007b).

Using ICT to gain more knowledge is easier amongst the affluent and better-educated segments of society whereas the city-poor and the rural residents alike are more likely to be left even further behind (Alampay, 2006).

2.3.2 Barriers of ICT integrations into schools

Bitner and Bitner (2002) point out eight areas of consideration that have been shown to be important in order for teachers to successfully integrate technology. These considerations are fear of change, teaching models, training of basics, motivation, learning styles and strategies, personal use, climate, and support. Other major factors that appear to influence a teacher’s use of technology in the classroom are: (a) availability of school resources, (b) student population and needs, (c) collaboration with other teachers, and (d) the support teachers receive from the school administration (Mouza, 2002-2003).

Cuban (2001) states that teacher’s belief systems about technology significantly influences actual classroom practice using technology. Along with these factors, ongoing support is critical. Teachers may be willing to take a chance and try new things with technology integration if they know they will have help and support when they need it. Smith and Robinson (2003) also state that “… integration is most likely to occur if the support system for such innovation is already in place.”
From the previous research described above, most research is done only at a school level and classroom level but the difference in this research thesis is that the research investigates widely from a school level and classroom level right up to a provincial level.

The rapid implementation of ICT in schools, worldwide, gives rise to an important and general question, i.e. What factors influence the use of computers in schools? Amongst the number of factors that influence the use of computers in schools some important ones include the physical number of computers in the school, whether or not a school has Internet connectivity, and whether or not teachers are trained effectively in ICT.

Although, most teachers recognise the importance of using technology in their classrooms, numerous barriers can block implementation efforts (Bingimlas, 2009). He focused on the teacher-level and school-level barriers. The teacher-level barriers include: lack of teacher confidence, lack of teacher competence and resistance to change and negative attitudes. The school-level barriers include: lack of accessibility lack of time, lack of effective training and lack of technical support. Whelan et al. (1997), who did some similar work, suggested that five barriers impede the acquisition and use of telecommunications and these include (a) lack of knowledge of possible ways to integrate advanced telecommunications into the curriculum, (b) inaccessibility of equipment, (c) lack of or outdated equipment (d) lack of funds specifically allocated for telecommunications and. (e) lack of in-service training

Norris et al. (2003) reported that a teacher’s use of technology is dependent upon their access to technology. If the access technology is limited the use and integration of technology is minimal. Additional research also revealed that barriers to the integration of technology include lack of time, need for ongoing assistance, required changes in attitude and pedagogical beliefs, need for a shift in the role of the teacher, fear and confidence levels, and lack of relevancy of training to the instructional setting (Hruskocy et al., 2000). Many teachers are overwhelmed by the prospect of spending additional hours after school learning to use the computer-based technologies placed in their classrooms (Falba et al., 2001).
Whelan et al. (1997) reported that the biggest obstacle to using the Internet was time. Teachers needed more time in order to learn how to search the Internet, access the net, practice their technology skills, develop lesson plans, and to correlate lesson plans with the curriculum. To quote them, “Most teachers reported spending almost three times as much as their own time learning about computer-related technology as they spent in district-sponsored training” (Mann & Shafer, 1997, July). Findings from Mouza’s (2002-2003) study demonstrate that it would be unrealistic to expect teachers to integrate computers into their classroom in innovative ways in a short period of time.

National ICT strategies are usually successful when the application and integration in education is well established. However, there is some research that argues about obstructive factors that can appear during the implementation process. Some papers highlight the need for schools to provide leadership when integrating technology into the organisation. The school management should ensure that all the processes involving technology in schools are managed effectively especially with regard to teacher training. It is made clear that the focus in the development of any technology strategy should be to ensure that the school administration and the head teachers are at the forefront of the integration of ICT into the school curriculum. The school administrators should not simply just update their skills and knowledge but also work towards ICT transformation through educational leadership (Mentz & Mentz, 2003). The next paragraph will discuss some general ICT barriers in schools.

2.3.2.1 Lack of funds

Unfortunately, most schools do not allocate adequate funds for staff development. While the private sector, in general, claims to spend about thirty percent of its technology budgets on training, other schools typically spend ten percent or less (Mann & Shafer, 1997, July). Some research claims that organisations should spend only thirty percent of their technology budget on equipment and the remaining seventy percent should be spent on the “human infrastructure” to support ongoing training and technical assistance (White et al., 2002).
2.3.2.2 Lack of infrastructure

Bingimlas (2009) identified several diverse barriers in implementing ICT. Lack of hardware and software is the major obstacle behind the barriers to implementation (Goktas et al., 2009). The availability of a dedicated computer room could determine that computers are used for teaching and learning rather than just for administrative purposes. In the Second Information Technology in Education Study (SITES), conducted in 1997-1999 and involving 26 countries, it was found that an insufficient number of computers in schools was the main obstacle behind realising a school’s computer-related goals.

Infrastructure is consistently raised as an issue by teachers working in a wide range of access conditions. In Thailand, despite the government’s efforts to provide adequate infrastructural facilities to all schools, disparities still exist between rural and urban schools. Lack of infrastructure also includes a lack of Internet connectivity (Prammanee, 2003). Due to the high cost of Internet connectivity and telecommunication, it is not always possible for schools, especially poor schools, to make use of the Internet for teaching and learning.

The move to equip schools with ICT and Internet connectivity is usually initiated by government. In some cases, the private sector, in collaboration with the government and educational institutions and members of the school community, also contributes to the implementation of computers in schools.

2.3.2.3 Lack of knowledge

Another barrier identified by Ertmer et al. (2003); Hruskocy (1999); Novak & Knowles (1991) stated that it is typically a lack of knowledge among teachers that is a barrier when beginning to integrate computers within the more routine tasks of teaching and managing their classrooms, even if they may have technical skills and the desire to use them. Smith and Robinson (2003) found that teachers are quickly frustrated in technology usage when they lack technical skills. Therefore, technical assistance and support are essential for effective curricular integration (Whelan et al., 1997). Boone (2001) discussed the importance of troubleshooting and the negative impact that technological failures have on the teaching and learning process. Those using technology should consider all the possible ramifications of technological failures.
According to McCannon and Crews (2000) when technology is available in schools, teachers tend to use the technology for administrative tasks instead of using them as an integral part of their instruction. McCannon and Crews, in surveying over 170 K-5 teachers, identified six reasons why teachers have not participated in training offered to them. These reasons are: (a) they had too far to travel after school; (b) release time was not provided during the school day; (c) traffic on the way to the training site was too heavy; (d) teachers were too busy; (e) no stipends were offered; and (f) someone else was already providing individual help.

Teachers need to commit a certain amount of time to learn technology skills. Not all teachers can find time to spare, and much research has identified lack of time as one of the major factors preventing teachers using technology resources (Renyi, 1996). Dupagne and Krendl (1992) observed in their literature review a generally positive attitude amongst teachers towards computers. However, Dupagne and Krendl’s review also reported that teachers share a number of concerns about integrating computers into their instruction. Although teachers may believe in the instructional effectiveness of computers, they remain unable to make use of the technology because they have their own time or knowledge limitations. The primary recommendation emerging from their study was the need for schools to invest time and resources for in-service and workshop training for teachers. Baylor and Ritchie (2002) predict that successful technology integration depends on the two variables of teachers’ openness to change and the extent to which teachers experience and practice using the technology available to them.

Many teachers fail to use new technology, not because they are technophobic, but because they cannot understand how technology could be used in their teaching practices, or they have doubts about the usefulness of technology (Lam, 2000). Research has also shown that teachers who have more experience with computer technology are more comfortable in using them and have positive attitudes towards computer technology resources, while those with computer anxiety tend to avoid using them (Akbaba & Kurubacak, 1998).
2.3.2.4 Lack of training

Suggestions from one study included the need to find out teachers’ own perceptions of their computer skills and the extent of their desire to receive further training. O’Donnell (1996) stressed that professional development programs must address the specific needs of teachers and should be ongoing over an extended period of time. Some researchers believed that providing more resources, time and training would solve the problem and encourage teachers to integrate technology (Swan & Dixon, 2006; Wahab, 2003).

The lack of time given to teachers for training, for trying out technology in the classroom, and for talking to other teachers about technology is a major barrier (Pelgrum, 2001; Swan & Dixon, 2006). Fullan and Stiegelbauer (1991) suggested that a teachers’ requirement for organisational, resource and training support must be met in order for them to successfully implement technology as an educational innovation. Other barriers such as fear, insufficient access, and lack of support may cause the teachers to be isolated from technology (Boser et al., 1998; O'Donnell, 1996). In addition, Cuban (1993) proposed that limited access to ICT equipment, limited time for using ICT and beliefs and attitudes toward technology explained why teachers use these technologies infrequently and selectively (L. Cuban, 1993).

Clark (2000) found that the provision of opportunities and training to enable teachers to experience computer technology resources and to learn how to use them in instruction are crucial for teachers’ acceptance and use of them.

Anderson (2002) identifies that effective teacher training is important if proper teacher training in ICT and computer use as a prerequisite in schools, is to be achieved. Only then can ICT be successfully implemented into the curriculum. The problem is that untrained or inadequately trained teachers may remain disinterested and may therefore develop a resistance to using the computers in the classroom. Inadequate training programmes usually emphasize computer skills training, rather than using the computer to enhance teaching and learning.
Teacher training in computer literacy is essential for the successful implementation and integration of computers into the curriculum. Mooij and Smeets (2001, p. 266) comment on the confidence of teachers to handle computers which may reduce their use in the classroom because they are unwilling to introduce them. Lack of knowledge on the teacher’s part may “...constitute a serious obstacle to the integration of ICT in schools”.

2.3.2.5 Lack of positive attitudes

Knezek and Christensen (2002) noted that teachers’ attitudes toward technology become more positive with ongoing training. Anxiety levels tend to be reduced rather quickly with exposure to technology. Akbaba and Kurubacak (1998) said that training programs must be designed not only to improve teachers’ skills with technology but also to help teachers change their attitudes toward the use of technology.

Dupagne & Krendl (1992) and Ertmer (1999) highlight the correlation between “teacher attitudes” and the successful integration of technology. Teachers with positive attitudes toward computers have been shown to demonstrate more successful integration of technology, while teachers with negative attitudes do not. Rogers (1999) noted that as teachers become more comfortable with technology, their focus on barriers decreases. Advance technology users find ways to work around problems; whereas, novice users are more likely to be frustrated and give up due to their lack of skills or confidence to overcome these barriers.

Several studies suggest that attitudes are an important factor in the use of technology (Bahr et al., 2004; Kyriakidou et al., 1999; Wahab, 2003). Ertmer et al. (2003) states that a teachers’ beliefs about their ability to use technology for instruction may be an important key, given the role self-efficacy appears to play in determining behaviour. Many characteristics affect attitudes toward new interventions in schools, but certainly the teacher’s level of knowledge is critical (Keeler, 1996, Spring). Pierson (2001) reported that the ways in which teachers used technology determined their personal definitions of technology integration. Beyerbach (2001) stated that teachers learn by doing and collaboration with peers is essential for successful integration of technology in the
classroom. Technology infusion, in order to enhance teaching, is a multifaceted process that takes time, support, and collaboration.

2.3.2.6 Lack of technology leadership

Leadership is crucial in developing and managing an effective ICT strategy for their schools. This section explores the key information and links all leaders will need to support them in their role.

Technology leadership is becoming a more important issue in the successful implementation of ICT. Schools require considerable staff development and support and school heads particularly must possess a strategy and knowledge for leading change. Wilmore and Betz (2000) noted that the role of school leadership has increasingly gained importance in the context of educational change. Since the 2000s, many researchers have understood some new perspectives for school leadership rather than just taking an instructional approach (Dexter, 2008; McGarr & Kearney, 2009).

Brockmeier et al. (2005) suggested that the integration of technologies for teaching and learning has impacted the traditional roles and responsibilities of the head teachers. New competencies that school-based administrators need to develop in order to be effective in their new roles as technology leaders are described in the context.

In addition head teachers and teachers face the huge task of reinventing schools and classrooms in a society that has been transformed by digital technologies, and many feel overwhelmed by the mandate to integrate computer technology into every subject and grade. Increasingly, school administrators are required to assume leadership responsibilities in areas with which they are unfamiliar, and for which they have received little training (Flanagan & Jacobsen, 2003).

2.3.3 The Sustainability of Implementing ICT

Purg and Zakrajsek (2009) notes that after the United Nations and the European Union, in 2005, accepted sustainable development as their priority paradigm in implementing the important strategies of cultural, social and economic development, the realm of education has seen important conceptual shifts. However Heeks (2002) notes that most implemented
information systems (IS) projects in developing countries (DCs) were unsustainable. Kitiyadisai (2000) states that most of the implemented ICT projects in Thailand had failed. Sustainability is one aspect of development programmes that is often neglected. The long history of development aid has shown that too many projects and programs start with a bang but all too soon fade out with a whimper and are quickly forgotten. This is also true for many ICT-based educational projects. In many instances, these projects are initiated by third party donors—such as international aid agencies or corporations—and not enough attention is paid to establishing a mechanism by which the educational institution or community involved can pursue the project on its own or in partnership with other stakeholders after the initial donor leaves (Pillay & Hearn, 2009-2010). This may be due to costs and finance but these are not the only barriers to sustainability. The sustainability of ICT depends not only on economics but includes social, political and technological components. These are considered in the following paragraphs but first it must be noted that it takes specialized professional and technical skills for a society to sustain a useful level of innovation to gain knowledge. The creation of such skills “…is one of the most important prerequisites for knowledge-based development and effective use of ICT” (Mansell & Wehn, 1998).

2.3.3.1 Economic sustainability

Tinio (2002) comments on the sustainable ability of a school community to finance an ICT-enabled programme over the long term. Since technology is expensive, cost effectiveness is crucial otherwise it is tempting to divert funds from other needs. He points out that it is crucial to have a financial plan which is locally based through community participation because small schools would otherwise not be able to sustain the high and recurring costs of ICT. He suggests that parent teacher associations are often found to be supportive of ICT projects. The costs of infrastructure including hardware and software are dictated largely by technology cycles where new production becomes progressively cheaper to buy as it is superseded by new frameworks/models with higher performances. The MOE could control expenditure by defining the economic life-cycle or the useful financial life of an item, and also through timing of its purchases to make the most of the efficiency of its systems (Paterson, 2007).
2.3.3.2 Social sustainability

Social sustainability is dependent on community involvement. A school does not exist in a vacuum, and for an ICT project to succeed political leaders, business leaders, parents and other stakeholders must be bought in. The potential effective role of ICT development is to ensure community involvement in deciding, planning and evaluating the project (Hearn et al., 2004). They point out that innovation in ICT works best when those who will use it get fully involved and are consulted. The stakeholders must have a sense of ownership and know why the ICT is being introduced.

IICD (2007) notes that setting up an appropriate, strategic, organisational structure involving headmasters and parents is necessary for the institutionalisation and longer-term sustainable management of ICT facilities. The island schools are at the centre of distributing knowledge to the islands and, therefore, a sustainable development of ICT may lead to social sustainability as well. Setting up administrative committees to manage ICT facilities has proven to be very effective in ensuring the sustainability of ICT initiatives. Beyond the school, it is important to seek support from the local authorities such as the province, district or national education authorities to prepare for longer-term opportunities of funding and to have ICT recognised as part of teaching and learning.

2.3.3.3 Policy sustainability

Hadjithoma-Garstka (2009) points out that leadership is required at each level to support and participate in any stage of the policy making process and this is essential for sustainability. The national policy could be shifted towards whole school improvement through utilisation of ICT resources and long term implementation. To achieve rapid and sustained progress towards the goals the project sets will require both a shift in the emphasis of policies and more effective approaches to delivery. One of the biggest threats to ICT enabled projects is resistance to change. If, for instance, the leader lacks vision or lacks perception of the benefits, then the use of ICT can hardly take off, much less be sustained long term. Due to the innovative nature of ICT-enabled projects, leaders must have a keen understanding of the innovation process, identify the corresponding requirements for successful adoption, and harmonize plans and actions accordingly.
2.3.3.4 Technological sustainability

Technological sustainability involves choosing technology that will be effective in the long term. In a rapidly changing technological environment, this becomes a particularly difficult issue as planners must contend with the threat of technological obsolescence. At the same time, there is a tendency to acquire only the latest technologies (which is understandable in part because these are the models which vendors are likely to push aggressively). Generally, however, planners should use tried and tested systems as stability issues plague many of the latest technologies. Again, the rule of thumb is to let the learning objectives drive the technology choice and not vice versa since the latest technologies may not be the most appropriate tools for achieving the desired educational goals. When making technology decisions, planners should also factor in not just costs but also the availability of spare parts and technical support.

Although valuable lessons may be learned from best practice around the world, there is no one formula for determining the optimal level of ICT integration in the educational system. Significant challenges that policymakers and planners, educators, education administrators, and other stakeholders need to consider include educational policy and planning, infrastructure, language and content, capacity building, and financing. A sustainable balance needs to be considered between (a) using the exact amount that simply enhances the quality of life, (b) assuring education creativity and the development of humans, (c) preserving human, cultural and biological heritage and (d) allowing real-life interactive social activities among people.

Much of the infrastructure for online activities will be developed by the telecommunications and broadcast industries. However, local resources can be deployed by building partnerships to develop local networks. Building in sustainability as an objective will help to broaden the scope of partnerships and may help to catch the attention of investors.

A particular challenge will be extending the infrastructure into areas that telecommunications companies will regard as less attractive. The island schools, in more
remote areas, with smaller populations and areas with no cable franchise, are not attractive for competition and, therefore, the initiative to provide will fall to public bodies alone.

### 2.4 ICT in Developing Countries

Several studies investigated strategies of how ICT is used in the public sector in developing countries. They have been carried out by looking at the background problems, such as the low level of economic development, poor infrastructure and political unrest, which will obstruct ICT progress. Most developing countries have restricted computer software in the public sector and also a lack of ICT skills and limited infrastructure. These situations exist not merely due to lack of financial support, but largely due to lack of coordination at different levels in making efficient use of the technology (Gichoya, 2005). The following sections describe some perspectives on ICT in developing countries and highlight the challenges in implementing ICT in remote areas.

#### 2.4.1 Perspective on ICT in Developing Countries

In the previous section research was reported that has shown up the obstacles that may occur when implementing ICT into developing countries. However, ICT can also give various potential benefits. For example, research in the technologies transfer field comments that successful technology transfer can help to support both the economic and social setting of developing countries. The success has the benefits of long-term economic growth as a result of technology development and increased indirect foreign investments (Madu, 1989). Therefore, improved implementation of ICT in a developing country may increase the chances to improve the economic growth and strengthen society.

There has been much research to suggest that in order to develop new ICT strategies, the government should establish policies through consultation or advisory committees which follow the tracks laid down by national leadership or national strategy goals. Generally, in order to set up a national ICT policy, a basic infrastructure of services such as electric power, telephone, broadcasting, and the Internet are needed (Adeyeye & Iweha, 2005).

A study of the macro focus related to the structure of the ICT organisation, information systems, ICT architecture or an overall ICT strategy is important (Fardal, 2007). These
studies have contributed increased understanding of the various components of alignment required between ICT and business strategies. For example, the social dimension of strategic alignment is explored, leading to indicators of the need to include the individual level when a study of ICT strategic phenomena is undertaken. ICT user perspectives in another research domain may strengthen our knowledge of the mechanisms that promote the enhanced use of ICT as well as identifying factors which lead to an alignment between ICT users and ICT managers (Reich & Benbasat, 2000).

The linkage between ICT strategy, ICT projects and ICT usage requires the technologies and information systems to be organised and implemented in a proper way. Despite the different perspectives at the macro and micro level, a clear socio-technical tension helps explore new technological opportunities, considering the social context in which the technologies might be used. However, there is only a small amount of research in social computing that acknowledges the importance of social dynamics and socio-cultural contexts before planning new technological interventions (Wood-Harper & Wood, 2006). From a socio-technical viewpoint, in order for a system to be effective the technology must fit closely with social and organisational factors (Avison & Wood-Harper, 1991). However, there is no single technique to deal with all ICT projects. However, considering the context is important in every implementation (Wild, 1996).

This research aims to show how the multiple-perspectives of the various stakeholders (directors, head teachers, teachers, parents, students) differ in a variety of dimensions by carrying out an interpretive case study in an island school context. It is similar to a few other research papers which have highlighted the different perspectives of the technical and the social dimensions (Markus, 1983; Rob, 1980).

2.4.1.1 ICT for Poverty Reduction

ICT holds great promise for developing society by connecting people to more up-to-date and accurate sources of information and knowledge. ICT plays an important role in enhancing the activities of the poor by increasing their productivity through increased access to the information market and drives economic growth (Kuppusamy et al., 2009).
Many studies have emphasised that the use of ICT leads to more effective economic reforms as it enhances the public administration’s efficiency and reduces bureaucracy. ICT technologies can be used to increase efficiency, competitiveness and market access for firms in developing countries. In addition, the potential benefit of ICT is to increase the incomes of the poor and improve human development through reduction of the barriers to knowledge and information. Moreover, ICT diffusion improves access to information and enhances data sharing, while it is also expected to foster civil and political freedom (Baliamoune-Lutz & Paper, 2009).

Technology also makes financial services accessible to the poor. Using ICT as a tool for economic expansion is more challenging than just addressing it only in an economic or technical context. ICT also needs political, educational, cultural, scientific, legal, regulatory and financial attention. Installation of ICT infrastructures can provide efficient tools for the exchange of information, ideas and knowledge and ICT can become an enabling tool for wider socio-economic development. When properly used, it can greatly increase the ability of the poor to benefit from economic development and from development programs which are meant to help them (Viitanen, 2005). Within the island culture, ICT could be an important tool for tourism management due to the fact that island people can gain income from promoting tourism through the Internet.

Countries with a higher income per head invest more in research and development because they have a greater ability to discover and use advanced information technologies. Also wealthy countries more easily increase the spread of the Internet’s telephone infrastructure through high speed broadband mainly for communication that also affects their economic growth (Mina, 2003).

2.4.1.2 Bridging the Digital Divide

Although technology offers a unique opportunity to extend learning support beyond the classroom, it has been a somewhat difficult attainment until recent years. In Thailand, for example, there is a huge gap between mainland schools and island schools and lack of access further widens this divide. Access using private technology on the island is very costly and in some places not even available. The challenge is, therefore, for the island
school works as the knowledge distributor. Connecting the school and mainland by using the Internet is very important to the island society. Providing schools with technology is nearly sufficient to fill the gap of the digital divide. However, teachers must have ICT skills and receive the appropriate training in order to use technology effectively and to increase student learning (Adam, 2007).

Education also extends beyond the classroom. Given that developing countries do not have access to extensive educational opportunities, there is still a great need for technological education. Technology has the potential to greatly contribute to the prosperity of developing areas. By bridging the digital divide, it is possible for poverty-stricken regions to enhance communication with other countries, therefore offering economic, social, and political opportunities.

There are, however, several misconceptions regarding the digital revolution. Bridging the digital divide by implementing technology in poverty-stricken areas requires more than merely providing the resources. Poor areas need more than the equipment; they need to know how to use the technology in a resourceful way so that they can improve their circumstances, whether it is related to health care, economic support, or other areas of distress. While the digital divide is narrowing in developing countries due to the increase in portable telephones and Internet access, there is still a great deal of progress to be made.

Technology enhanced education is generally perceived as a way to relieve poverty, social division and improve living standards due to the fact that technology can deliver educational programs at a lower cost than traditional education systems. This technology-supported education system is cost-efficient, which is especially meaningful in countries with poor infrastructure, lack of Internet access, lack of financial resources and lack of trained teachers (Gulati, 2008; Oliveira, 1988). For example, in Thailand, the business sector is rapidly catching up with its counterparts in Singapore, but the educational sector is lagging far behind. At the tail end of the ICT utilization spectrum are the agricultural and rural development sectors, with the least number of ICT users, applications and solutions, and with most of the information poor.
Prammanee (2003) commented that the policy makers and educators need to be circumspect when considering the economic and cultural aspects of the country, and this applies to their attitudes and opinions about implementing the Internet in Thailand. Thailand is still considered to be a developing country, due to the fact that Thailand lacks human resources, funding, and technology expertise. It is difficult to just to simply adopt and assimilate the Internet from Western countries into the country.

According to the OECD (2009), the term digital divide is usually used to refer to the gap between individuals, households, businesses areas at different socio-economic levels with regard both to their opportunities to access ICT and to their use of the Internet for a wide variety of activities.

Most fundamentally, according to Norris (2001), the divide can be at a social or global level. A digital divide often exists between the information rich and the information poor, particularly in the developing countries whose more and less-developed regions are divided between urban and rural areas. Without any further support or planning the new ICT divide can tend to follow the track of old dividing lines and endorses old inequalities. Therefore, the digital divide, is often just a warning sign of a much deeper and established economic and social divide within and between societies, which existed prior to the ICT revolution.

As mentioned earlier, although numerous aid programmes have been initiated in order to support technological development in poorer nations, the motivation behind such programmes has been questioned. While developed countries argue that such aid is motivated by moral values aiming to assist poorer countries to prosper, participate and benefit from a knowledge-based economy, critics are sceptical, arguing that in practice this has often served to benefit the industrial world (Castells, 1999; Forman, 1995; P. Norris, 2001). Wilson (2004) also argued that the reasons behind developed countries’ concern to embrace of ICT are commercial, political, and social. Nevertheless, the network effect is that developing countries are increasingly becoming large markets for Western industries, and a significant part of the global market.

Although ICT in education is seen as significant in many aspects in a computer-rich world, there is still a huge gap in the implementation of computers in schools between richer and
poorer countries. The island schools, with their poor access to information compared with schools in the city or on the main land, could bridge the digital divide through the implementation ICT projects.

2.4.2 Challenge of Implementing ICT in Remote Areas

Information and communication technologies are composed of hardware and software tools which enable recording, obtaining, accessing, organising, presenting and the use of information electronically and telecommunication tools such as telephones, faxes, modems and computers, which make possible the use and access to information (UNESCO, 2002a). Integration means amalgamation into a whole and as Earle (2002) states integration of ICT is not a product but a process. Therefore, in developing ICT in remote areas the significant focus, for developing countries, is integration toward reaching their goals in developing society and alleviating poverty.

The availability of information and knowledge plays an important role in supporting rural school development and literacy with ICT. Moreover, this also helps to promote the effectiveness and efficiency of school development projects. However, compared with developed countries, the use of ICT in the educational sector in developing countries is more limited, because the countries face shortages of financial resources leading to limited Internet access and limited infrastructure. Moreover, they are also restricted in numbers of trained teachers and proper policies (Gulati, 2008).

The next section explains the main challenges and solutions for implementing ICT in remote areas in developing countries. The main challenges include: (a) the infrastructure restrictions, (b) insufficient training and ICT skills, (c) financial restrictions, (d) policy restrictions, (e) political restrictions, and (f) social and cultural understanding.

2.4.2.1 Infrastructure Restrictions

ICT infrastructure is a major consideration for operating effectively in remote areas. The lack of an appropriate infrastructure may obstruct the implementation of ICT in the islands. Three basic infrastructural requirements for rural ICT initiatives are electricity, telephones and network connectivity (Brewer et al., 2005). Islands are constrained by factors
associated with infrastructure access due to high infrastructure and transportation costs, limited business support, and a poorly developed infrastructure. The high costs associated with ICT infrastructure in remote areas originates from the cost of building and maintaining, and operating the infrastructure. The cost of building an ICT infrastructure in rural areas is either prohibitively expensive or not commercially viable, especially the in building of equipment which generally includes high transportation costs (Srisai & Thongthamachat, 2005).

Electricity and telecommunication infrastructures in rural areas of developing countries are also poorly developed (Munyua, 2000). Andrew and Petkov (2003) indicated that the telecommunications infrastructure in a rural area is very complex. A solution is required in rural areas where electricity may only be available for six to eight hours in one day and the voltage and frequency may vary outside the acceptable limits for ICT hardware to operate.

Therefore, alternative forms of power generation, such as solar electricity to power ICT on the island or in the remote area, are being considered because the cost of petrol is very high in remote areas. Lack of electricity supply affects all electronic equipment and also creates a weak telecommunications and Internet backbone including low bandwidth, low robustness, noisy lines, jamming and often poor service and access for the poor which is still hampered by issues of cost and the limited buildings out in rural areas (McNamara, 2003). Moreover, even though mobile telephony in developing countries has been expanding rapidly in remote areas, few providers appeared to be able to provide Internet access. In developing countries, large areas are still unable to obtain a reliable source of electricity and the nearest telephones are miles away (Tinio, 2002).

2.4.2.2 Restricted training and ICT skills

Training is another important aspect of successful information and communication technology projects and, because learning is more effective through practice, innovative and interactive training would be more successful (WorldBank, 2002).

Lack of IT skills and training have been identified as one of the major obstacles to successful adoption, management or the use of ICT in developing countries (Adam, 2007). As a result, where ICT is developed to a large extent for the context of the cultural and
social standards of developed countries it may therefore be inappropriate for providing ICT in rural situations without making use of the limited indigenous technical skills (Davison et al., 2000).

Training and technical skills should be central to the whole ICT project process. Therefore, users should be trained in the operation and application of ICT, as well as in the development processes of ICT. In addition, ICT technical support is very important in the role of ICT development (Wongchalee & Nakakul, 2010).

Heeks (2002, p. 8) maintains that staffing and the local skills base in developing countries is limited in reference to the wide range of skills needed for ICT development. These skills include systems analysis, design, and implementation as well as the set of broader skills such as planning, implementing and managing ICT initiatives. In addition, Christensen and Remler (2009) mention that adopting ICT is also more complicated than adopting other technologies. The first stage of using new technology generally requires training which significantly increases the short-term costs, particularly when the staff are being pulled away from normal tasks.

People who act as intermediaries between the demand and supply of information tend to lack the technical means to collect, process, store, transform and disseminate information in appropriate languages and channels for different end users. The unavailability of training materials, especially the challenge of finding appropriate training formats and content for the variety of needs of these remote schools and groups of educational staff are also considered as major issues that obstruct the implementation of ICT in rural areas. An insufficient amount of training and ICT skills and the extremely short supply of skills and human resources in developing countries may appear to be the greatest barrier for the diffusion of ICT among rural people (Pigato, 2001).

Lee (2001) explains that human resources are crucial for making good use of new technologies and that if new technology is to be successfully diffused in developing countries it requires both an access to advanced technologies as well as an attitude that “nourishes the human resources” to make use of them. Furthermore Urquhart et al. (2007) note that in ICT intervention, ICT capacity building ideally occurs in two ways. Firstly, by
“...providing the necessary skills and training for the ICT intervention to be sustainable from the beginning of the intervention and secondly, by building on the human and intellectual capital through the use of the ICT network itself.”

Gulbahar and Guven (2008) have commented that in order to provide the schools with the hardware and software needed to integrate ICT training into all levels of primary education, as well as to provide ICT equipment to teachers and students to access information and to ensure the successful utilization of new technologies, skill development in human resources and the provision of facilities for IT training in developing countries, are important (Montealegre, 1998). Governments have a precise role in providing the right policy environment and the IT infrastructure to enable the development of human resources.

2.4.2.3 Financial Restrictions

In developing countries there is a need for responsibility to develop the rural telecommunications environment through the rural communications development policy and to ensure that people in rural areas have reasonable and affordable access to communications services. However, the implementation of ICT and use of ICT in remote area obviously incurs costs that require sufficient financial resources to support the sustainability of the project. The financial resources needed include those necessary for the supply of the technical infrastructure, including networks, hardware and software. However, the main hindrances are electricity and telephone lines that are generally not available in rural areas. It is a major challenge to overcome if it is not properly planned and implemented and the communication costs and the electricity costs may affect the overall cost of the project (Afzal et al., 2005).

In the case of India’s experience with ICT implementation, it was found that technology alone does not create change. It takes commitment by people or stakeholders and requires a long term implementation period in which it still remains an issue that there is sufficient financial sustainability to support the project (Pigato, 2001).

Hosman et al. (2008) reported the challenges of ICT implementation in the Quang Ngai project. ICT can make a positive contribution during the development when the local residents adopt the ICT for their own economic benefit. Therefore there is a further
challenge to the financial sustainability of the project. Although the government is financially committed to providing a universal service, it is preferable for development from the local private sector that the project becomes self-sustaining.

In some rich countries in Asia, low-cost communication provided by the Internet brings about further improvements in productivity, education, health care, entertainment, global awareness, and the quality of life (Xiaoming & Kay, 2004). On the other hand, many poorer countries are facing problems in developing their telecommunication systems. Internet Service Providers (ISPs) are usually accessible in industrial and business locations or urbanised areas, but their extension to rural areas and remote places is expensive and very slow and thus it results in limiting access for poorer and under-privileged citizens to new knowledge resources

Implementing ICT in developing countries will, therefore, depend on the level of growth in the economy to raise consumer income and generate investment in both public and private sectors in national networks. Very little ICT used in developing countries was developed with the consideration and analysis of the specific needs, priorities, ability to pay, and market conditions of rural communities, especially in rural areas. Therefore, the new technologies are often too expensive for poor rural people, especially local people who may live with little income each day (Ali & Mission, 2003).

Furthermore, Chareonrit et al. (2005) comments that most ISPs are located in cities; hence rural people are faced with paying expensive long distance connection fees. In South-West Thailand there are few Internet Service Providers services on the mainland. However, the island schools also provide Internet for local people, health care units and tourism.

Cost-recovery is important to ensure the financial sustainability of ICT projects in rural areas, as insufficient financing can play a considerable role in project failure. In the case of financial support in Thailand, it depends on public funds, which may consist of taxpayers’ money and international loans. The civil service should be accountable to the public in their handling of public money and future investment in education but there is no certainty each year and most ICT projects have been implemented and yet still have maintenance costs.
Most have found it difficult to generate sufficient income from the project to be financially self-sustainable (Kitiyadisai, 2005).

2.4.2.4 Policy Restrictions

Most ICT policies in developing countries seem to be mismatched with the country’s context and culture. Furthermore, the native policy makers in the developing countries do not effectively use technologies (Tongkaw et al., 2009). They do not take into account, nor consider, the ‘macro-level contextual dimensions’ of their societies. However, technology operates within the deep cultural and social milieus (Vernal, 2009). In developing countries, the policy and decisions made on ICT are being taken at national and state levels. With regards to the prevailing lack of knowledge, poverty is encouraged and progress is slow (Hopson et al., 2002, Winter). Therefore, developing countries need to learn within their own environment the way in which IT policy can be created and applied to serve their own country's needs (Pradhan, 2002).

Many developed countries have implemented ICT successfully into schools for teaching and learning, but have fallen behind with the implementation process and cost effectiveness (Howie et al., 2005). In addition, one of the problems of strategic planning in many developing countries is governed by a top-down approach which tends to fail to incorporate the real needs of local communities (Bhatnagar, 2002).

Rapid economic growth in South East Asia affects social development in a way previously unparalleled in human history (Corbitt, 1999). Furthermore, from the view of policy, there are suggestions that, in a South East Asian context, the state is fundamentally central in policy. There is no decentralising of policy text or discourse. Rather, there is an implicit discourse that the state is in control in the South East Asian situation.

In Thailand, policy response is far less formal. However, there is no accompanying Act (Corbitt, 1999) and the policy pays little attention to the immediate and essential needs of local education. Nevertheless, the widespread use of IT holds its potential to spread social benefits across every region of the country. The new Thai Learning 2010 Master plan, was initiated to propose an introduction of learning technologies into all of the education sectors and to promote the development of knowledge, skills and understanding of what will enable
people of all ages and in all areas of Thailand to embrace a culture of lifelong learning: ten
years strategy – 2000-2010. However, this policy is still centralised and controlled by the
capital city, and not fully distributed to the provincial level and the school level.

Heeks (2010) notes that “ICT policy in many countries is unintelligible” because there is a
lot of fragmentation and not much focus on the whole process which leaves the ICT policy
divorced from the development process. Nevertheless, bringing those together is a way of
transforming the technology benefits. Unless such deficiencies can be addressed, ICT may
continue to fall short in its developmental impact. Strategic policies can provide a rationale,
a set of goals, and a vision for what education systems might become with the introduction
of ICT and how students, teachers, parents, and the general population might benefit from
its use in schools (Kozma, 2008).

It is widely accepted that ICT can be an important potential lever for introducing and
sustaining educational reform efforts, as well as being a useful aid for both teaching and
learning. However, despite the evidence of how the use of ICT in education initiatives
around the world has become increasingly widespread, there is comparatively little
guidance that exists for policy-makers and educators in developing countries (OECD,
2009).

2.4.2.5 Political Restrictions

Andrew and Petkov (2003) have commented that in developing countries, political stability
or instability and a particular political philosophy have an impact on the financial factors,
priority of service, and ICT development. In addition, Pick, (2008) suggests that the results
for a single nation in seeking to improve ICT depends on politics and leadership to
appreciate how multidimensional factors need to be combined for development. In addition
he notes that nations that have political stability and lack of violence allow the development
of ICT to diffuse rapidly. In contrast, to date, Thailand has a time line of political instability
and also some acts of violence since 1992. When the Minister of Education is changed, not
only are most of people in high positions changed but also many of the district
administrators and principals in the provinces are changed. Changes in the political
situation will also cause changes in the actual amount and types of hardware and software
purchased (Zamani, 2009). Also changes in the political situation might also cause change in the international exchange rate, i.e. dollar/baht which in turn may have an impact on computer purchases. The results showed that, not only did the world’s political situation impact computer use, but that local political change can affect computer use and consequently technology innovations may develop more slowly in Thailand. A successfully implemented ICT project strongly depends on the political and cultural environment that continuously influences it (Rozendal, 2003).

The political dimension is often missing in considerations of educational technology research (Coupal, 2004). “Countries that have political and economic openness or existing infrastructure such as telephone lines, might have a positive impact on Internet usage” (Wunnava & Leiter, 2009). Furthermore, as another author points out, politics often produces shifts in educational policy and only strategic policies can provide the reason, goals and vision for what an education system might look like be after the introduction of ICT (Kozma, 2008).

In this research, attention was given to the fact that staff at the teaching level are usually affected by political influences ranging from government officials to school leaders. Consequently, political factor at many different levels will affects the promotion of sustainable ICT development in the island schools.

2.4.2.6 Restrictions of Social and Cultural Understanding

The nature of adaptations in IT-based techniques in developing countries requires an understanding of the wider and local contextual factors influencing the implementation of such techniques, the process of implementation at the local level, and the ensuing change resulting from the implementation process (Bada, 2002).

Although, much research has been done in the usage of IT/IS by considering the impact of the primary national culture on human behaviour and the way humans use IS/IT, Myers (2002) notes that there has been little research into the actual and potential uses of information and communication technologies (ICTs) in poor communities (D. Miller et al., 2005). Some previous research has commented that more manageable negotiations between the cultural and school policy can create a successful integration of technology into
everyday practice and embed it into the core task of schooling. Moreover, the core challenge for educational leaders is to guide the implicit and explicit negotiation processes that must occur to match the demands of innovation, including new technologies, to the existing culture of the school (Fishman et al., 2000).

In the case of Thai culture, previous research illustrates the interaction between technologies and culture and the way that the culture can change the way technology is used. Thai culture is naturally inherent in daily life in the way Thais bring that into their work practices. A very hierarchical structure in Thai organisations reflects the sense of bureaucratic and elongated decision-making process during information systems development (Thanasankit, 2002).

The use of ICT in rural development has been limited among the people on the islands and groups due to social and cultural barriers within the island communities. Social and cultural barriers refer to factors that can cause individuals or whole sectors of society to participate in ICT for development initiatives especially, in this case, when moving from place to place. In addition, the diversity in language, low literacy rate and other cultural factors in a developing country may also affect Internet development in Asia (Xiaoming & Kay, 2004).

2.5 Chapter Summary

The literature reviews in this chapter provide an overview of the integration of information and communication technology (ICT) in education. This study drew on literature from three major areas: The Thai educational reforms including reported problems in the Thai educational reforms, ICT in education, and ICT in developing countries. This study sought to gain knowledge about both the benefits and barriers when integrating ICT into the island schools. Although many studies investigate the impact of ICT on education in developing countries, few of them focus on schools in very remote situations such as the island schools. These island schools have already used information technology for nearly five years but historically there was some ambiguity in the perceived role of computer technology in education and society. ICT in these schools can be used for school administration, teaching and learning.
3 CHAPTER THREE: THEORETICAL FRAMEWORK

3.1 Introduction

In order to choose a useful theoretical framework that can aid the data collection process and analyse data for integrating ICT into island schools, it is important to assess existing frameworks that have been used to classify ICT success in the literature. Much of the previous research demonstrates that a theoretical framework should be used to explain the main issues to be studied (Miles & Huberman, 1994). Frameworks are useful because they help the researcher to organise and integrate the various elements of a problem in a simple and consistent way; and ensure the attainment of the pursued outcomes (Montagna, 2005). It is believed that ICT frameworks for schools can help to identify and assess the teaching and learning and provide social benefits.

The objective of this chapter is to review the theoretical frameworks and models which are relevant in integrating ICT in education. The following sections will discuss the existing frameworks presented in the literature and also examine the usefulness that these frameworks offer to clarify the research questions this project investigates. The first step of this chapter focuses on reviewing the details of theoretical frameworks and criticises previous research. The second step of this chapter describes the possible frameworks that might be useful for this research and justifies an appropriate framework for integrating ICT into the island schools in Thailand, as an example of a developing country.

3.2 Theoretical Framework

3.2.1 Actor Network Theory (ANT)

The term “Actor Network Theory” (ANT) was devised by Michel Callon (1986). It refers to a theoretical framework which describes the world as a network of social and technological actants (Latour & Woolgar, 1986; Law, 2007). Law (1992) proposes that ANT privileges neither natural (realism) nor cultural (social constructivism) accounts of scientific production; asserting instead that science is a process of heterogeneous engineering in which the social, technical, conceptual, and textual are puzzled together and transformed. ANT is a theoretical framework used in social studies of technology to explain
the way technological artifacts are constructed in society. Under this framework, the actant (both human and non-human) entities are identified. The networks in which they are embedded are explored, in order to identify ways in which the social context is bound up with the different actants (Latour & Woolgar, 1986).

Actor network theory emerged from social studies of science and technology. Studies such as Latour and Woolgar (1979) followed the scientists and engineers as they performed actions that constructed facts and enriched the knowledge from which things were made. In science and technology, ‘what works’ matters because it is a criterion for knowledge claims. This theory has been applied to several scientific areas but has mainly been used in sociological studies to explain constructions for human interactions and their relation with science and technology.

Analytically, ANT is interested in the way that networks overcome resistance and gain strength internally and gain coherence and consistency (stabilise); how they are organised (juxtapose elements) and convert (translate) network elements; how they prevent actors from following their own proclivity (become durable); how they enlist others to invest in or follow the program (enrol); how they bestow qualities and motivations to actors (establish roles as scripts); how they become increasingly transportable and “useful” (simplify); and how they become functionally indispensable (as obligatory points of passage).

A key issue for this specific theory concerns the description of an actor-network. What task, technologies and people constitute an actor-network, as a group of actors working on the same objective? After implementing ICT into island schools, the tasks are changed for each particular group of stakeholders. The changing roles of stakeholders are impacted by ICT implementation which is the core question of this research. However, the way in which the ANT poses answers to this sort of question is different to the way that other theorists answer the question. Whereas the latter group analyses the minds of the actors and the culture of a group, they do not accept that the material artifacts of a group could have equal analytical weight. Therefore, those studying the island schools would need to take into account the context because the teachers and the students both have specific actions within their particular specific culture. The researcher has outlined a question to ask about the relationship between people and technology in the island schools after implementing ICT.
Previous research shows that in a conventional educational and learning theory; even in that which accords a central place to socially situated learning theory (Lave & Wenger, 1991) there is an emphasis on the importance of understanding the person in the social context. To understand the stakeholders on the islands, it could be done by analytically locating the implementation process within the context. The island culture is different from that of the mainland. Therefore, improving the process of implementing ICT into island schools requires an individual who understands the system and can design the system appropriately according to the culture difference. As noted by Walsham (1997), Latour’s Actor Network Theory combines the broader issues of the social tradition with new conceptualisations such as computers and networks that increase technologies to an equal status with human actors. This perspective explores the complex interrelationships that develop between people and the technologies. The theory employs interactions with other individuals, organisations and institutions within complex, interconnected networks.

All networks involve elements of organisation and elements of disorganisation. The researcher considered some macro-actors such as the state, organisations, nations etc. In this case, the macro-actors are the ESA, organisation in Satun Province and the micro-actors are the island schools. The first key idea in ANT is that the researchers should not assume the existence of macro-entities in advance of the analysis. They should always look at macro-actors as works in progress, which are declining or expanding, becoming simplified or more complex. In this case, the researcher studied most elements of the organisation and most of the stakeholders who are involved in the system. The Thai educational structure is described in Chapter Two.

Actor network theory tends to not assume the fixity, nor the finality, of the kind of institutions which many theorists do assume; rather they see such institutions as being in flux and provide analytical concepts for understanding the organising/disorganising processes in play that generate this flux. If institutions have been built and expanded over many decades, centuries even, they can also be broken down, or replaced, or collapsed. Developing ICT into schools is continuous work because of the social and cultural changes.
Elgali and Kalman (2010) used actor network theory for exploring the construction of the failure concepts in the Israeli national ICT integration program. The significant advantage of ANT in relation to alternative approaches to understanding technology-rich programmes is that it treats both people and technological artefacts symmetrically and thus can expose relationships and contexts which are more difficult to detect if other approaches are used (Doolin & Lowe, 2002; Tatnall & Gilding, 1999).

According to Ayyad (2009), it is possible to use Actor Network Theory (ANT) to interpret or understand the implementation barriers of e-government and information systems. ANT was used as a tool to understand how change took place in situations where some, who believed they owned power, could exercise that power to enforce the adoption of new technology and create a critical mass. The research used the Actor-Network Theory as a methodology to look at the implementation barriers and challenges facing e-government projects. The paper aimed to understand the root causes of the failure of the projects. The research found that ANT could be used to look at e-government and could stress the reciprocal interrelationship between the social and technology at the same time.

Several authors have used ANT to discuss Information System innovation as a process involving the mobilisation of actors (Hanseth et al., 2004; Pedrosa & Sousa, 2007). Whether a process of innovation actually gets launched, the extent to which it is pursued and whether it produces the outcomes intended by the actors who conceived it, depends on the power relations of this network of actors and on the influence of other networks that might erode or support it. A particular aspect of ANT is that technologies themselves are seen as powerful actors that may be mobilised to enforce a network.

Walsham (1997) argues that ANT addresses the local contingent, but it pays little attention to broader social structures which influence the locals. Another criticism is its stance on moral and political issues; the theory decreases the arbitrary distinctions between the social and the technical issues and considers that they open up new possibilities for those who want to understand the place of technology in human experience. In this research, ANT could be applied to examine the stakeholder’ interactions with technology and the effect on education change of integrating ICT into the island schools although some of the research questions may not be answered by using ANT alone. ANT allows the researcher to stress
the importance of compliance within the interpreted relationship of human and non-human interactions in the implementation of ICT.

In summary, the actor-network theory examines the motivations and actions of actors (both human beings and nonhumans such as technological artefacts), who form elements, linked by associations, of heterogeneous networks of aligned interests (Walsham & Sahay, 1999). It can say that actor-network theory focuses on the interplay of human and nonhuman actors in the actor-network in organisation or social life and both human and nonhuman actors must be considered or treated with the same status when analysing the relationship amongst the actors.

The objectives of this study aim to answer questions such as: what are the barriers and benefits of implementing ICT in island schools and how this ICT implementation can be sustained for island schools. The period of implementing ICT and the period after implementation are the crucial parts of this study. However, this study does not intend to analyse the relationship between ICT (nonhuman) and human actor or actors in actor-network in the island school development. The actor-network can only be used to draw a current “big picture” of the implementation and the interaction between the technology and people in context. This theory may not explain how ICT implementation can be sustainable for these island schools. It is possible to study the network elements of both people and technologies by using this tool. However, in the context of island schools, the situation must also introduce other elements, such as adding the culture and the society dimensions into the findings of the research.

3.2.2 The Diffusion of Innovation

Diffusion of Innovation is the theory about how, why and at what rate new ideas and technology spread through cultures Everett M. Rogers (1995a, p. 5) defined diffusion as “the process by which an innovation is communicated through certain channels over time among members of a social system”.

Everett M. Rogers (1995a) proposed four main elements that influence the spread of a new idea: (a) the innovation, (b) communication channels, (c) time, and (d) a social system. This
definition features communication and reflects an individual-level innovation-decision process.

The question is how to elaborate the model to apply it to the diffusion within organisations, such as schools. Initially, researchers simply applied the model of the individual to the school. Then, they included uniquely defined school attributes such as size, centralisation, and complexity that affect innovation. Next, they moved to focus on implementation in an “explosion” of studies and generated a new model of the processes through which a school implements an innovation. For example, Rogers’s intra-organisational model includes agenda setting, matching an innovation to the agenda, redefining-restructuring, clarifying and making routines. At the school level, the teacher acts as a collective by setting an agenda, matching an innovation to agenda, and so forth. Similar to other models e.g., Leonard-Barton (1988), Rogers’s model has an administrative focus in which the organisation decides to adopt an innovation and then must go through a roughly linear process to implement it.

In Diffusion Theory, researchers have tried to understand all the factors that influence ICT/IS innovation adoption decisions (Beatty et al., 2001; Martins et al., 2004). They typically look at the organisational and intra-organisational levels rather than just an inter-organisational focus (Prescott & Conger, 1995). Another assumption of the traditional Diffusion Theory perspective has been the homogeneity of the institutional environment across the adopting units. This assumption tends to obscure variations across the units arising from geographic distance from the source of the innovation, local norms, and regulations and the availability or unavailability of factors to support the diffusion system. This view of Diffusion Theory is especially problematic in the current period of globalisation that is characterised by processes of rapid technological change.

Everett M. Rogers, in his seminal work on the Diffusion of Innovations (1983), describes the process of adoption and decision-making that seems to apply to schools’ and educators’ adoption of technology. Rogers explained diffusion as a process by which an innovation is communicated through certain channels over time and among members of a social system. Thus, diffusion of an innovation within Rogers’ theory is both an individual and a social activity. Additionally, Rogers found that the diffusion of innovations was not only affected
by certain behavioural traits, but by other factors, such as the perceived attitudes of the innovation and the type of decision involved in the adoption process. Other factors, such as the size of the organisation and its socioeconomic status were also considered to be theoretical reasons why individuals choose to be involved in the innovation diffusion process.

Much of the literature related to diffusion of innovation has focused on the process of, and barriers to, adoption and the use of media tools by users within their own context (Kautz et al., 2005; E. M. Rogers, 1995b). There has been very little focus on the tool itself, and the effect of the context on the meaning of the designer and maker for its use.

Previous research on the diffusion of computers in schools has generally focused on the effects of three sets of factors on the adoption of computers: (a) the access to infrastructure, (b) the institutional factors, and (c) the characteristics of the teacher (M. Burns, 2002; Zhao et al., 2002).

A few studies have highlighted the importance of social contexts, social processes, and social support when teachers use computers (Becker, 2000; Zhao et al., 2002), but there has been very little theoretical or empirical research on the social processes that affect the implementation of computers within a school. It is possible to integrate social capital into a theoretical model of diffusion within organisations. Researchers should consider the use of longitudinal, social-network data to assess empirically the effects of that social capital on the implementation of computer technology in schools.

Everett’s theory on the Diffusion of Innovation suggests that the user’s perception of the characteristics of an innovation affect adoption (Moore & Benbasat, 1991; Plouffe et al., 2001; E. M. Rogers, 1995a). According to Everett M. Rogers (1995a), it is important conceptually to determine the exact boundaries that define technological innovation. This research is therefore related to the general area of innovation diffusion which has an extensive literature basis. Innovation diffusion theory could answer some parts of the research questions, i.e. infrastructure factors; institutional factors such as scheduling, teacher factor such as willingness and ability to used ICT in school. However, from a research point of view, there are still several factors that follow the institutional hierarchical
context including the school level and educational province level. Therefore, the researchers have to look for another model that covers all the research questions.

3.2.3 House’s Perspective Model

House (1981) discovered a three perspectives model which examines technological, political, and cultural perspectives. The technological perspective assumes that teaching and innovation are technologies with predictable solutions that can be transferred from one situation to another. The focus of this perspective is on the innovation itself; on its characteristics and component parts; and its production and introduction as a technology. The main assumption from a technological perspective is that everyone shares a common interest in advancing the innovation. The only remaining issue is how best to implement it (House, 1981). The technological perspective on alternative assessment reform draws attention to: (a) the difficulties of devising and refining valid forms of measurement; (b) the challenge teachers face when acquiring a wider range of assessment skills and strategies; (c) the need to harmonise assessment expectations between home and school and across school levels; and (d) the issue of time and resources that help or hinder the introduction of new assessment practices into the routines of the school. However, there is much more to alternative assessment reform than just refining the measurement technology, developing teachers’ assessment literacy, and managing the organisation’s capacity to implement the change. Some of the assessment problems that manifest themselves as technological issues of implementation go beyond the assessments themselves. They are caused by inappropriate use, political and bureaucratic interference (Broadfoot, 1996) or institutional priorities and requirements that can mitigate against any significant changes in assessment (R. J. Wilson, 1996).

The political perspective on educational innovation, in House’s (1981) view, involves the exercise and negotiation of the power, authority, and competing interests among groups. A political perspective on alternative assessment recognises that all assessments involve acts of power. It also identifies the problems of implementing alternative classroom assessment as moving beyond the issues of technical coordination and human communication to encompass the power struggles among ideologies and interest groups in schools and societies. A political perspective also treats alternative classroom assessment as itself being
problematic as a strategy that might not empower people but could become a sophisticated new form of selection and surveillance.

The cultural perspective investigates how innovations are interpreted and integrated into the social and cultural context of schools. It is suggested that the innovation process is actually an interaction of cultures. Change is conceived as blending new ideas with a cultural history. In the cultural perspective, the challenge of assessment reform is one of reculturing (Fullan, 1993; Hargreaves, 1994) or rethinking the nature and purpose of classroom assessment. The innovation of classroom assessment reform involves many new strategies. Historically, classroom assessment has been the hurdle that students needed to overcome to show they were ready for the next stage. It occurred at the end of instruction, that is, the end of a class, a unit, a semester, or a school year, and was a symbol of completion and a comment on the adequacy of learning. The substance of learning was much less important than teachers’ collective judgments about their students’ learning potential, as demonstrated in routine classroom tests and exams.

The three perspective model from House (1981) seems appropriate for an investigation of ICT in the island schools. The three perspectives—technological, political, and cultural are suitable for an analysis at the school level and in this research, investigations right from the provincial education system level to the school level. Miller and Lieberman (1988) have been systematically studying schools and how they change. The three perspectives assume a change from studies of the fidelity of adopting curriculum materials and technologies to analysing the role of change agents in school improvement projects, through to testing hypotheses about the nature of school organisational structure and leadership behaviours. In addition, the contribution of federal funds brings about a political perspective (House, 1981) into the educational change and improvement efforts. Hargreaves et al. (2002) similarly examine classroom assessment reform from three perspectives—technology, cultural and political but add in a postmodern perspective because, since House (1981) discovered his three perspectives on educational innovation, the social and educational worlds have changed dramatically.

Hargreaves et al. (2002) model, developed from House, explores the important postmodern perspective which reshapes public education and the agenda for educational change.
However, House’s original three perspective model is still relevant at the classroom level for integrating ICT into the island schools in terms of examining just the technological, political and cultural perspectives. If this research extends the view from a higher level, i.e. educational province level to the school level then the researchers will have to look at other models to fully answer the research question.

3.2.4 Socio-Technical Theory

The socio-technical theory emphasises that there is a dynamic relationship that shapes the progress of construction between technology and the organisation. Socio (of people and society) and technical (of machines and technology) are combined into the one word ‘socio technical’ or ‘socio-technical’. Both of these terms, hyphenated or otherwise, appear ubiquitously in ergonomics literature and have the same meaning.

According to Geels (2004) who studied systems of innovation which explicitly incorporate the user side in the analysis, the unit of analysis is widened from sector systems of innovation to socio-technical systems. The article provides a coherent, conceptual multi-level perspective, using insights from sociology, institutional theory and innovation studies. Socio-technical design is concerned with encouraging the direct participation of end-users in the information system design process. The system includes the network of users, developers, information technology at hand, and the environments in which the system will be used and supported. A socio technical ‘system’, as well as being the descriptive term given to any practical instantiation of socio and technical elements engaged in purposeful goal-directed behaviour, is a particular expression of socio technical theory (Walker et al., 2009).

According to Singh, Wood-Harper et al. (2008), the socio cultural aspect could be implied. Using a group collaboration tool spanning multiple countries, they explain how the social and cultural climates, differences in time and space, as well as technological infrastructure of countries affects collaboration between individuals given their distinctive operational and administration policies. Their research designs of socio-technical systems for a decentralized form of organisation where decisions are made locally. In addition, the
organisations encouraged its workforce (knowledge workers) to work from home. The nomadic work practices of the workers resulted in a loose organisational hierarchy and a cost effective workspace. For cutting the costs further, a group of freelancers are employed temporarily to provide specialised skills to the project team. In the case of manufacturing firms, one or more functions are outsourced to other firms (Singh et al., 2008).

Not much previous research has employed a unifying socio-technical concept into the field of education. Earle (2002) finds that the terms “educational technology” and “instructional technology” are often used interchangeably. Both share a common interest in the processes of human learning and teaching, with some variations in definitions and levels of complexity, depending upon one’s personal viewpoint.

The Socio Technical System (STS) is an approach to a complex organisational work design that recognises the interaction between people and technology in workplaces and refers to the interaction between society's complex infrastructures and human behaviour. Previous research done from a socio-technical perspective showed that the focus is on the end-user application and the system can be designed to suit the user and the environment.

The socio-technical model would not be appropriate for this research in respect of the administrative software design because the ICT or the end software cannot be programmed and therefore this theory is limited for investigating the impact that standard ICT has on education change and also on exploring the benefits and barriers that obstruct implementing ICT on to the island school. The Socio-technical model could be used to find out what affects the implementation of e-document systems between the island schools and the mainland organisation, ESA. The socio-technical design may also work together with action research to find research approaches that describe a process and a human set of principles in the context associated with technology and change (Mumford, 2006). Therefore, using only socio-technical model might not answer all the research questions.

3.2.5 Multiview Methodology

The original concept of Multiview posited a three-way relationship between the analyst, the methodology, and the situation. Avison and Wood-Harper (1991) suggested that parts of this relationship were missing in many descriptions of Information Systems development,
and that methodologies often contained unstated and unquestioning assumptions about the unitary nature of both the situation and the analysts involved in investigating it. Despite this criticism of other methodologies, Multiview itself offered no further guidance on how any given instantiation of the triad (analyst-methodology-situation) might come about in actual practice. To make sense of IS development, researchers need to draw on Sophisticated Social Theory, such as Giddens’ (1984), Structuration Theory (Jones et al., 2004; Walsham, 1993) and Knowledge Interests (Dahlbom & Mathiassen, 1993). The purposes of IS development practice require an approach that is accessible to practitioners while not being naïve or simplistic. To improve the performance of the analysis the IS refers to a role. The role can be assumed by IS professionals, user personnel, or consultants, i.e. change agents involved in IS development.

The Multiview methodology was initially developed in the late 1970s and early 1980s and at that time waterfall methodology was often used for Information System development. Multiview is one of the well-known action research and soft system methodologies (Wood-Harper et al., 1985). Moreover, action research has been seen as particularly desirable for IS research and closely links research to the real-world concerns of practice (Baskerville & Wood-Harper, 1998).

With more than half a decade of action research carried out, the Multiview methodology (Avison, 1991, 1997, 1998; Wood-Harper et al., 1985; Wood-Harper & Wood, 2005) for information systems development emphasises that information systems development theories should be contingent rather than prescriptive because the skills of different analysts and the situations in which they are constrained to work has always to be taken into account in any project (Wood-Harper et al., 1985).

The initial Multiview approach concerns four areas of analysis: human activity systems, socio-technical systems, data analysis and structured analysis (Wood-Harper et al., 1985). It could also be used to develop a theoretical framework for tackling computer systems design which will take into account the differing views of various stakeholders in the development and use of a computer system.
Multiview aims to carry out a socio-technical analysis and design to facilitate the development of information systems that satisfy both social and technical objectives. Multiview is a methodology which structures the tasks for the analysts and users during these analyses and design activities (Wood-Harper et al., 1985). Multiview perceives information systems development as a hybrid process involving computer specialists who build the system, and users for whom the system is being built.

Multiview is deployed for consultancy work by initiators (Wood-Harper et al., 1985). In particular, Multiview helps in providing answers to the following questions and in involving all stakeholders in answering the questions.

- How is the computer system supposed to further the aims of the organisation installing it?
- How can it be fitted into the working lives of the people in the organisation that are going to use it?
- How can the individuals concerned best relate to the machine in terms of operating it and using the output from it?
- What information processing function is the system to perform?
- What technical specification of a system will come close enough to doing the things that you have written down in the answers to the other four questions?

The developed Multiview2 framework (Figure 3.1) shows the socio-technical analysis and design as a part of an interpretive scheme (modality). The scope of Multiview2 is broadened to include software development, implementation and production operation. Multiview2 provides a systematic approach to Information System Development which is reflective, constructive and unifying with respect to the analyst, the situation and the methodology. The Multiview2 frameworks were created under the Multi perspective theory. Therefore, the following section will describe the relation between the Multi perspective theory and Multiview2 in detail.
Multiview methodology can explain some parts of this research. This methodology is appropriate for developing information systems. However, the integration of ICT in to island school research has to be seen widely from an overview perspective of the impact on education change, the benefits of ICT implementation, the barrier factors and the sustainability of ICT implementation.

### 3.3 Determination of the Model: Multi-perspective Model

The multiple perspective approach described by Mitroff and Linstone (1993) can be used to inform the particular occurrence of Multiview2 under any given set of circumstances. In unbounded systems thinking, Mitroff and Linstone argue that complex problem solving requires the application of as many disciplines, professions, and branches of knowledge as possible, with each one employing different paradigms of thought. The idea of “multiple perspectives” (Linstone, 1985) is used to describe the various ways of thinking which comprise unbounded systems thinking.
The use of multiple perspectives is justified by Linstone (1989) who comments that “each perspective yields insights not obtainable from the others” and that the “O (operational) and P (personal) perspectives are essential in bridging the gap between analysis and action” (p. 314). Thus, O and P perspectives are used to complement the T (technical) perspective, not to replace it. Using the O and P perspectives allows us to bring in the human and social factors that are replete with complex problems and thus focus on human beings both as individuals and groups, including ethical analysis (Wood-Harper et al., 1996). In addition, Linstone (2002, p. 292) states that “any perspective may illuminate any element” and “it is conceivable that a technical element can be understood without use of the technical perspective.” Therefore, making use of different perspectives in this way allows us to concentrate more on how we look at a problem rather than on what we are looking at.

A multiple perspective approach provides us with a richer base to investigate complex problem situations. Any problem may be viewed from any perspective; the different perspectives may reinforce each other, cancel each other out, or operate in the dialectic mode. Choosing a particular perspective to adopt is in itself problematic and involves the investigator’s ethical values and moral judgments. All complex problem situations, however, will inevitably require the adoption of all three perspectives.

According to Fredriksson (2008), in the perspectives for using ICT in schools, we need to understand the intentions, conditions and activities surrounding the introduction, innovation, implementation, and use of ICT in the school conceptual frameworks. As pedagogical practices are multifaceted an innovation can be analysed at many different levels i.e. macro, meso and micro. The actors outside school at the macro level prescribe the national policies, guidelines goals and intentions, usually referring to international trends and competitiveness and massive pressure from the information society. Factors at a meso level are to be found inside schools. Conditions such as the role of the context and school culture, readiness for change as well as leadership and supportive organisational environment have to be taken into consideration when analysing an implementation. At the micro level, teachers’ pedagogical and technological skills, size of the classroom, access to ICT and the number of students, etc. are of importance.
In accordance with Mitroff and Linstone’s (1993) multiple perspectives approach, the pattern of IT policymaking is influenced by a complex and dynamic interaction of factors – social, political, technological and cultural – not just a single force or a static process such as the simple conversion of straight international models. As such, the need for a framework to incorporate the analysis and in-depth study of these factors arises. In this study, a systemic approach (Ackoff, 1971; Checkland, 1981) which includes the interactions between the different factors of a country’s policy network and stakeholder groups is proposed.

In order to obtain a variety of perspectives and identify the issues surrounding a country’s operation the global arena needs an intention to explore the key stakeholders’ concerns (Metcalfe & Hobson, 2001). Key stakeholders include government policymakers; private and public IT industries and market sectors; and education and health sectors. IT statistics, strategies and regulations are used to measure in relation to the country’s IT labour market, computer specialists, research and development, infrastructure, education, economy. By applying Checkland’s (1981) terms, this research primarily becomes holistically concerned with the application of a systemic view through a multi perspective approach, in the area of globalisation, to IT policies guiding a Nation’s development.

A model relating the cultural dimensions between developed and developing virtual communities was formulated emphasising the multiple level of analysis encompassing the levels of technology (T), organisation (O) and individual-society (personal) perspectives (P), as suggested by Linstone (1984).

Pradhan (2002) states that:

In line with Mitroff and Linstones’ (1993) multi-perspective interpretation in their book ‘The Unbounded Mind’, we see the pattern of acquisition of IT as being influenced by a complex and dynamic interaction of forces - social, political, economic, cultural, and organizational as well as technological - and not a single factor or a static process. There is a need for multi-perspective research that comprises all vital aspects of introducing IT, namely the technical, the economic, the social, the cultural, the organizational and the political. Linstone (1984) highlights the need to incorporate the various stakeholders involved in a project studied so that the closest truth can be found. In order to obtain a variety of
perspectives and identify the “missing issues” in the process of IT acquisition, it is our intention to discuss some of the factors which need to be considered in developing countries when adopting the technology from abroad.

As such, there is a need for a framework to incorporate the analysis and in-depth study of these factors. The study highlights different issues and problems in the phenomenon of the island schools. The purely technological perspective focuses on issues of organisation, structure, and strategy. In addition to this the study also needs to examine how the implemented ICTs make an impact on the social and cultural context of the islands. A political perspective is also needed to view the organisational issues as being embedded in and resulting from the dynamics of power and control in education sectors of all layers. The ICT implementation problems may caused by inappropriate use, political and bureaucratic interference, or institutional priorities and requirements. In this study, a multi-perspective approach is proposed since it can include all the interactions among the different viewpoints of key stakeholders who are related to the implementation of ICT on the islands.

Madu and Jacob (1991) adapted a multiple perspective approach in the transfer of technology to less developed countries (LDCs). They used two case studies to show how the use of multiple perspectives allows the consideration of the technical, organisational and personal perspectives in technology transfer decision-making process, thus enhancing and facilitating the process. The research uses a multiple perspective approach and cognitive mapping. By cross-cuing the three perspectives, it is possible to show the depth, richness and intricacy characterising the decision processes. In addition, they mention that the cross-cuing process of the three perspectives is a necessary step to highlighting and synthesising the various insights obtained in a coherent framework. However, it is difficult to justify technology transfers on the basis of technical perspectives alone and, similarly, difficult to present the organisational and personal factors on a cognitive map alone.

Other research by Ash et al. (2000) used a multiple perspective approach for describing the complex system of a Physician Order Entry (POE) in hospitals. Most hospitals will have to implement physician order entry defined as a process which allows a physician to use a computer to directly enter medical orders.
The multiple perspective concept is not simply another methodology to add to the analyst’s tool kit. “There is no six-step procedure, no formula to weight perspectives” (Linstone, 1989, p. 326). The main applications of the TOP are in the area of high level decision-making. In the United States, the major focus of TOP has been primarily to improve participants’ strategic thinking (Zhu, 1999).

It is possible that a large and complex set of issues can be analysed by selecting important stakeholder groups and gaining their perspectives on these three systems. Figure 3.2 shows the multi-perspective model that could describe the integration of ICT in the island schools. The figure draws together the different perspectives of all the stakeholders.

Figure 3.2 Multi-perspective model of ICT integration at island schools adapted from Linstone (2002, p.279)

The multiple perspective approach was advanced to help the systems practitioner bridge the gap between analysis and action, between the model and the real world. The organisational and personal perspectives also focus more attention on the problems of implementation.
The concept serves as an effective and practical vehicle to overcome the limitations of systems analysis in dealing with complex real-world situations (Linstone, 1989). In addition, it is important to gain perspectives from all stakeholder groups who are considering the implementation of ICTs, to foster and to help the planning process. The model may be useful for structuring data collection and formatting a report.

In the multiple perspectives approach, it can be seen that the pattern of information technologies policymaking is being influenced by a complex and dynamic interaction of social, political, technological and cultural factors (Mitroff & Linstone, 1993). Building on the above professional experiences and examples, this research will explore the argument that developing countries, like Thailand, would benefit from a systemic IT policy which includes all the social, political, technical and cultural factors. The reiteration of Checkland’s (1981) Systems Thinking model may highlight some of the key policy implications of IT acquisition which Thailand will need to address in order to participate in the global arena. As such, there is a need for a framework to incorporate the analysis and in-depth study as these factors arises. In this study, a systemic approach is proposed which includes the interactions between the different factors of a country’s policy network and stakeholder groups (Ackoff, 1971; Checkland, 1981). In order to obtain a variety of perspectives and to identify the issues surrounding a country’s operation in the global area, it was our intention to explore key stakeholders’ concerns. In this research, the key stakeholders included the director of the office of Satun Educational Service Area (ESA), head teachers, teachers, parents and students in the island schools.

In Thailand, the integration of ICT in the schools is encouraged and driven by several projects and initiatives in line with national ICT policies, for example, EdNet, SchoolNet, ICT Master Plan (2002-2006) and Thai Learning Technologies 2010. Previous research in ICT in education has been done at several levels of the government institutions. For this thesis, the researcher has focused the case studies on the basic education level in the remote islands. The research findings included investigating the general factors and the current status and impact of integration ICTs at island schools. An implicit basic assumption in this study is that the multi-perspective integrations of ICTs at island school all are significant. This research employed a multi-perspective model provided by Linstone (1984) which
specified three systems that are crucial to determine multiple perspectives including: Technical (T), Organisational (O), and Personal (P). The Technical system includes the hardware, software, networking and basic infrastructure. The Organisational system includes the policies and procedures. The Personal system includes the behaviour of political and individual key players.

On the basis of reviewing the literature in chapter two, the research approach includes: a) the benefits, b) barriers and c) sustainable of ICT implementation in island schools. This approach is summarised in table 3.1 and this table will be used as an initial template for analysing data. Details of how to analyse the data will be described in chapter four.

<table>
<thead>
<tr>
<th>Approach/Perspective</th>
<th>Technical (T)</th>
<th>Organisational (O)</th>
<th>Personal (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>potential benefits of implementing ICT</td>
<td>• tool for teaching and learning</td>
<td>• enhances education administration</td>
<td>• uplift economic</td>
</tr>
<tr>
<td></td>
<td>• tool for school administrator</td>
<td>• reduces bureaucracy</td>
<td>• uplift social</td>
</tr>
<tr>
<td></td>
<td>• enhances education administration</td>
<td></td>
<td>• developing society</td>
</tr>
<tr>
<td>barriers of implementing ICT</td>
<td>• poor infrastructure</td>
<td>• lack of financial resources</td>
<td>• shortage of skilled manpower</td>
</tr>
<tr>
<td></td>
<td>• inadequate infrastructure</td>
<td>• financial Restrictions</td>
<td>• lack of coordination</td>
</tr>
<tr>
<td></td>
<td>• limited computer</td>
<td>• policy Restrictions</td>
<td>• lack of trained teachers</td>
</tr>
<tr>
<td></td>
<td>• limited software</td>
<td>• political Restrictions</td>
<td>• social and cultural understanding</td>
</tr>
<tr>
<td></td>
<td>• inadequate technologies</td>
<td></td>
<td>• knowledge</td>
</tr>
<tr>
<td>sustainability of implementing ICT</td>
<td>• basic infrastructure, power electric, telephone line, broadband, hardware and software.</td>
<td>• should set up policies</td>
<td>• attitudes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• economic</td>
<td>• leadership</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• political</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• financial</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• funding</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1 The factors from the literature review classified by TOP perspectives
3.4 Chapter Summary

This chapter started by describing the theoretical frameworks that should be used to explain the main issues to be studied. Frameworks are useful because they help the researcher to organise and integrate the various elements of a problem in a simple and consistent way. The second section of this chapter reviews some possible candidate frameworks or models which could be relevant to integrating ICT in education. The third section of this chapter describes the selection of an appropriate model that might be useful for this research and in the last section the researcher identified the literature base of the TOP model and an approach is suggested for organising and integrating the various elements of a problem in a simple and consistent way.
CHAPTER FOUR: RESEARCH METHOD

4.1 Introduction

This chapter discusses the research design and methodologies for examining the integration of technology into the island schools in South Thailand. The purpose of this whole study is to examine how ICT implementation can be sustainable in the island schools, the benefits of ICT in the island schools and the implementation barriers that may emerge. The primary consideration is from the stakeholders’ perspective whose views are most relevant to the integration of technology in the island schools group. The research has a social context which relates to cultivating the effective use of technology in schools. The research contributions aim to suggest a framework for the sustainable implementation of ICT in island schools. This framework shows the elements of sustainability of ICT implementation of island school context in order to provide an additional valuable source of knowledge for the local education policy makers in Thailand and other developing countries. A Multi perspective Model is used and the specific findings, methods and future inquiries of this research are examined in this study. The analysis and interpretation of these findings will increase understanding of the practices that influence the effective use of technology for educational improvement.

This methods section is divided into five subsections which discuss: (a) the philosophical paradigms of the research; (b) the research methodology considerations; (c) criteria for research design; (d) the data collection techniques and procedures; and (e) data analysis and validity.

4.2 Philosophical Paradigms of the Research

4.2.1 Quantitative and Qualitative Research Paradigms

Quantitative research is described by the terms ‘empiricism’ (Leach, 1990) and ‘positivism’ (Duffy, 1985; Myers, 1997). It derives from the scientific method used in the physical sciences. The approach of the Quantitative research is “a formal, objective, and systematic process in which numerical data are utilized to obtain information about the world” (N. Burns & Grove, 1987), using a deductive process of knowledge attainment (Duffy, 1985).
Qualitative research differs from qualitative approaches as it develops theory inductively. There is no explicit intention to count or quantify the findings, which are instead described in the language employed during the research process (Leach, 1990).

Another major difference between qualitative and quantitative research deals with the underlying assumptions about the role of the researcher. In quantitative research, the researcher is ideally an objective observer who neither participates in nor influences what is being studied. In qualitative research, however, it is thought that the researcher can learn the most by participating and/or being immersed in a research situation. These basic underlying assumptions of both methodologies guide and sequence the types of employed data collection methods.

Quantitative research methods were originally developed in the natural sciences to study natural phenomena. Examples of quantitative methods, now well accepted in the social sciences, include survey methods, laboratory experiments, formal methods (e.g. econometrics) and numerical methods such as mathematical modelling. Descriptions of quantitative research methods are outside the scope of this research. However, it is generally accepted that for understanding underlying social situations, qualitative methods are more suitable than quantitative methods because the data collected is usually more descriptive and cannot be so rigidly analysed.

The most suitable research method for each research topic is guided by the nature of the research and the researchers. The choice between quantitative and qualitative very much depends on the research objectives but many believe that results are most useful when the two methods are combined (Miles & Huberman, 1994).

Qualitative data uses sources of well-grounded and rich descriptions and explains the processes in their identifiable local contexts. In this case, qualitative research interviews were used to validate particular measures and to clarify and illustrate the meaning of other kinds of data sources.

It is usual to think of the qualitative paradigm as being most appropriate for theory generation because of its capacity to investigate complex interrelationships in their natural
settings (Glaser & Strauss, 1968). This study investigates the impact of implementing ICT into island schools on the natural island environment. Consequently, it was considered more appropriate to conduct the study in the qualitative paradigm because of the complexity of relationships and potential interdependencies on the islands. Similarly, because the whole island environment was likely to be affected by this implementation and also because the island school environment itself would affect that implementation, a case study methodology, where the individual school is the case, was considered the appropriate method within the qualitative paradigm. Furthermore, the qualitative paradigm allows the building of a theoretical framework that could be followed by future research, or be generalised into a theoretical contribution.

There are many steps and confounding interactions in the journey from a national policy statement to teacher and student activity in the local school classroom. Greater confidence can be expected from closely studying the steps in the process. Yalin (2007) mentions that future research into the integration of ICTs into schools may use qualitative research methods (e.g., interviews, case studies) to examine in depth the barriers to stakeholder participation. Also it would be beneficial to identify the practices and experiences gained by the stakeholders which overcome the barriers to ICT integration in the island schools.

There are several ways to conduct research by using qualitative research methods. The following section explains some qualitative research methods in the Information Systems field that can be used in this particular research and why this research method is suitable for some research but not suitable for others.

4.2.2 Interpretive Research

The philosophical basis of interpretive research is hermeneutics and phenomenology (Boland, 1991). Interpretive research studies generally attempt to understand phenomena through the meanings behind people interaction with the context or with each other. In the Information System (IS) field, researchers call this a social constructivist position interpretive (Checkland & Holwell, 1998; Walsham, 1993, 1995). (Walsham, 1995) refers to Interpretivist versus Positivist approaches to Information Systems. He said that interpretive methods of research are ‘aimed at producing an understanding of the context of
the information system, and the process whereby the information system influences and is influenced by the context’ (Walsham, 1993). Myers (1997) suggests the underlying epistemology of Information System research can take three approaches: positivist, interpretive, and critical.

“IS research can be classified as interpretive if it is assumed that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools and other artefacts. Interpretive research does not redefine dependent and independent variables, but focuses on the complexity of human sense making as the situation emerges; it attempts to understand phenomena through the meanings that people assign to them” (Klein & Myers, 1999).

Hirschheim (1992) said ‘IS epistemology draws heavily from the social sciences because information systems are, fundamentally, social rather than technical systems.’

One of the fundamental principles of interpretive research is that the researcher is not an independent observer analysing a situation objectively. Rather, the researcher is involved in their past history and personal agenda. One of the benefits of adopting an established theory is that it provides the opportunity to view the world through a purposely chosen lens. The researcher carefully selects the theory and discusses both the positive and negative dimensions. Moreover, because the interpretive case study in IS focuses on the social structures or human actions, it is very important to understand the real situations leading to the research questions.

4.3 Research Methodology Considerations

4.3.1 Action Research

In action research, the researcher works in close collaboration or participating with a group of people to improve the situation in a particular setting. The researcher does not ‘do’ the research ‘on’ people, but instead works with them, acting as a facilitator. Therefore, group management skills and an understanding of group dynamics are important skills for the researcher to acquire. This type of research is popular in areas such as organisational management, community development, education and agriculture.
Action research begins with a process of communication and agreement between people who want to change something together. Normally, organisational change is not the responsibility of all the people in organisation. Action research often takes place with a small, willing group of dedicated people and is open to new ideas. The group then moves through the stages of planning, acting, observing and reflecting. The process may happen several times in a circular way until it reaches an optimum. In action research, various types of research methods may be used, such as questionnaires for diagnosing and evaluating stage, interviews, and focus groups for gauging opinion on the proposed changes.

Education Management Action Research Model (Kenneth et al., 2005) is a model that conjugates pedagogical thinking, curriculum design and organisational context. It was founded in a paper (Nunes & McPherson, 2003) which concluded that action research is suitable for e-learning development.

4.3.2 Ethnography

One of the central questions of the late twentieth century is to ask how information technology is producing social change? The difficulty of setting and measuring indicators of social change is that non material considerations are often addressed. Most research related with cultural change involves the use of an ethnographic method (Tacchi, 2006). The emphasis in ethnography is on describing and interpreting cultural behaviour. The ethnographer is required to spend a significant amount of time in the field. Ethnographers immerse themselves in the lives and culture of the group being studied, often living with that group of people for months. The researchers participate in a groups’ activity doing observation on their behaviour, taking notes, conducting interviews, analysis, reflecting and writing reports. These activities may be called fieldwork or participant observation. Ethnographers highlight the importance of the written text as well because it can show the culture they are studying. Ethnography has also been applied to modern industrial settings and is used in the study of information systems and organisations. The most important benefit of Ethnography is that it reveals what people are doing and what they describe. In addition, Ethnography is useful for observing the reactions of people in relationship networks. The main hindrance of the Ethnographic method is the long time spent collecting data and the limitation that only one situation can be studied.
The main goal of this research is to make an important contribution to our knowledge of the adoption, use, and impact of new information technologies in the island schools. An Ethnographic methodology may be suitable for this research where there are multiple perspectives in each specific case. The combination of Ethnography and Action Research is called Ethnographic Action Research and has been done by UNESCO in India. Their article is based on the findings from ethnographic action research done in community-based initiatives aimed at reaching ICT to the poor and marginalised. The research was conducted from early 2003 to July 2005. It attempts to explore the question why, in some contexts, children and youth may be preferred over adult members by the community for learning ICT. Action researchers employed many different ways for gathering data including interviews, participant observation, diaries, and surveys to understand the dynamic structures of both poverty and media use in their locality. Ethnographic research, such as this, ensures that any interpretation is made in the context of the given cultural context and there is an emphasis on the everyday lives of the people (Subramanian, 2006). However, adequate time must be taken to understand the complex situation in depth and Ethnography seems to be the best methodology in which we choose to employ in this research.

4.3.3 Grounded Theory

Grounded theory is a methodology which was first laid out in 1967 by the two researchers, Glaser and Strauss. It tends to be a popular form of inquiry in the areas of education and health research. The emphasis in this methodology is on the generation of theory which is grounded in the data – this means that it has emerged from the data. The theory is developed inductively from a corpus of data. It differs from other methods by means of seeking to test a hypothesis that has been formulated by the researcher.

The purpose of grounded theory is to identify properties of categories that indicate the action pertaining to a phenomenon. The incoming results could be generalised or transferred to those specific situation. Generally, the precision and predictive capacities of grounded theory rely on: first, systematic and widespread theoretical sampling; second, the conditions and variations that will be discovered and turned into a theory; and finally, its generalisability (Strauss & Corbin, 1998).
In grounded theory, the preferred data collection methods can be determined by analytical guidelines gained from flexible data collections such as focus groups and interviews. A comprehensive literature review also takes place throughout the data collection process. The data from the observations can be summarised into conceptual categories. Research which employs grounded theory may gain creditability in a research setting by taking more observations or repeating the process of analysis. Over a period of time, as the conceptual categories are refined and linked, a theory evolves (Glaser & Strauss, 1968, p. 436; Miles & Huberman, 1994).

Grounded theory is a useful methodology for multidisciplinary studies since it ties the varied perspectives together through conceptualisation of the data and its implicit social organisation of processes and problems (Glaser, 1992).

Grounded theory seems to be a suitable methodology when a theory is not directly available to explain a process (Creswell, 2007). For this research, the literature revealed models which are available, but are incomplete because they do not address the potentially valuable variables of interest to the researcher. Moreover, this researcher focuses on the multi perspectives of various stakeholders. Grounded theory may be used to generate a theory that explains how people are experiencing the integration ICT in island schools. Moreover the theory may also generate a general framework that can widely explain ICT issues in the island context.

Grounded theory does not examine any stakeholder involvement in the research. The majority of data collections came from the multi perspectives of stakeholders related with island schools. In addition, this research employed existing frameworks that highlight the multi perspectives and collect information from the real situation.

Reviewing these various methods, it seems that an interpretive case study should be considered as an avenue to pursue because it could explore and explain the phenomenon from the stakeholder’s perspectives with reference to existing theories. The rationale behind the case study is now described.
4.4 Research Design

4.4.1 The Rationale of the Case Study

The concepts of case study research differ from real ‘cases’ that are represented in general research papers as an analytical process. The case study, as referred to in this study, attempts to capture the circumstances and conditions of an everyday or commonplace situation. Yin (2003) states that a case study that represents a typical project may be called the representative or typical case. This research could be described by a case study in the research domain which involves the investigation of contemporary phenomena in a social context in which the boundaries of the context are not obviously divided (Myers, 1997). In this research, Island school is a complex organisation providing education to nomadic pupils. It is multi-cultural in terms of location and language and administrative structure which authorised by the two Ministries, problems of school budget and politics have occurred.

Stake (1988) comments that, what is special about the case study is that it ‘focuses on a bounded system, whether a single actor, a single classroom, a single institution, or a single enterprise – usually under natural conditions – so as to understand it in its own habitat (p.256). Yin (2003) identifies that the case study’s unique strength is its ability to deal with a full variety of evidence and as a specific strategy has a distinct advantage when ‘a how or why question is being asked about a contemporary set of events, over which the investigator has little or no control’ (p.9).

Case studies are intensive descriptions and analyses of bounded systems or units (L. M. Smith, 1978) for the purpose of gaining an in-depth understanding of the situation and meaning for those involved. Case studies are particularly suited for uncovering the interaction of significant factors and the characteristics of situations or phenomena where it is impossible to delineate the variables involved from their context (Yin, 1994). These have been found to be useful in providing heuristic insights into the problems or situations studied as the knowledge resulting from them is concrete and contextual, as opposed to the generally abstract and formal knowledge derived from other research designs (Stake, 1981).
Given that the purpose of the study is to explore and understand the experience of the island schools which have implemented ICT through government in the education sectors then, as Sanders (1981) points out, case studies are useful to identify and explain the educational issues and practical problems. In particular, case studies have been found to be useful for studying educational innovations and evaluating programs to inform policy (Merriam, 1998).

The nature of this study is deeply interpretive. The strength of case studies is the richness of the data and the ability to uncover the complex relations among the various contextual factors involved in the situations or phenomena under study. It is hoped that the rich descriptions of good practice can be used for further analysis, interpretation and theorising to arrive at a tentative typology for conceptualising the classroom interactions and the strategies for change.

A key focus of this case is to investigate the challenges and barriers encountered in implementing ICT into the island schools. The complete case study will include studying the contextual factors at the school level. The concept used in the definition of the case is that of "zooming out": in order to really understand the conditions for the emergence, sustainability and transferability of these practices. The research needs to find out about some important aspects of the school context, the goals and vision of the school, the ICT implementation history and the strategies involving the infrastructure and, specifically, funding, staffing provisions, staff development and other related initiatives in the school.

For an in-depth study of the use of ICT in teaching and learning, as perceived by the education system, a common form of purposeful sampling was used. This involves identifying participants and cases of interest and people who know what cases are information-rich and are good examples for study (Merriam, 1998).

Considerable effort was devoted to the selection of cases that would provide a range of worthwhile examples which reflect the widest range of approaches to ICT implementation approaches in the island schools as well as provide examples across different island schools. However, as the approach can only be evaluated after the implementation of ICT, the implementation makes the island environment and people changed. The island schools were selected from the Satun Education Service Area (ESA) office located in Satun
province. The entire list of selected schools was not determined all in one go at the start of
the research but rather evolved slowly throughout the period of the study. Recommendations from the director of Satun ESA narrowed the selection for case study to
three island schools. The actual choice was finally governed by the very fluid situation in
the schools in terms of technology implementation at the time and the need to have an
extended contact and access to the schools before the formal data collection could start.
Furthermore, the case studies also required interviews with gypsies or sea nomads who are
the parents of students from island schools (Appendix E5).

In order to arrive at a short list of potential schools for the study, the researcher consulted
deputy director Satun ESA, who had good contact with schools. This identified schools that
were actively engaged in some form of ICT integration in their school curriculum. The
researcher then contacted each of the head teachers and asked if they would be willing to
allow the researcher to conduct the research. The key criterion for selection, at this stage,
was that the researcher was allowed to observe in classrooms where ICT was used and was
to be able to make a photographic record of what was being conducted. The decision of
which specific lesson(s) were to be observed was generally arrived at after discussion and
negotiation with the head teacher. This was sometimes influenced by specific
recommendations pertaining to a specific teacher or a specific subject area in that school
when permission was granted to observe those classrooms. However, in most
circumstances, the researcher would consult the head teachers and ask about the kinds of
ICT supported teaching/learning and school administration that was going on in the school
and then specific requests would then be made to the head teacher to provide the widest
range of diversity of experience in the classroom for the data collection.

4.4.2 Research Context

4.4.2.1 Education structure of Thailand

The Thai Education system consists of 12 years of free basic education guaranteed by the
constitution: 6 years in “Pratom” (primary education, P1 to P6) and 6 years in “Mattayom”
(Secondary education, M1 to M6). In the Thai system, only the first 9 years of education
are compulsory and up to 12 years of free basic education guaranteed by the constitution.
The present policy regarding the use of ICT in education was established by the Ministry of Education (MOE, 2002) in accordance with the 1999 National Education Act, the 2002-2016 National Education Master Plan, the 2010 National ICT Master Plan, and the 2010 Thai Learning Technologies Master Plan.

The 1999 National Educational Act initiated an overall reformation of the Thai Education System in five major areas: 1) educational system; 2) learning; 3) educational administration and management; 4) teachers and educational personnel; and 5) resources and investment for education related system. Considerable changes in the structure of management and administration have taken place in order to support the key teaching and learning changes stipulated by the 1999 National Education Act. The Act supports the use of technologies in the improvement of teaching and learning quality.

The 2002-2016 National Education Plan serves as a framework for formulating the development plans pertaining to basic education, vocational education, higher education, and religion, art and culture. It provides objectives and policy guidelines for implementations which will lead the Thai into a knowledge-based society.

The 2010 National ICT Master Plan was based on the development of a national ICT infrastructure, human resource development, and the information systems for Thai people. The major goals are to promote innovation; build human capacity, and strengthen the information infrastructure and industries to transform Thai society into a knowledge-based economy.

The 2010 Thai Learning Technology Master Plan provides strategies and initiatives to facilitate access to learning technologies and promote a lifelong learning culture in Thai society.

The MOE ICT Plan focuses on the use of ICT in the four areas; improving the quality of teaching and learning; developing educational management and administration systems; building the capacity of educational personnel; and developing an educational ICT infrastructure.
Emphasis is on decentralising of administrative responsibilities to the local level with the consolidation of education planning at the central level. This reformation process in Thai Education System led to the establishment of 175 Education Service Areas (ESA) in 2003.

Each ESA comprises an Area Committee, which is responsible for approximately 200 educational institutes and a population of 300,000 to 500,000 students. The ESA for Satun province is responsible for 175 educational institutes and 43,186 students (updated 10 June 2009).

The Office of the Basic Education Commission (OBEC) coordinates the continuity of activities to achieve government policy in social development and also implements the policies of the Ministry of Education. OBEC assesses the results of activities which are implemented by all Educational Service Areas, which then leads to improvements in policy-based tasks.

Figure 4.1 Thailand educational structure
The Tenth National Economic and Social Development Plan (2007-2011) is based on a collective vision of Thai society as a “Green and Happy Society,” where Thai people are endowed with a morality-based knowledge to give resilience against the adverse impacts of globalisation. The main emphasis of the National Development Plan is to increase the capacity for improving the quality of life of Thai people. The plan states that promoting the intensive use of Information Technology enhances learning efficiency by ensuring access to the necessary infrastructure, technologies and software to complement learning.

Although the Government is responsible for frequency distribution, signal transmission devices and other infrastructure necessary for mass media communication in the provision of education and services, too many plans have been formulated to implement these policies. Furthermore, there are too many agencies involved in the same plan thus leading to incoherent and inconsistent plans due to differences in organisational culture. In addition, other government policies are always not in line with the ICT policy. While Ministry of ICT deals with communication and telecommunications, the two major public enterprises in telecommunications (TOT and CAT) are being privatised. The Ministry of ICT is increasingly becoming engaged in the privatisation process rather than concentrating on ICT.

Not only does ICT play an important role in teaching and learning, but also in management. The new educational system is moving towards decentralisation, focusing on restructuring the framework of resource allocation, organisational structure, curriculum, the teaching and learning process and professional development. It has not been easy to completely integrate ICT into the educational system and structure during this transitional period.

The 2010 Thai Learning Technology Master Plan provided for the installation of ICT systems into all schools throughout Thailand including the island schools. The reason was to offer opportunities for learning to all students. However, in the island schools, the utilisation of ICT and its preferences still raises many questions because they found many problems during the processing of the project.

The island school case is interesting because of the distinct culture, languages and religion. This research interprets the context and how it influences ICT strategies which differ from
the national government master plan. The ICT strategies plan is divided into a national and an education ministry level. Neither of the strategies are completely suited to the island schools and the contextual analysis of development is very different from mainland schools. Some failures of these strategies are grounded in their unsuitable nature.

This research will illustrate the use of description to explore the research questions clearly. Moreover, the research will address any issues arising in the schools and the communities, after ICT is implemented into the schools. A new framework will be provided as a strategy for sustainable implementation on island schools.

4.4.2.2 Island school context

The research took place in the Andaman Sea located in the South of Thailand and surrounded by several very beautiful islands (Appendix E6). The context of the social situation is quite different from the mainland. The rich context is best captured by a case study approach. Multiple resources of information including interviews, observations, and also participations in different aspects of school life could be collected from different stakeholders. The data collecting section describes the methods and plans for collecting data in this area.

Departments of Local Government, under the Ministry of Interior, are in charge of provincial, as well as local level government. The country is administratively divided into 75 provinces. The Provincial Governors and District Officers are appointed by the National Government and are the major authorities in the Provincial Government, acting as representatives of the National Government. The Provincial Government directly supervises the activities of Local Authorities. Provinces are divided into a number of districts (Amphor), headed by district officers falling under the responsibility of the Provincial Governor. A district is divided into sub-districts (Tambon) and is headed by a sub-district chief (Kamnan). A sub-district consists of several villages, headed by village heads.

Most of the people living on the island in the Andaman Sea are Gypsy or Sea nomads or Morgan who emigrated from neighbouring countries, such as Indonesia, Malaysia and Thailand. They have their own (specific) language called “Chaw-lay”. Generally, most of
the local people live nomadically in temporary houses spread around the islands (Appendix E7). The limitation of transportation causes most people to have difficulties in reaching convenient facilities. Moreover, in the view of the government, communication in the local language limits educational development. Therefore the Thai government offered a fundamental compulsory education by establishing twelve island schools with selected limited resources. Out of fifty-one islands, only twelve islands were selected for the location of primary and secondary schools. There are shortages in basic facilities required by the schools such as teaching staff, books, drinking water and electricity. Moreover, the ratio between teacher and student is not reasonable and therefore teachers on the islands are responsible for many more children than mainland teachers.

The study investigated the use of computers in the schools which provide primary and secondary education under the structure of Satun province. To increase the richness of data collection, some schools would be selected, and focused on, as representative cases of the island schools and three out of twelve schools from the island schools were chosen: Ban Koh Adang school, Ban Koh Sarai school and Ban Tan Yong Ka Boey school. The selected schools are located on three major islands: Lipe island, Sarai island and Pu Yu island, respectively. Table 4.1 shows the number of students in island schools separated by gender in 2009 and Table 4.2 shows the number of teachers in island schools separated by gender in 2009.

<table>
<thead>
<tr>
<th>School Name</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ban Koh Adang school</td>
<td>192</td>
<td>189</td>
<td>381</td>
</tr>
<tr>
<td>Ban Koh Sarai school</td>
<td>176</td>
<td>149</td>
<td>325</td>
</tr>
<tr>
<td>Ban Tan Yong Ka Boey school</td>
<td>123</td>
<td>122</td>
<td>245</td>
</tr>
</tbody>
</table>

Table 4.1 Number of students in island schools separated by gender in 2009
Source: http://www.sesao.go.th/mis52/mis52_1.htm
<table>
<thead>
<tr>
<th>School Name</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ban Koh Adang school</td>
<td>10</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Ban Koh Sarai school</td>
<td>5</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Ban Tan Yong Ka Boey school</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 4.2 Number of teachers in island schools separated by gender in 2009

4.4.2.2.1 Ban Koh Adang school

*Ban Koh Adang* school is located on Lipe island, which is in the Adang-Rawi group of islands located in the Andaman sea within Tarutao National Park, Thailand. (Tumbon Koh Sarai, Ampore Moung, Satun Province). To access the island, a boat journey of 90 kilometres is required. It is not always possible to travel to the island between May and October due to the storm season. The island has two main seasons; May to January is the rainy season and February to April is the dry summer. In the rainy season from May to October, the island is affected by the South-West Monsoon and is isolated from the mainland. From November to January, the sea route opens up for the high tourist season.

The school has one class at each level from the nursery to M3; there are all together 381 students. There are 16 teachers in the school. Ban Koh Adang school is under a government policy which uses a top-down approach and Ban Koh Adang school reports up to Satun ESA who reports to OBEC and finally to the MOE (see figure 4.1). Most budgets including those related to learning and teaching in the school ultimately come from the Ministry of Education. The school has some subsidised funds for employing nursery teachers from the local government which is called the Sub-dist rict Administrative Organization (SAO). The department also subsidises funds for a school meal and milk. Some subsidised funds come from international support (UNESCO), which is however, not permanent or consistent.

Ban Koh Adang school is the main educational provision on Lipe island. As far as the social structure, the island follows the Ministry of Interior organisational plan. The Sub-district Administrative Organization (SAO) is responsible for political voting, resource management, security, travel, food and water management including the milk projects for children. Most of the people on Lipe island are “Chaw-lay” or “New Thai”, or “Urak-
Lawoi”. Generally, they are nomadic fishermen moving from one island to another in the Adaman sea nearby Thailand, Malaysia and Indonesia. These islands have beautiful beaches and people have taken the opportunity to become tour guides and have settled their family down permanently on Lipe island. The island people have animistic beliefs and they do not have any major religion. However, Buddhist monks arrange activities on the island in the summer time. In 2003, a study showed that most people aged between 15-60 years old can read and write Thai (Charconrit et al., 2005). However, they lack inspiration to go on to higher education. One great social difficulty on the island is the dispute of ownership of land between those who legally rent the land from the government and the nomadic people who were the permanent settlers in the land before. The sharing of resources especially fresh water is also becoming a problem. Moreover, the immigration of businessmen who come from the mainland to build resorts or travel agencies is creating conflict with local people.

4.4.2.2 Ban Koh Sarai school

Ban Koh Sarai school is located on Sarai island (Tumbon Koh Sarai, Ampore Moung, Satun Province). The school has one class for each stage from nursery to M3, with a total number of 325 students. There are 19 teachers in the school. Sarai island has saline coastline full of mangrove trees and forests which are the breeding grounds for innumerable fish. Many of these fish species are very commercially important and in addition the Sarai fishermen have a nursery for crab farming. Thus, the people of Sarai island have a greater income than the Adang group of people. Nevertheless, it is still below the national average income and therefore they are still officially classed as poor. The island coast is generally muddy and the beach is less beautiful than that on the Adang island.

The major problem for education in Ban Koh Sarai school is students missing classes because most students follow their nomadic parents to fish on other islands and the children sometimes need to help their parents with boat handling. Most of them only get as far as M3. (the compulsory course) and move away from school to work. Even so, Ban Koh Sarai school still has seen more children enter higher education than Adang school.
4.4.2.3 Ban Tan Yong Ka Boey school

Ban Tan Yong Ka Boey Chai Pattana school is the new name of Ban Tan Yong Ka Boey school. The school is located on Pu Yu island, (Tumbon Pu Yu, Ampore Moung, Satun Province). On the island, there are approximately 601 families in three villages and most of them are fishermen. The school has one class per stage from nursery to M3, all together 245 students. There are 15 teachers in schools. Most students are locals and after they finish school they will get local jobs.

About 3,000 people live on the island. Most of them are Muslim who use Malay as the local language because the island is located more southward between Thailand and Malaysia. Travel to the island is difficult because they lack good public transport. Moreover, the facilities are very basic and limited for example there is a lack of fresh water. On average people on the island only have a very basic education. However, they have agreed to send their children to the mainland for the higher education. A large obstacle for the children in terms of education is the lack of funding from their parents who are very poor and have a very inconsistent income.

Overall, any social differences between the three islands does not directly affect the attitude towards ICT and progressive education. ICT implementation in schools brings about the potential for an improved education for the staff and this, in turn, improves the chances of attracting long term appointees from the mainland. Attracting and cultivating more highly educated staff for the islands are the major issues that affect the progressive education of students.

4.5 Data Collection Techniques and Procedures

The objective of this research investigation is to use the multi perspectives of five groups of stakeholders who are involved in the process of integrating ICT into the island schools and to see whether they are ready to use ICT to contribute to improving the quality of education.
The Multiple Perspective approach was advanced to help in collecting data and guiding the analysis. The Multiple Perspective approach taken in this research potentially makes a richer base from which to investigate complex problem situations.

The researcher has investigated the current situation to explore whether the stakeholders are benefiting from the use of ICT or whether there are barriers to implementing ICT into the schools, and then how ready they are to make use of ICT in everyday life. The influencing factors could clarify the process of ICT implementation into the island schools context and provide an additional valuable source of knowledge.

When integrating ICT into schools, policy makers should seek consultations from those who will be most directly affected in the schools i.e. the head teachers, teachers, students, parents and the director of Satun Education Service Area who all, as stakeholders, need to be part of the conception and planning process.

The researcher participated in the data collection for each school case study. After confirming a school’s participation in the study, the researcher informed the school of the list of school documents that needed to be collected. Before actual visits were made, the researcher also read up some general information to gain as much background information about the school as possible. The researcher made school visits, agreed by the head teacher, for observing the school natural setting. School visits were made for purposes: to collect data pertaining to lesson observations, for interviews and to understand the school context. Each lesson observation was conducted by the researcher, who was responsible for taking field notes and for photographic record. Details of the data collection are described in a later section and more than one lesson would be observed in a school. As far as possible, the researcher collected data and conducted interviews pertaining to the school context and kept in an electronic form.

The observation of the lesson and the situation before or after the lesson is useful in order to understand the process of using ICT in classroom. To complete a case study, the researcher had to spend more than a week, on site, in each school.
4.5.1 Interviews

The purpose of the interviews was to focus on the informants’ understanding rather than just checking the accuracy of the interviewers’ account. The interview technique allows the researcher to explore the meaning of the questions and the answers involved, which goes deeper than other research procedures. Interviews, especially qualitative interviews, allow for understanding and meaning to be explored in depth. This is particularly the case with longitudinal research, where each informant is interviewed on several occasions over a period of months. This research uses qualitative interviews to examine the context of the thoughts, feelings and actions of the stakeholders for exploring relationships between different aspects of a situation. The researcher believes that interview is a powerful approach of helping the researcher to derive the explicit from things that are implicit.

In the interviews, a semi-structured format was used; following procedures outlined by Patton (1990), pre-written and general questions were used as the main prompts in eliciting information.

The emphasis in the interview situation was on discussing their perspectives in relation to the three major dimensions: technology, organisation and people; and questions were used just to initiate a discussion. There were five groups of interviewees: director, head teacher, teacher, student and parent. Initially, in each interview a general question was asked, and from then on, questions arose from dialogue with the participant. However, occasionally the researcher introduced a topic in which more information or comments were required.

The researcher began the interviews by describing the research project, assuring the participants that what they are going to say was in confidence and that where quotations would be used, the identity of speakers would not be revealed. Then, the interviewees were given a consent form explaining that they can withdraw information at any time. Some strategies were used to put the interviewee at ease and to ensure a flow of discussion while at the same time acquiring information. These include: assurances of confidentiality, asking guidance from participants, probing questions, encouragement to continue, and verifying with interviewees that what they intended had been conveyed.
The flexibility of the interviewer to allow the interviewees to explore their experiences is essential. The length of the interview is also important. In order to allow for reflection to occur during the interview, the researcher has to appear unrushed and willing to allow the interviewees to explore the topics they feel most comfortable with. As the interviews progressed the researcher pursued questions which had not been yet dealt with or topics which needed further probing. The interview was conducted at a time convenient to the interviewees in order that they did not feel rushed during the discussion. Most of the interview sessions were conducted during the late afternoon after the routine work of the interviewees. All discussions were recorded by an electronic recorder. Some important issues were written down by the interviewer. Attempts were made to provide the opportunity for all the participants to freely speak their minds with little interference or influence on statements by the researcher.

An interview is also an important means of data collection in this study to find out the intended lesson objectives, clarifications on the lesson plan as well as the teachers’ and students’ evaluation of the lesson and the learning outcomes. The interviews were conducted in a semi-structured style interviews and a list of questions was used to guide the interviews (Appendix C).

4.5.1.1 Director

The interviews with the group of directors of Satun ESA were very important because they hold key information about the initiation and implementation of ICT in schools located in Satun province. They are responsible for national policy. Generally, they are very busy people who only had limited time to devote to an interview. Connections were made through Songkhla Rajabhat University which supports education in the Satun province area and provides the scholarship needed for this research. Contact was made by an invitation letter via Songkhla Rajabhat University which was then forwarded to the director of the ESA. The plan of the meeting was set up by the Satun ESA and the researcher confirmed a visit at the Satun ESA office. Despite being very busy, they gave a very positive welcome and offered very useful information. They also provided useful documents relating to the island schools. This was very useful in providing useful background information before the researcher went to the real (interview) situation. Moreover, they were willing to
demonstrate the e-filter software used to exchange documents with island schools and explained this during the interview session (Appendix E8). The researcher used an electronic recorder to take key notes. The director introduced the researcher to interview the deputy director. He had more than fifteen years in the job and had responsibility for implementing the ICT projects. After the interview, they gave their email addresses to the researcher and telephone numbers for further contact and offered to make contact with the head teachers of the island schools. This also lets the head teacher become familiar with the objectives of the research so that they had time to prepare some source documents before the researcher went to the island.

After the introductions concerning the background and nature of the research, and the reasons for doing the research, questions about the implementation of ICT into island schools were included from both positive and negative perspectives.

4.5.1.2 Head Teacher

Follow-up interviews were conducted with the head teachers who follow national policy from top authorities and were responsible for implementing ICT into the island schools. The head teachers use their experience in providing infrastructures and managing school policy following ESA regulations. Three head teachers from three different island schools were interviewed. An interview with the head teacher was normally arranged after the general school documents listed above were gathered and read. The interview provided an opportunity to hear from the head teacher about their vision for the school and about IT developments in the school, the school's IT implementation plan and the major challenges and difficulties that would be met in the implementation. The school documents provided good background preparation for interviews so that any special issues gathered from these documents could be followed up in the interview.

4.5.1.3 Teacher

In the three selected island schools, thirty-four teachers participated in the interview sessions and represented most of the teachers in the schools. They were very willing to participate in the sessions. A number of the teachers who involved in teaching with ICT were willing to express their perspectives from before and after implementing ICT in
relation to the barriers and advantages and to their experiences using ICT for teaching/learning and everyday life.

In each school, the interviewed teachers were selected by the school head teacher. The teachers were free from their duties during the interview session. The head teacher helped to arrange the interview queue and each teacher spent about forty-five minutes to one hour.

The interview questions related with their work including: using computers in teaching and learning; using computer in everyday life; reasons for using computers; obstacles and problems of using computers; and requirements of using computers in the future.

After the formally organised activities and professional sessions with directors, head teachers, and teachers, the researcher organised less formal meetings with students and parents.

4.5.1.4 Students

Before the commencement of the lesson, the researcher sought the permission and help from the teacher to invite a group of 4-6 students to stay until the end of the lesson to conduct a focus-group interview. The purpose of the interview was to seek students' views on the attractiveness and effectiveness of the lesson activities and in particular the uses of technology during the lesson.

All interviews apart from the parent interviews took place in locations of the participants’ choice: in their offices, staff rooms, classrooms, workshops, or computer labs. The interviews lasted from forty-five minutes to one hour. Important notes were taken by hand during the interaction.

4.5.1.5 Parents

In total, eight of the students’ parents were randomly chosen by the head teachers who had been interviewed. Most parents work on the islands in professions related to the tourist resort, transport and fishing. Most participants are the fathers of students. All interviews took place in locations of the participants’ choice: at home, resort, school, or on the boat.
Some parents are working at the local administration office. Interviews lasted from 45 to 60 minutes. Radio record and notes were taken by hand during the interaction.

4.5.2 Observations

Denzin and Lincoln (2003) notes that observations can be used to emphasise the importance of human meanings, interpretations and interactions that would add value to existing knowledge. Useful observations in this case study were made when the researcher made site visits to gather data in the island context where the researcher was familiar with the background and the area.

Using multiple observers is one way to ensure reliability of observation (Tellis, 1997). The ESA was consulted to add more formal information to observations within the schools and to increase the reliability of contact with the schools by a letter of formal introduction (Appendix A).

Notes were the primary means of recording participant observation data. The researcher collected field notes directly from the field in the island context, and from the participating events (Appendix E9). The usual procedure was to jot down brief notes about the highlights of the observation. Comprehensive field notes were then usually written within the next few days. Observation is a unique mode of data collection in which the researcher actually participates in the events being studied. The researcher may have concerns for any biases that may occur during active participation. However, this should be weighed against not gaining any observations at all and, in reality, active participation is the only certain way to gather information without missing important details.

In order to explore the sustainability and transferability of any good practice and to better understand the conditions for these practices to be implemented in schools, it is necessary to study the school context within which such practices occur. The implementation of ICT in teaching and learning studied within one school context could be seen as an implementation of educational innovation. It is important to study the vision and mission of the school, the general perceptions of the head teacher and staff regarding the roles and functions of ICT in education and the school’s ICT implementation strategy and plan. For this reason, the research requested each of the schools, where classroom observations of
good practices were conducted, to provide specific documentation about the school as well as to provide the opportunity to conduct interviews with the head teachers, teachers and students. In addition, the researcher would request a tour of the school premises to learn about the ICT infrastructure and setting of the school.

The researcher would normally be shown around the school premises either by the head teacher or teachers on a tour highlighting the ICT infrastructure and setting. This allowed the researcher an opportunity not only to have a firsthand knowledge of the technology set up in the school but also an opportunity to find out the intended modes of usage for the different facilities. Field notes of the observations would be made during these visits. Every opportunity was taken to talk with teachers and students about their perspectives in relation to positive or negative thinking about implementing ICT in schools. Some of the occasions were not conducive to note taking. However, all obtained information was eventually used to expand the researcher’s understanding of the situation or to pick up clues as to what was happening, so that this could be followed up later. It was also used for interpretations that evolved as the research progressed.

Lesson observation was a primary source of data in the present study. In order to capture as much as possible the physical setting within which the lesson was conducted (some of the lessons included activities outside of the school premise), the atmosphere of the classroom was noted as well as the details of the interactions that took place; thus two kinds of data collection were obtained.

The researcher stayed at the back of the classroom throughout the lesson and took notes to describe the settings and the transactions that took place as well as making comments on any observations made.

The photographic records taken around school and classroom interactions were supplemented with field notes. A variety of information about the lesson would also be noted down: the subject area and topic being addressed, school and classroom context (grade level, time, setting of the classroom), number of students in the class and the ICT infrastructure available to the class. The photographic give more “subjective” observations
like the mood and the peripheral activities in the classroom in the form of a kind of time-sequenced commentary adding to the researcher’s perception of the pertinent features.

4.5.3 Documents

Yin (1994) identified some sources of evidence that support case study research. Not all sources are essential in every case study but, importantly, multiple sources of data make the research more reliable. The validity of any documents is carefully reviewed by researcher so as to avoid any incorrect data being included in the database. The researcher carefully picks up any corroborated evidence gathered from other sources. The potential for over-reliance on document evidence alone in this case study has been criticised. There could be a danger if the researcher is inexperienced and mistakes some types of documents for unmitigated truth (Yin, 1994). At all times the researcher tries to elicit from participants those documents which are related to implementing ICT into island schools. The researcher collected documents from two main sources: Satun ESA offices and direct from schools. The documents from ESA contain records of plans and policies, and specific schools records including: numbers of teachers, students and school database. The following documents were included: School goals and missions, School development plan and/or year plan, School annual report, School vision and policy relating to IT in the school and the IT implementation plan (computers and peripherals, network, and configurations) and School history.

4.6 Data Analysis and Validity

4.6.1 Data Analysis

The distinctive features of qualitative data-collection methods are also reflected in the methods used to analyse the data collected. Moreover, the choice of qualitative data analysis not only follows from the types of data but also from the research methodology. A qualitative researcher focuses on the meaning of text rather than on the measurement on numbers. The interviews are recorded and transcribed. The text that qualitative researchers analyse is most often transcripts of interviews or notes from participant observation sessions, but text can also refer to pictures or other images that the researcher examines. Stake (1995) said that qualitative data analysis is an iterative and reflexive process that
begins as data is being collected rather than after data collection has ceased. The researcher considers template analysis from King (2004) for handling all sources of qualitative data in this research.

Template analysis is a qualitative data analysis method which refers to a style of organising textual data by producing codes, or ‘templates’ that represent a particular theme (King, 2004, p. 256). Template analysis starts with an initial template constructed from the literature review or previous research theories. The researcher interprets field notes and interview transcripts with this initial template. Then, the researcher amends the initial template during the analysis process to try to link in any related issues. The process of interaction with the data and gradual refinement of focus is called progressive focusing (Parlett & Hamilton, 1976). Additional concepts need to be investigated or new relationships to be explored. In this study a final template was then generated and is described in the main findings of this research.

4.6.2 Validity

The validity and reliability of qualitative data depends to a great extent on methodological skill, sensitivity and the training of the researcher. Systematic and rigorous observation involves far more than just being present and looking around. Skilful interviewing involves much more than just asking questions. Template analysis requires the generation of an initial template from carefully selected literature review or previous important theories. Generating useful and credible qualitative evaluation data through observation, interviewing, documents requires discipline, knowledge, training, practice and some background experience.

Lincoln and Guba (1985) suggest alternative criteria for the quality of qualitative research by replacing internal validity with credibility and replacing external validity with transferability, replace reliability with dependability, and replace objectivity with confirmability. The internal validity of qualitative research may possibly come from the right setting and an accurate reflection of the situation. The external validity of qualitative research may come from detailed knowledge of the demographic and situational descriptions from the researchers view. In qualitative research, external validity equates to
transferability of responsibility of the reader, not the researcher. The researcher may use nominated informant samples to provide dense descriptions and situational descriptions.

Moreover, to seek validity in terms of thinking credibility or transferability (Wolcott, 1990), the researcher needs to listen and observe carefully and read written reports accurately. The researcher uses primary data in the reports and begins writing a report early after coming back from field work to decrease the risk of missing data. Furthermore, the researcher keeps all data for the final report and seeks feedback.

4.6.3 Reliability

Reliability is also primarily a positivistic concept but in qualitative research, reliability equates to dependability (Wolcott, 1990). The idea of dependability emphasises the need for the researcher to account for the ever-changing context within which research occurs. The researcher is responsible for describing the changes that occur in the setting and how these changes affected the way the research was approached. Different researchers may reach similar interpretations by different data analysis processes. Repeated examinations can produce similar observations.

4.6.4 Confirmability

Qualitative research tends to assume that each researcher brings a unique perspective to the study. Confirmability refers to the degree to which the results could be confirmed or corroborated by others. There are a number of strategies for enhancing confirmability. For this study, the researcher explains the procedures for checking and rechecking the data throughout the study. Moreover, the researcher actively searches for and describes any negative instances that contradict prior observations. After the study, the researcher conducts a data audit that examines the data collection and analysis procedures and makes judgements about the potential for bias or distortion. Lincoln & Guba (1985, p. 317) emphasise inquiry audit as one measure which might enhance the dependability of qualitative research. This can be used to examine both the process and the product of the research for consistency (Hoepfl, 1997).
4.6.5 Ethical Considerations

Qualitative research can raise some complex ethical issues. It is up to the researchers to identify and take ethical responsibility for the consequences of their involvement. In this research the context is within the island schools.

Throughout the study, all precautions were taken to ensure that the research was conducted in a professional and ethical manner. The head teachers were fully informed about the nature and progress of the study. The Director of Satun ESA office sent introduction letters from the researcher before the field work began. The researcher considered the ethical research principles that included matters of informed consent, privacy, anonymity, confidentiality, betrayal and deception (Giordano et al., 2007). The researcher was responsible for making sure that the participants each understood their right to refuse or quit the interview at any time without penalty and the confidential nature of the project. These issues were carefully explained and all participants sign a consent form. All participants were allowed to remain anonymous. Anonymity of participants was ensured by following a standard set of protocols for dealing with sensitive professional information namely that the directors, school head teachers, teachers, students and parents were given codes to ensure anonymity.

4.7 Chapter Summary

This chapter is divided into five subsections: (a) the philosophical paradigms of the research; (b) research methodology considerations; (c) the criteria for research design; (d) the data collection techniques and procedures; and (e) information regarding data analysis and validity. Each school case consists of the following general data structure: (1) school background, history and mission; (2) ICT implementation plan and strategies; (3) description of ICT resources and infrastructures; (4) documentation and pictures of observations on lessons; and (5) interview data from directors, head teachers, parents and students. There were great variations as well as similarities among the schools. The next chapter will describe the data analysis and results.
5 CHAPTER FIVE: RESULTS

5.1 Introduction

As noted in Chapter 4 (section 4.5), the current study gathered data from a wide range of samples from three of the island schools in the Andaman sea, South-West Thailand which were carefully selected to incorporate schools where ICT was actively being implemented. The literature review enabled factors to be identified which are presented in this chapter and which are believed to have a direct impact on ICT integration. Data collected during this phase was obtained from schools that were expected to engage in ICT integration according to the MOE project mandates. A preliminary analysis of the data from fieldwork studies narrowed the investigation in order to select which three island schools could serve as critical case studies for further, in-depth, investigation. This chapter is organised to discuss the original research question and interprets the findings in relation to relevant literature.

The challenge of qualitative research is how to make sense of the data collected. Analysis of texts from forty-five interview transcriptions, field notes and annual reports were used to find emerging themes or patterns. Templates were then applied to thematically organise textual data for analysis and interpretation.

The researcher used a template analysis as a qualitative method for organising textual data by producing codes, or ‘templates’ that represent a particular theme (King 2004b, p.256). An a priori of existing themes was identified and established from previous theories and this was applied during the analysis. A final theme emerged by adapting previous themes found in the interviews.

In the analysis, a ‘template’ was produced from ‘coding’ which represented themes emerging from textual data (King, 2005b). Following King, this study designed an initial template from research questions, a research model and relevant literature (see detail in Appendix D1). A second template was then built on the first to reflect the emerging issues (see detail in Appendix D2).
Initially the data was tabulated and organised under three perspective themes: technical, organisational and personal, before looking in depth at the research questions. Each participant or stakeholder, related to three primary schools, completed the investigation from their own experience and included administrators, head teachers, teachers, parents and students. Each perspective came from their own beliefs and how they see possibilities for change with respect to integrating ICT in the selected schools.

NVivo software was used in the research to organise the interview transcriptions and to generate codes for highlighting and referencing texts before performing any analysis. The starter of categories is based on the initial template (Appendix D1). The software provides tools to help organise qualitative data. In this research, textual data indexed by codes became retrievable for inquiry through the codes and cross-codes. Supplementary data collected from observations and school reports were read, coded and put in a table by hand. Data from all sources were interpreted in table format according to the final template (Appendix D3).

Following the TOP model, the research data was organised into a table with columns for the perspective categories technical, organisational, and personal and rows for each of the five respondent types: directors, head teachers, teachers, students and parents. Linkages and relationships were then formed by studying the table which then made it possible to investigate the core of the research questions which are: (a) the potential ICTs benefits, (b) the barriers to effective implementation and (c) sustainability of Implementing ICT. In the coding potential benefits of implementing ICT were underlined, barriers to effective implementation of ICT were italicised and the points related to sustainability recommended of ICT were made bold. Each of these main factors in the research question was then expanded by applying more explicit “factor codes” that are defined in Table 5.1.
<table>
<thead>
<tr>
<th>FACTORS</th>
<th>FACTOR CODE</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential Benefits of Implementing ICT</strong></td>
<td>BECom</td>
<td>Communication</td>
</tr>
<tr>
<td></td>
<td>BETLng</td>
<td>Teaching Learning</td>
</tr>
<tr>
<td></td>
<td>BESoc</td>
<td>Society</td>
</tr>
<tr>
<td></td>
<td>BEMan</td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td>BEEnt</td>
<td>Entertainment</td>
</tr>
<tr>
<td><strong>Barriers of Implementing ICT</strong></td>
<td>BAInfra</td>
<td>Infrastructure</td>
</tr>
<tr>
<td></td>
<td>BAMan</td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td>BACulture</td>
<td>School Culture and Environment</td>
</tr>
<tr>
<td></td>
<td>BAPolicies</td>
<td>Policies</td>
</tr>
<tr>
<td></td>
<td>BAPolitics</td>
<td>Politics</td>
</tr>
<tr>
<td></td>
<td>BAHum</td>
<td>Human Resources</td>
</tr>
<tr>
<td></td>
<td>BAFin</td>
<td>Finance</td>
</tr>
<tr>
<td><strong>Sustainability of Implementing ICT</strong></td>
<td>SusInfra</td>
<td>Infrastructure</td>
</tr>
<tr>
<td></td>
<td>SusHum</td>
<td>Human Resources</td>
</tr>
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<td></td>
<td>SusPolicies</td>
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<td>SusFin</td>
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<td></td>
<td>SusPolitics</td>
<td>Politics</td>
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<td></td>
<td>SusCo</td>
<td>Co-operation</td>
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<tr>
<td></td>
<td>SusMan</td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td>SusCulture</td>
<td>Culture</td>
</tr>
</tbody>
</table>

Table 5.1 Factor Codes and Meanings

### 5.2 The Results

All the responses contained in the following tables have been translated from Thai to English and are quoted very much in the note form of a direct translation. All names have been left out to ensure anonymity. The respondent types are coded and denoted by
D=director, HT=Head teacher, T=teacher, S=student and P=parent. The references in brackets show which factor code has been attached to the responses and a code for the category of person who said it, e.g. (BETLng:D2) means that the researcher has attached this data quotation to BETLng, a benefit for teaching and learning and this data quotation originated from D2, one of the Satun ESA directors. This system was adopted to keep all the original quotations in a convenient back referencing system as the analysis progresses forwards. When the categories were stabilised it became the final template (Appendix D3) that constituted the research findings. The following table shows the details of each particular category in the final template.
### 5.2.1 TOP and Director Perspectives

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Technical(T)</th>
<th>Organisational(O)</th>
<th>Personal(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Director perspectives</strong></td>
<td>The development goal for basic education is to provide every school with at least one computer per school for accessing the Internet. The main advantage of integrating ICT in island schools, from the Education director’s perspective is that electronic documents that provide fast communication between basic education sector and island school (BECom:D1). The teacher on island agreed to use computer. They thought that it is the only way to communicate to mainland (BEcom:D2). Moreover, they use computer for preparing course content by looking at the education website provided by MOE that have some course contents for download (BETLng:D2). The island schools have many related technical problems. These include lack of continuous electric power, unsuitable building for housing delicate hardware, inadequate telephone lines (BAInfra:D1) and Internet connections, inferior hardware and software, low technical support and maintenance and inadequate financial support.</td>
<td>Today, schools are efficient using computer in teaching, learning and managing documents especially island schools (BEMan:D2). The communication between ESA and island schools is improving in the way of updating data (BECom:D2). Before long, we sent hard documents by fishermen sometimes, the document lost. The education director perspective believes that integration ICT into island schools is less important than the basic needs (BAHum:D1) for example building, food, education tools, teacher. Therefore most of the budget for developing schools tends to serve basic needs first before implementing technology. The island schools have no coherent ICT strategies (BAPolicies:D1). The plans for implementing ICT runs are short term and do not relate to each other. The top-down managements make the process of creating ICT strategies plan complex and difficult to manage (BAMan:D1). MOE created ICT strategies plan for requesting budget in national level. Island schools require human resources, knowledge and skills associated with technology. In terms of adequate skills, the ESA were setup basic software training courses such as word processing, spread sheets, database, e-mail and Web browser applications (BETLng:D1). Teachers who teach in school since 2006 had been training basic ICT at least three days, they can use basic software for creating document for example Microsoft Word, Excel, PowerPoint and Internet. New teachers get benefit from the skill teacher who have trained since then (BESoc:D1, D2). The school management scheme tries to ensure that the learners benefit by the teachers becoming skilled in technology. Throughout the process, the island schools send existing teachers to get basic information technology. However, teachers with technology skills will not travel far away from the mainland to teach in island schools which lack convenient facilities (BACulture:D1). Most teachers in island want to move to mainland, they think that living on island is risk and far from civilization (BACulture:D1).</td>
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</tr>
</tbody>
</table>
This problem added to the scarcity of resources and infrastructure compounds the failure to implement ICT successfully (BAInfra:D1).

The purchase system management by national level (BAMan: D1), they decide to buy ICTs device which huge of volume and low price that mean one time of purchase for every school in country. However, the problem is the provider cannot send products on-time because of huge amount of computer.

The barrier of technical issues proposed by the directors of ESA show that the delivered hardware system has problems (BAInfra:D2). The schools in big city will receive the product first. Other schools which located out skirt of the city will get computer later. Sometimes, they waited for years. Moreover, the ICT devices have been out of date, before the schools used.

Another problem is lacking of the services after buy ICT devices because the providers cannot onside service (BAInfra:D2).

Director give more comments in terms of sustainability such as alternative hardware for example PDA, laptop and alternative energy such as wind mill (SusInfra:D2)

The plan is the master plan for ESA however, when MOE get the budget they will use the budget following their plan without concern about the lower level (BAMan:D1). Then, they will buy the ICT devices by their own and distributed them to ESA. ESA has responsible for distribute the devices to schools.

The director of ESA also comments that top organisation needs the ICT planers. Moreover, ESA required the ICT position plan but the top organisation have never thought about this (BAHum:D1).

“I am a person who responsible for ICT Consultancy of ESA. My duty is to control the ICT strategies plan that covered the services of distribute the ICT devices for about 100 schools on mainland and 12 schools on islands. This position is the special duty of my work. MOE doesn’t provide specific position for ICT because, I think it is very new position.”

A school in Satun ESA has a teacher who finished bachelor degree in computer but the teacher move in-out very often (BAMan:D1).

Director point of view island schools have to finding donator support from private sectors and local university (SusInfra: D2).

Head teachers said that in 2007, the island schools did not have any teachers who have IT or related knowledge (BAHum:D1).

The major problem of human resource at school located in Satun province is inadequate ratio between teachers and students (BAPolicies:D1). The process of swap teacher and Head Teacher positions is very slow. Then some schools will not have enough teacher or not have skilful teacher (BAHum:D1). ESA does not have any policies about swap the positions or limited of sign contract (BAPolicies:D1). The contract of teacher did not state the how long that they can retire or move out. Moreover, they get the salary equally wherever schools they teach. Then, if they have opportunities to move out of island, they will go. Most of IT teachers may retired or move out within 6 months. ESA responsible for the swap process. When someone left a position, new teacher should be filled as fast as possible but it takes about 1 semester of 1 year to get a new teacher.

Another problem is the position is not reserved for the special skills such as ICT. Then, when an IT teacher move out they will replace with other teachers as fast as possible but with out concern about the special skill. An island school should have an ICT teacher because they can fix some ICT problems.
### TOP and Head Teacher Perspectives

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Technical(T)</th>
<th>Organisational(O)</th>
<th>Personal(P)</th>
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<tbody>
<tr>
<td>Head teacher perspectives</td>
<td>The ICT history in island school began in 2005, MOE encourages all school in Thailand using computer for administrating and managing (BEMan:HT3). Most of computers in schools provided by MOE that had spent thousand millions Baht. Then MOE distributed computer to local area office, ESA that located in particular provinces. ESA responsible for balance amount of computers in each schools depended on schools size (BAMan:HT3) but a school should have a computer. Head teachers on island schools also said that an electronic document system, provides the e-filling program, is very useful for communicating (BEMan:HT1,HT3). The program uses for discussing and exchanging information between head teachers, teachers and ESA officers. The program uses for updating basic information about teachers and students, such as amount of students and teachers, teacher and student attendances and circular formal email. That is very convenience for those schools that cannot send that documents via post or facsimile.</td>
<td>ICT is important for teaching, upper level should have ICT assurance and encourage teacher to use ICT in teaching (SusHum:HT2). Head Teachers believe highly in the ability of ICT to increase the simplicity and speed of social communication and reduce the cost for transportation (BECOM:HT1). ICT is necessary to island or remote schools because they lack of communication channel. The students have limited of information such as news. Internet provide the great opportunities for children to learn and increase their knowledge. Internet uses to support learning better than library that contain not enough books and very old (BETLng:HT3). ICT can help solve socio-economic problems and increase income from tourism and fishing markets (BESoc:HT1). Island school is a learning centre also support village product. Island school is a centre of general election of people on island and ICTs is importance</td>
<td>If the integrating e-learning into island schools is complete, everybody will have the opportunity to gain as much knowledge as the mainland schools (SusHum:HT1). The great opportunities for children is the tourism industries always provided good salary position for student who know basic computer skills and good English communication (BESoc:HT1) but only two or three student can graduate or diploma and come back for work on island. Today, the students are interested in learning with computer. In each group of students, they prefer to use computer differently, young student, Pratom, they like drawing program, Matayom students like Internet, social network software, game, email and chat. Teachers tried to integrate computer to teach student and it makes the students more interested in subjects (BETLng:HT1,HT3). Head teacher commented that it’s more interesting than the teacher teaching by stand in front of the class. Moreover, Internet can help in the way of support information. Moreover, the students like ICT because their located near school and they do not have any</td>
</tr>
</tbody>
</table>
The school head teacher said that their children spend time learning technology more than children on mainland (BETLng:HT1,HT2,HT3).

The main problem of hardware is the infrastructure cannot use for long period (BAInfra:HT1). The obstructions of using ICT in the schools are the limited of electricity, the inconsistency of satellite, the limit of computers, unsuitable building, and lacking of maintenance.

First, the electricity system in school which is solar cell is very limited. Every day, the teachers need to finish their job before 15:00pm. The electric provider system is inconsistency especially in rainy season (BAInfra:HT1,HT2,HT3).

Even though, school staff and pupils want to use computers, the limited energy supply during school time are the cause of problem. They can use computer properly only six months a year.

Second, the Internet system which used satellite is unpredictable speed, when it is bad weather the speed is very slow or sometimes cannot used at all (BAInfra:HT1).

We get support from local government to provide milk in school and for employing a teacher in subjects local island language (BESoc:HT1).

The island school group was co-operation among those, in 2005. The project got small budget only one year. They were good relationship in some developing ICT human resources and curriculum (BEMan:HT1,HT2,HT3).

The head teachers commented that the problem of development ICT in island school come from top-down functions (BAPolicies:HT1). Every plans came from MOE that makes many problems of centralise such as

- MOE administrator does not understand the context of island school (BAMan:HT1).
- the schools requirement application is very one for support that event (BESoc:HT1).
- the schools requirement application is very.

Island school has most of teachers have skill in Thai and Social subjects but lacking of other subjects (BAHum:HT3).

The Thai language teachers can teach in Science and Mathematics. Although, they are not skills in other subjects they can use ICT to search for material and media from Internet (BETLng:HT3).

The implementation ICT make benefit for students by getting new knowledge that can continue to higher education. In addition this year, increasing Matayom 3 students enter higher education or college on mainland (BESoc:HT3).

The school provide computer class in Pratom 4 to Matayom 3 for one hour per week and if the other teachers want to use computer in other period they can use by ask a teacher who responsible for use computer in school. Now the IT service room has a teacher who teach mathematic maintaining the computers, island school doesn't have any special IT services (BAHum:HT3).
Third, computer is not enough for teachers and students (BAInfra:HT1) and the schools have very old computer (BAInfra:HT3). The teacher said that there are about 3 students per a computer. Usually, the computer lab room have a fix time table, each class have only an hour per week. Any other free periods, students and teachers need to share. There are some students waiting for accessing the computer lab room after a the class of Pramtom 5.

Forth, the computer room is not suitable for protect rain or salty vaporation (BAInfra:HT1).

Fifth, the schools lack of maintenance procedure (BAInfra:HT1). Moreover, the maintenance process is very slow and this problem becomes worse when the island has monsoon (BAPolitics:HT1).

In addition, the school did not have any surge protection (BAInfra:HT3).

The head teachers also commented about software problems. Those included accessing problem and virus problems. All teachers included head teachers need to contacts ESA for exchanging basic school information, but accessing to ESA database is very slow. A teacher comments that some of ESA slow processes to approve.

Top-down functions makes the process of implement ICT is very slow, especially process of budget decision and the ICTs purchase system (BAFin:HT1,HT2,HT3).

- Lack of promote any project and lack of cooperative between national level and school level (BAMan:HT1).

The unsuccessful implementation is the mismatch between the goal and practical. The budget for school should be under the control of school board (SusFin:HT1,HT2,HT3). School should have their opportunities to do something by themselves for example planning to spend budget for ICT project or ICTs maintenances (BAFin:HT1,HT2,HT3). Top-down function makes lot of conflicts between the providers (computer sellers) and customers (island schools) (BAMan:HT1,HT2,HT3).

Moreover, this problem also found in remote schools as well.

The process of purchasing ICT equipments is slow because of complex organise problem and government policy problem (BAMan:HT1,HT2,HT3). The Education Service Area should allow the school contact the providers directly to decrease the occurrence problem.

Head teacher commented that knowing ICT can improve knowledge in society (BESoc:HT3).

ICT helps teachers to keep up to date with developments in their subject area (BETLng:HT3). Every year the island schools rely on tourist volunteers teaching their students in their schools and those volunteers have use ICT for teaching students in school and also teaching English (BESoc:HT3). That example is a good challenge for pupils and local staff teachers.

Insufficient training of school staff about ICT is a problem for integrating ICT in subject (BAHum:HT1). The Education Service Area needs to train staff in ICT support and the ESA need to concern about teacher knowledge background or requirements before embarking on training programmes (SusHum:HT1,HT2,HT3).

The schools lack of skills teachers who can maintain ICT (BAHum:HT2) and develop Information system that may useful in learning and teaching system. The schools should have the human resource plan in the way that to encourage them to work for long time period (SusHum:HT1).
websites or documents contain virus (BAInfra:HT2).

ESA encourages our schools to use e-learning but I think it is impossible for island schools or remote schools because the students can use computer in some classes in schools and they cannot use at home.

The usage time is not enough because the computers at schools usually shared between teachers and students.

A teacher commented that the computer in school is not ready to use because some computers have many problems. It’s inconvenient to use (BAInfra:HT2).

The process of manage the infrastructure is not relevant and not sustainable using. At that time, some island schools have no electricity but get computers. MOE which is the top organisation provided computer to the schools without study the infrastructure context (BAMan:HT3). The year later, MOE bought a small power engine for the school but the school also did not have budget to buy fuel (BAFin:HT3). Another year later, government solved this problem by implementing solar cell power with satellite instead. Moreover, the further budget of computer come from local university.

Some of products bought by MOE and delivery to island school are mismatch with school context, such as telephone line networking device or Desktop PC which Island school without telephone line and have to save energy eg. Notebook (BAMan:HT1).

Head teachers want some more budget for buying computers for adequate services to students (SusFin:HT3).

Limited budgets for computer maintenances make obstruct of ICT development. ESA controls amount of students in classroom for not more than 50 students per class. An island school have only 10 computers that means 1 computer per 4 students (BAMan:HT3).

Moreover, the head teachers commented that the school got budget for repair ICT devices all together only 5,000 Baht per year. If school have any requiring sent application for approve again.

All decisions related with island schools depended on ESA especially the budget and the project approval. The process of approve project takes very long (BAPolicies:HT3) that it needs to workout paper process to request budget early for one year generally in

Usually, a school should have an ICT teacher position for solving problem. However, ESA move the teacher position unfairly (BAPolitics:HT2). Although, the school want that position but ESA does not provide it and final decision is depended on ESA. ESA itself has problem about human resource as well, they have no clear policy and most of policy is inconsistency (BAPolicies:HT2).

The problem came from the lacking of promote the plan and the understand in whole system (BAPolicies:HT3). The leadership (like head teacher) knows only the plan but he don’t know the details. ESA training courses are suitable for school in the city, the lack of meeting or workshop between ESA and school level. ESA should understand the whole system and promote the plan to school level (SusAdm:T3A).

This problem come from the top-down functions in the education sectors. Lower level has less power to plan and organise by themselves. The head teacher also commented that the ICT teacher developing plan does not appear in ESA sectors (BAHum:HT3).

The term time calendars of island school which does no match mainland is a main reason of mismatch meeting or workshop (BAMan:HT1,HT3). Then, sometimes, the
Today, some teachers think that they have opportunity for use computer in school (BETLng:HT3) but they are also need the sustainable development. The top organisational should have the plan for sustainable development by concern the context of the island schools and design the solution in step by step. The basic infrastructure is the previous part of developments and following by the computers and maintenance plan and education policy maker have to built ICT policies for island school which unique culture (SusPolicies:T3A).

October, if the project approved we can use that budget in next year.

Head teacher also commented that he need to spend more time on the maintenance process as well. Sometime, he needs to wait for a year to repair computer (BAPolicies:HT3).

Another problem is that budget of maintenance is unpredictable. If the school missed out this year budget they need to wait for the next year (BAFin:HT3).

The head teachers commented that ESA is very complex political (BAPolitics:HT3). Even though, the school can have four more places for teachers, ESA cannot provided a ICT position.

Some problems are related with the national political. Top organisation have power to move teacher or head teacher from one school to another one by man power at high level (BAPolitics:HT3). Another obstruct point of the project management is the project with island schools is run for short period of time and inconsistency. Some projects run only for half and stop because their changed leader (BAHum:HT1).

The other problem comes teachers and head teachers who lack motivation and vision for mainland school have summer holiday before the island school holiday. This make some problem about the training schedule.

ESA often set up training courses following mainland school terms. Then, island school teacher cannot attend that training course. (BAHum:HT:1) Island school teacher should be trained for improving their ICT skills at least 2 time per term (SusHum: HT1,HT2).

ESA may send the invitation to the teacher go to training about e-filling on mainland. However, the courses is inconsistency, if some courses have the places they will let the island school knows. Most meeting and training come very limited time. Island school teacher has no opportunity because they have a lot of work to do and they cannot leave the class during school term because the school has limited teacher. Going to training course affects the teaching process.

The head teacher said that some advanced training courses are not suitable for island school, (BAMan:HT3) for example the course about server maintenance or web authorising. Moreover, the schools faces many problems related with sending teachers to train on mainland for example the school need to provide expensive to training, cost of transportation, accommodation. The school get less funding for training than other expense.
ICT development (BAHum:HT1).

The basically school have been tried to request ICT assistances from Songkhla Rajabhat University in several academic fields. That includes computer, science, mathematics and music. However, the problem is the policy of Songkhla Rajabhat University does not support teaching assistant go to teach in risky and remote area because it is difficult to check and assessment the teaching, also island school don’t have insurance policy for offer student teacher training in school (BAHum:HT3).

The head teachers said that “ESA focuses on developing on mainland school especially the group of outstanding school, dream school, it’s make a big gap between remote school and city school (BAMan:HT1,HT2,HT3). There provide many ways to develop those schools.”

Lack of strong co-operation with local private sector means island school get a little help from business sector (BACulture:HT1,HT2,HT3). It is not enough because they think that they do not get any benefit from school The development system plan should be considered in the way of bottom-up design. The school should have the co-operation between the school and (BAFin:HT3).

Some schools have been asked for setting training up in island schools because the holiday in island is differ from mainland. It should be more convenience than set up training on mainland. However, the ESA said that the island schools not ready to set up the training course because they are not have not enough computers (BAInf:HT1,T5A,T7A).

Island schools need to improve themselves and have their own policy (SusPolicies:T3A).

The government expand compulsory highest national education from six years to nine years but the schools are not ready to change, they lack of teachers in many subjects and some of them teach in other subjects and the teacher agreed that they are not skilled in those subjects.

The existed problem in school is the lack of skilled teachers (BAHum:HT3). This problem exists for long time. The schools have never get the permanent teachers. The longest teacher lives there for only 6 months. They will move out to other schools because the ESA policy does not limited the contract period. ESA has a policy which said that only if there is any positions free the teacher can transfer anytime. However, I think, this is critical and it direct affect the student in the class (BAPolicies:HT1,HT2,HT3).
society including business sectors. **The plan should be discussed together**, when the plan finished, ESA will send it to MOE, respectively. When the plan approved, the schools will follow the plan directly (SusPolicies:T3A).

I think developing island schools should have the developing plan by knowing the factors on island school. **The plan should have a framework or details for development including consider about sustainable development** (SusPolicies:HT1,HT2,HT3).

**MOE should give opportunities to ESA and island school group to build up ICT Framework and ICT policies for Island school group** which a unique context. (SusPolicies:D1,D2)

**Longer contract such as for two or three years may help for improving this situation** (SusHum:HT1,HT2,HT3).

The school has limited subjects because the teacher skill is limited and the subjects do not relate with context of island school. **The school lack of other knowledge supporter such as museum or central library** (BACulture:HT3).

The social problem includes the problem of missing schools of Matayom 3 students. They follow their parents to fishing or be a labour in other islands or other countries for long times (BACulture:HT3). Some of them come back but they cannot catch up the lesson. This issue affected students assessment score. Then, the schools cannot reach the national standard assessment level.

The head teacher suggested that basic education should provide more fund for teacher in island school who do research related with ICT in classroom and to **pay overworked teachers who want to improve their skills** (SusAdm:T3A).
5.2.2 TOP and Teacher Perspective

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Technical(T)</th>
<th>Organisational(O)</th>
<th>Personal(P)</th>
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<tbody>
<tr>
<td>Teacher</td>
<td>Computer is very important for teaching and learning in island schools. It is useful for schools were poor materials or media. Computer can use to search and provide knowledge for teachers. If teachers have inspiration to learn ICT they will improve their knowledge by using computer (BETLng:T3A). Most teachers in island school have inspiration and enthusiasm for learning ICT. Some teachers spend their own money to buy computer and accessories for school work (BETLng:T1A, T2A). Some teachers have loan for buying personal notebook. They believe that it should be more convenience than waiting for using school’s computer. “We should have computer for teacher use for preparing course contents separated from student computers. Computer for teacher should be notebook (SusInfra:T8A).” Notebook with battery is very useful here when the solar system shutdown. It can use after school until run out of battery and the</td>
<td>ESA school database centre seems to be a useful management for island schools. Island school need to update information of students they were school absent from the reason of travel with their parents, it will know their attendance (BEMan:T25S). If ESA provide E-learning system for offer students who were absent will be great opportunity all of them (SusAdm:T3A). Teachers agreed that using technology for managing in school in the way of data centre management is very useful. The schools have management documents faster. The process of swopping students between island schools is faster than last decade (BEMan:T3A). Teachers use computer both for managing and teaching (BETLng:T18K). They use e-filling via Internet to manage documents and report school data to ESA. Teacher said that it is very convenient and fast (BEMan:T18K, T22S). The system provides the government documents in electronic form such as the circular mail or formal letters. It is very useful innovation because it is more</td>
<td>Teachers thought that following a good, distinctive strategy will ensure that school will receive a good success (SusMan: T1A,T3A). The first requirement of a strategy is to solve hardware, software and human resources problems which include:- infrastructure(SusInfra:T20K), reliability of systems, training in human resources (SusHum:T25K). Schools should also concentrate on ICT leadership and try to improve ICT skills for trained teachers to lead The students in island schools now have changed because of they received new knowledge from teacher who have new knowledge from Internet (BESoc:T10A, T27S, T32S). Computer knowledge is very important for teacher because teacher will teach up to date knowledge to their students (BETLng:T18K). Some teachers improve their knowledge from their colleagues (BESoc:T5A, T7A, T9A, T16K, T17K, T21S, T23S, T24S, T31S, T32S).</td>
</tr>
</tbody>
</table>
Most teachers use computer everyday in three major purposes: managing documents, teaching and learning, and supporting every day life. They feel that they are improving their teaching skills after learned ICT.

### Managing documents

Teachers use many applications such as e-mail, e-filling, and most of Microsoft Office products.

Some teachers use computer for create documents related with the school assessments such as keeping student score or grading.

ESA provides a software for student assessment named ‘Bookmark’. The software runs on Windows operating system. ESA controls the standard of file format and the data consistency. Teachers need to use it.

Some teachers use computer for creating documents related with the school assessments such as keeping student score or grading.

### Teaching and learning

Some teachers use Internet for other purpose such as using for tax paying.

Some teachers believe that MOE should give teacher motivation and provide the policy to encourage teacher doing their own contents on e-learning on ESA website.

Some teachers use computer for managing the hardware in school. They have tried to use data-based system to keep equipments list for searching. They commented that it is convenience when search and check it every year.

Island schools are welcome to new teachers who move from other risky areas. Moving to island schools is easier than moving to mainland.

### Supporting everyday life

Teacher have their own inspiration to work and teaching computer in island schools.

Some teachers have previous ICT knowledge at the time that they were study at colleges. Learning from Internet is another way to improve their own ICT knowledge.

Some teachers have skills to maintain some basic computers problems such as installing new Windows OS or scanning virus. If those teachers cannot solve the problems, the schools will send the computers to fix on mainland.

Island schools have a good opportunity from traveller. In 2006, the school provided Internet service for traveller.
teachers comment that it’s very convenient. For example:

“I’m head teacher’s assistant, computer is very important for exchange information between island school and ESA on mainland. The exchanging documents improved after used Internet, it’s replaced sending by boat (BEMan:T11A).”

ESA has a website for updating school data which called “Website data centre 2010”. It includes features of student data, students absent school data, head teacher report, school device report (BEMan:T25S).

Teaching and learning

Teachers integrate ICT in their classroom. There are many subjects that the teacher use computer in their class such as Science (T5A, T9A, T32S), Mathematics (T32S), Social, Sport (T5A, T10A), Astronomy (T21S, T22S), English (T11A) and Art (T26S, T29S).

Island school lacks of other media such as TV or newspaper (BACulture:HT3). Computer is an important tool for teacher in island school. It is the good media for

We can teach here (an island school) for two years then we can move out to mainland (BAMan:HT1).

A teacher commented that not much of research done an Island school because difficult to accesses to the remote area and risky from weather eg. Strom and disaster, this the reason of why in the top of national level don’t know what exactly of school situation (BACulture:T22S).

Today, requirements from teachers and students to use computer in school are increasing. Teachers need to use computer sending electronic report through Internet, collecting data and prepare course contents (BETLng:T7A).

The major barrier factor related with the inconsistent position of human resources in island schools (BAHum:T2A, T32S). ESA lack of permanent role about swop schools of head teachers and teachers.

The ICT plan stops when the head teachers and teachers change move out and it happens very often.

The students also have their inspirations of learning new knowledge. They follow their teacher and very kind to help their teachers (BESoc:T9A). They think that teachers are as same as their parents (BESoc:T18K).

Today, the students in island school are change. Previous day, they speak only “Chaw-lay” language, but today they can speak Thai and English. For English, they learn from travellers. The schools have increasing number of the students who contact foreigners via email or social network and they can using ICTs better when they know English language (BESoc:T3A).
It is difficult to imagine the new thing that students never known before for example Tsunami (BETLng: T9A). Students have more understand when watching picture and video from Internet that they have never seen before (BETLng: T9A, T5A). Some teachers said that the teaching process is not much changed, but the teachers have more choices (media) in classroom (BETLng:T18K).

“I’ve taught here for two years, I teach student to learn sport from Internet because We have only small field near the beach for playing football. The students learn about sport rule from website. However, we play sport outside more than using computer in lab.”

“I teach geography I use computer for teaching the movement of the tides” (BETLng:T20S,T22S).

“I have encourage students to use Internet, suggest some website, multimedia” (BETLng:T8A).

“I’ve taught English for eleven years, English is important for communicate and discuss on Internet, Students practice to use English to communicate with (BAHum:T2A).

Most of teachers here want to move to mainland if they have a chance. When they moved, there becomes the following problem that is students cannot continue their study. Sometime, the schools lack of teachers for long time period (BAHum:T5A).

Teachers commented that if they have a head teacher who does not support ICT in schools. The project related with ICT will stop Teachers are always waiting for the head teacher who are interested in ICT to continue their work (BAHum:T2A).

Some head teachers encourage teachers to use ICT in their classroom. He want teachers to pay attention to finding the new innovation for teaching because the school lacks of books. ESA also encourages teachers use e-learning for teaching as well (BETLng:T20S).

The leaders should have vision and they should have plan to developing ICT in whole system (SusHum:T27S).

The leaders should have vision and they should have plan to developing ICT in whole system (SusHum:T27S).

For students, they are very shine, less confident than the mainland students but they are concentrate on their work and they like media such as CD or computer (BESoc:T16K).

The children are concentrate on learning, they like to learn and searching Internet, and they have fun. If the school can provide efficient education, they can receive high quality education (BESoc:T22S).

Some teacher come back to teach in schools after finished degree on mainland

I’m a second student in island school and able to graduate in university, I decide to be a teacher in my school (BESoc:T19K).

In the last five years, each island school has link to a local university for help in developing school.

Our school, Sarai school was cooperate the network of Technical College Satun (SusCo:T21S). At the time island school got several benefit from Local higher education such as training, located of school web server and build school building.
travellers via email. They can read news or travelling information from website” (BESoc:T11A). Teacher should apply their subject by integrate ICT in their classroom.

“I use computer in Art subject, I teach student to draw, paint and design” (BETLng:T26S).

Some teachers did not use computer in their classroom but instead use for personal searching of data and preparing the course contents (BETLng:T9A:T16K T28S) because it’s easy to update information (BETLng:T16K).

When the Internet has problems teacher use stand alone computer and media such as books, CDs, in class stead of computer but also use computer to make worksheets (BETLng:T16K).

Most of school top school websites provide the course contents that may useful for teachers for example OBEC websites provides some worksheets for adapting use in the class (BETLng:T31S,T20S).

Island schools should design their own curriculum to support island context and the teachers should integrate ICT in their classroom (BETLng:T13K).

The management role seems under the political issues. Teachers comment that the developing plan works very well when they have strong relationship with head of projects. However, the relationship will change when other people replaced the position. The projects will stop (BAPolitics:T8A, T21S).

“… we were co-operation with Satun Technical college for development ICTs however, this project ran only six months. ESA and Technical college changed the leaders. The project stopped (BAHum:T21S).”

Every project from ESA is inconsistency and unsustainable. The project run very short period of time (BAMan:T27S).

Teacher lack of motivation go to teach on island because distance from their family, lack basic need and also island school located in area of disaster (BACulture:T1A, T2A, T9A).

Island society is very peaceful. The teachers have free time after school to rest. Teachers spend their time to improve their ICT skills by practicing computer and preparing course contents (BESoc:T27S). Similar to the students, they also have free time after school for improving their knowledge by using computer (BESoc:T28S). Even senior students, they are still come to play computer at the schools (BESoc:T31S). They all have a good chance to use computer (BESoc:T32S). In addition, playing computer make teacher happy, teacher can read news or contact their families via Internet with image or video (BESoc:T28S).

“From my experience, the project run by university is the more successful than the project from ESA (SusInfra:T1A).”

The problem of Thai education is because the education system is very complex and
Teacher used basic software in island schools including: Microsoft word, Excel, PowerPoint, Email, MSN, multimedia. And also have some special software have used in island school for example graphic and e-filling (BETLng: T18K, T21S, T22S T24S, T29S).

Communication

The islands are located isolate from mainland. This is area was limited to communicate with the people on mainland. The communication with mainland through computers makes the teachers feel happy and they will stay for longer teaching contracts (BECom:T1A).

“I use computer everyday, I live in island like in prison. We have to pay transportation by boat very expensive if we want to go to mainland. Then, I think Internet is the great chance for connection to mainland (BECom:T8A,T10A).”

Internet helps for communicating between island teacher and their family on mainland.

Some teachers use computer for checking news from Internet and other entertainments such as drama, movie, games and social slow process (BAMan:T18K).

Teachers suggested that the MOE needs to improve the management system, otherwise it will obstruct ICTs development and it affects for all of education level.

The problems of managing ICT come from slow buying process, and employing. Teachers commented that ESA idea came from top education level and they will ignore island schools (BAMan:T22S). Teachers feel that the education leaders do not understand the context. Top level organisation may make many mistakes because they are lacking of the local information. Sometime they bought ICTs device that unnecessary and not suitable for the island context.

“MOE lack of expert in developing ICT plan in the top level and have a huge gap connection in each level (BAHum:T32S).”

They do not pay attention to the importance of implementing ICT in island school (BAPolicies:T21S, T31S, T32S). Sometime the computer devices become to the government political problem (BAPolitics:T32A).

ICT management in school should be cooperate with society. The important key for developing is funding from society, MOE focuses only budget and it use all budget for hardware. They’re ignore the importance for developing human resource. And also The school have neither plan nor policy related with human resources (BAPolicies:T16K, T2A).

The requiring ICTs training course mismatch with ESA provided, some course higher than island school teachers knowledge and some course not a required of teachers (BAMan: T20S, T26S, T32S).

The human resource plan should follow the school requirement and suitable for island context (SusAdm:T2A, T31S). Usually, the school doesn’t have a training plan. The first step of every ICTs project start with hardware investment, they don’t think about user (BAMan:T22S). The teachers feel that ESA provide training course unfairly. Sometimes, the training session provides for only few schools on mainland or only for head teachers (BAPolitics: T22S, T28S, T32S).

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Some training course is conflicted with teacher requirements (BAMan: T5A, T26S).

“Basically ESA training course calendar will be sent to school by e-mail or showed on website, Actually island school teacher not able to attend the course from the several reason such as place not available,
network (BEEnt:T16K, T20S, T21S). Kids application software is a good media for teaching in nursery classes, sea gypsy pupils interested in games, watching cartoons (BEEnt:T28S). Today, social network is another way to contact with friends and family. Some teachers said that they are using social network to meet their friends (BESoc:T31S).

Students move schools frequently because their parents move from one island to others for fishing in the nomadic people’s culture (BACulture:T3A). When the students move to other school, the school needs to update the data and respond to ESA. Previous ESA data system is manually input and lacking of standard. Internet make the way to manage these data. Make the way to input data is more easier than previous system (BEMan:T24S, T29S).

Teachers who responsible for the updating school data with ESA use computer for collecting the data. Sometimes both teachers and students need to use computer after school time including weekend.

Students use computer until 5pm, using for surfing Internet, searching for data and doing homework. Teachers have their responsibility for opening the computer room after school finish (BETLng:T30S).

Supporting the local people to be teacher in school, co-operating with travellers (BESoc:T3A).

“I think the knowledge services for island society shouldn’t look only students in school, but we should concentrate on all people in island including: teenage learning and adult learning (BESoc:T3A).”

Teachers commented that it is a good chance for increasing knowledge society in island schools. Teachers said that there are many people meet each other in school everyday because they have no where to go and they like to the schools. The schools should have learning area. If teachers know what the people want to do or what they want to learn, it may very helpful for society (BESoc:T3A).

The ESA have very restriction to authorities island school, the limited of exposed staffs idea or perspective, it’s make teacher fear and lack of motivation to do their job. Schools have limited to developing or create project, only run small project and short term development and also the ESA political make barrier co-operation with local public sector (BAMan:T8A).

The teachers commented that school was co-operation with education institute sector is a best way to solve some problem in school, training fee, far distance, course not suitable or school day.

Example ESA was invited me to training Software graphic design, So hardware in island school not able to use it. Moreover, sometimes head teacher decide who should attend and sometimes, head teacher decide based on which teacher want to do something else on mainland in addition to training (BAHum:T26S).

Moreover, some training projects ran for short time period. It is inconsistent and unsustainable project (BAPolitics:T28S). Moreover, they are also lacking of project assessment as well (BAMan:T32S).

The teachers commented that ESA does not follow the development plan. They change the plan when required by the leader (BAPolitics:T2A).

Teachers suggested that they should have training sessions two times a year (SusAdm:T26S).

The suitable training time for island schools teacher is on the monsoon season because the school closed. The schools should send teachers for training on mainland. However, ESA often set up the causes following the mainland school calendar which overlapped
Teacher on island school working very hard to upgrade their position level by writing a book or to do classes room research. They have great opportunities to write a book by using Internet for searching data for write a book (BETLng:T27S).

The obstacle of teaching here is because the hardware and infrastructure are neither reliable nor consistency.

The problem of hardware and software are including: limited computers, limited electric work only daytime, taking long time to repair, inconsistency Internet or slow speed (BAInfra:T5A, T10A, T18K, T21S, T30S, T2A, T17K, T18K, T27S, T1A, T5A, T7A, T31S).

The poor infrastructural support base, examples include inefficient electricity and Internet systems (BAInfra:T1A, T2A, T17K, T18K, T18K, T27S).

*Electric shortage

However, the schools computers have limited time to used, they can use only on day times because at night time the island lacking of the electricity.

All computers use from 10am-3pm. We use such as training, technical support, students' development (BE Soc: T21S).

“They came here to construct the building, teaching island teachers. I like this project, we should have other projects like this. We should have sign agreement in the name of organisation, it's better than use personal relationship (SusAdm:T3A).”

The island schools should have the cooperation between island school and other organisation including public sector and private sector (SusAdm:T30S).

In the teacher’s perspective, the Ministry of education is responsible for planning ICT strategies but it was promote only in the national level (BA Policies:T1A, T16K).

The budget for ICT integration in schools should be allocated to the schools and the budget should be under the control of an ICT school board (SusAdm:T1A).

ESA should have ICT plan for island schools moreover, they should have efficient management for human resources (SusHum:T5A).

with island schools calendar. It is not convenience for teachers going to train when the school open because it affects teaching process (BA Man:T9A, T10A, T22S).

Lacking of ICTs teacher who is experience in field of computer working in island school. In addition the lack of ICTs teacher is from the reason a big gap of salary between public sector and private sector (BAHum:T32S, T10A, T31S).

“Most of island school have the same problems and they solve the problems by asking who has good basic knowledge or good experience with computer to do any job that relate with computer (BAHum:T18K).”

Some teachers lack of motivations and inspirations to work on island schools, if they have another choice they will go out from island schools (BAHum:T30S). Moreover, ESA has done nothing to inspire teachers to work on the islands (BAHum:T32S).

The island schools lack of organisation that can help in technical support it become unsustainable to developing (BAHum:T32S).
power engine to create electric power serve computer. However, the voltage of the power is not stable that affect the computers. We have electric generator from solar cell and power generator (Diesel). The power generator provides the electricity from 10am-3 pm everyday. Today solar cell didn’t work. I think because we use it for five years without maintenance. The solar cell system have old system and it’s structure distorted from sea salt, some of them collapse.

For power generator, I’m not sure about how long that school can pay petrol because the price of petrol very expensive and also the power system is inconsistency and make computer broken.

*Long time repair
Some damaged computers are in the waiting list to fix because the rule of MOE annual budget have more restricts (BAMan:T31S).

*Internet speed
Internet is very slow and inconsistency, the complex processes of respond for fix take a long time (BAInfra:T25S, T28S, T13A, T8A).

Today, teachers feel that ESA did not have any strategy plans related with human resources (BAMan:T31S).

The schools lack of the ICT management systems. The school structure is very complex. Different infrastructures equipment came from different companies given by different organisations. The school should have data-based for keeping and managing data (BAMan:T27S, T7A).

For example, when a computer has broken the school need to send it to fix on mainland. The process of computer fixing is taken long time and lack of department who are responsible directly (BAMan:T10A, T31S).

“We have to wait for repair process very long especially if it occurred in monsoon season because we need to send our computers to repair on mainland and waiting until end of season (T10A).”

The process of fixing computer has many steps. The teachers said that the process of repair came from very complex management of the organisation such as equipment code checking, repair allowance documents, sending the computer to fix and waiting for coming back. Each process takes long time especially if computers come from the donator. ESA doesn’t respond any

Some of older teachers lack of basic ICT skills and software then they ignore to use computer (BAHum:T2A, T10A).

I has fear to use new technologies because if I don’t have ICTs basic skill it’s will be mistake and make it fails (BAHum:T3A, T32S, T21S).

Some teachers do not understand software function and how to apply to use in classroom or apply to their works Most of them agreed that they are lacking of chance to training (BAHum:T3A, T5A, T7A, T32S, T21S).

Island teachers lack of skills to create web contents. Usually, they download existing contents from learning websites. However, it is difficult to find and not suitable for their curriculum. They should have their own web server for running web service (BAMan:T18K).

English is a second important language for island students. Usually, they are speak local language but in schools they are speak Thai. Sometimes, they lack of understand Thai.

There is a little problem in the early education however, students those use ICTs for practice communication they also can speak English to conversation with travellers (BESoc:T18K, T24S, T9A).

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The school should have wireless connection that the teachers can connect their notebook from other classroom instead of computer lab (SusInfra:T8A).

*computer not reliable

In 2006 computer system in schools is working properly and a year later, the system inconsistency because after installed never ever maintenance or don’t have any update. Some of teachers feel don’t like use computer and try to ignore it (BAInfra:T18K).

*Limited computer:

The computer in school is not enough because teacher have to share with students. Sometimes teacher needs to work privacy such as create final exam or score record. (BAInfra:T5A, T10A, T18K, T21S, T30S, T5A)

“I want to use computer in the case of urgently works but I need to wait for long time then the work is not finished on time (T2A).”

The computer in school is not enough because of limited budget and very low quality.

The problem is the users have limited to ICT requirements. Sometimes, head teacher needs to bring the broken computers to fix on mainland by himself (BAMan: T10A, T25S).

The teachers feel that ESA or top organisation work independently and make a huge gap with bottom levels. In addition ESA not clear organise in hierarchy when work with island school they make a complex task (BAPolitics:T16K, T29S).

MOE provides Island school

In term of ICTs system, MOE was decide complex system they do not clear the goal and conflict with each others for example:

- Sub-district Administrative Organisation (SAO) provide budget of teacher salary teaching local language subject and also provide school milk and school dinner.
- MOE provide salary for teachers for those teaching in classes Pratom 1 to Matayom 3 and also purchase computer hardware and software.
- Ministry of Information and Communication Technology (MICT) provide satellite Internet and networking equipments.
- Ministry of Energy provide by solar cell system.

Today, the schools have hardware but some teacher cannot use it. The teachers need to develop themselves because they want to learn new technology. Teachers need to spend their own money for ICT training courses (BAFin: T4A, T16K). Some teachers cannot afford it (BAFin: T22S, T4A, T9A).

“I have trained Bookmark software that I have paid most of the cost by my myself (BAFin:T4A).”

“I have go to training at Community College on mainland last year in summer. I use my own money, I want to learn computers, At that time I learn Microsoft Word (BE Soc:T18K).”

“Schools did not support training cost, most of teacher use their own money to pay for accommodation and it’s very expensive (BAFin:T9A).”

Generally, the training courses provided by ESA are free of charge. However, they have limited places. Moreover, limited of supported budgets such as transport and accommodation affect the training attendance of island teachers (BAFin:T1A, T9A).
knowledge and they have limited to use computers (BAHum:T3A).

The schools have seventeen computers, however, few of them are completely damaged and some of them cannot use Internet (BAInfra:T18K).

“In schools we need to share computer between teachers and students. The computer lab has free sections for teacher use for prepare their courses. Last year I need to use computer lab after school time but limited power supply. We consume power for computer in day time and charge battery own notebook for using after power system shutdown (BAInfra:T10A, T11A, T12A).”

Elder teacher spend less time on computer. They think they are too old to learn and it is not convenient. Moreover, they think that computers in school are very busy. If they are spend long time on computer other people cannot use it. The teachers commented that it’s long queue for using computers (BAMan:T21S, T22S).

I don’t want to share computer with children because I’m worry about the children know details of my exam. (BAMan:T28S)

can’t make all of device working properly, island not simply to contact providers and also island school don’t have technical to know what is exactly doesn’t work. In addition most of provider under government authorises, difficult to contact and located in Bangkok, service too delay (BAMan:T27S).

The head teachers and teacher, they doesn’t have any participation to make any ICTs in school plans but ICTs device distributed from MOE to school and some products don’t suitable for island school. School staff can’t complain or change to other product, they still scare empower who in level top authorise (BAPolitics:T2A, T32A).

When ICTs systems have problems, schools can’t contact provider services directly (BAMan:T16K) because the services came from various providers. However, schools have to contact ESA first, very difficult to solve the problem.

At the current in this school (Tunyong Kaboey) solar cell doesn’t work from last year no one come to service, school using power engine every day. ESA doesn’t have any rules about the number of computers that each school should have. Most of budget for buying computers has given to school in the city that ESA has encouraged to be an outstanding school. The Island schools should provide supported training budgets for teachers and educators (BAFin:T2A).

Another problem of study in island school is the problem of the missing students who followed their parents to finishing in neighbour country (BACulture: T21S, T22S, T23S, T25S).

Sometimes they missed school for a month. Teachers help them by give special teaching course. Sometime, they are gone for long until can’t catch up the course or they move to other island. Their parents ignoring the children education (BACulture: HT3, T1A, T2A).

For the head teacher, the island school should have outstanding vision head teacher, clever and working hard, they should have proper salary. The adequate salary will distract other people to work as the position. They should have no pressure to work and don’t have empower to control them (SusAdm:T3A, T4A, T8A, T13K).

For teacher, island school should have the ICT skill teacher. In addition, schools should have their ICT development plan for example giving scholarship for students in island to become a teacher. Moreover, the school should have
The island school needs other media when the computer not reliable. Education Service area need to provide alternative technologies when the Internet down, for example CD-Rom course, off-line Internet (SusInfra:T1A,TA2).

Teachers also need new technology together reliable technical systems. The ESA should have easy access digital library to support general library which is lacking of books. Some teacher use computer at library, school’s library have a computer for searching information. They share that computer with students (BEMan:T23S).

Librarian use computer for their own work and for managing books in library as well.

“I use that computer for preparing courses and manage the books because we just got some books from a company donor. I think about the borrow, returned books software because now we use manually (BEMan:T23S).”

The scarcity of hardware and software in the schools is due to shortfalls in the budget and lack of interest of the Education Service Area in the quality of the ICT delivered, limited number of computers which keep teachers feel that the distributions budget is unfair and ignore nomadic pupils (BAPolitics:T17K).

Some teachers said that the problems came from the lacking of assessment of project and management of hardware and software (BAMan: T22S, T24S).

The salary for island’s teachers is equally mainland schools. However, teachers need to pay high cost for transportations to island and basic needs such as fresh water or vegetable, pork, chicken and fresh food (BAFin:T8A, T28S).

“Our salary should be more than schools in the city. We have to paid higher price of transportation by boat. We have salary for 7,250 baht/month (160 pound/month) and we have to paid 1,200 baht/month (24 pound/month) for returned ticket. Moreover, teacher in island school have to pay higher price of living cost such as drinking water (BAFin:T8A).”

Moreover, the teachers have no opportunity to have other incomes in weekend like teacher on mainland (BAFin:T8A).

Some teachers need to move to mainland because the island is lacking of basic need such as:

teacher developing centre (SusHum:T8A,HT1,HT2,HT3).

Third, students, island schools should provide education for moving student. If they follow their parents to other islands they could continue their education (SusHum:T8A, HT1, HT2,HT3).

Fourth, parents, island schools should have relationship with parents. The school should set up meetings and join activities or let their parents to participate in development plan (SusHum:T8A).

Developing human resources is more important than hardware. The school should concentrate on human resources plan (SusHum:T8A).

The school should have clear teacher developing plans to sending teacher to improve the skills for one or two times a year (SusHum:T3A, T16K).

The plan should be related and be systemic continuous for next coming teacher and include funding for training (SusHum:T3A).

The school should have teacher development centre for improving teachers in island school in every subjects for example English, ICT. Moreover, the school should receive the easily way to contact of consultant service
systems out of date and slow the system. And computers in island schools are using very old CRT monitor, consuming energy and heat when use for long period (BAInfra:T30S, T1A).

Poor maintenance and lack of spare parts and technical ‘experts’ from the manufacturers are imported whenever the technologies break down, this leads to waste of resources, time and money (BAInfra:T1A).

However now we can’t use Internet. Internet has problem for a month The school contact TOT. We need to wait for repair router which had damaged because of the lightning, they said that they need to repair router’s part (BAInfra:T18K).

I have move from Narathiwat, the district full of terrorists. I’ve taught there for ten years. I’m really happy living here in summer. In monsoon, the weather is terrible, we cannot find the shade to block the rain. We use the plastic to cover computers. All transportation stop in five or six months (BACulture:T9A, T28S, T18K, T29S, T31S, T8A, T10A).

Most of teachers will out of the island before the monsoon and come back in summer. SEA don’t have a plan for teachers do in monsoon (BACulture:T28S).

It is impossible to change school time table. The island schools have no permission to change school time table. The teachers commented that they should manage our own time for using computer for example moving the computer classes to the period of 10am-3pm. After that the schools should have the class that not require using computers because the electricity is not enough for (SusHum: T30S).

ESA should consider on using ICT for lifelong learning. The schools and ESA should work together for this project (SusHum:T22S).

The government should consider on developing the local people to become a teacher in island school (SusHum: T30S, T23S). That saves money.

“Teacher who teaches in island school for very long time is the teacher finished from this school. She is a local people. She has her inspiration to work here, then, I think if the government want to developing this area they need to develop the local people (SusHum: T30S).”

Teachers who teach here should know a bit of local language. It will make good communication between students and teachers (SusCulture:T18K).

The island schools should have co-operation with local people and ESA, that’s make the schools strength and have sustainable developing (SusCulture: T21S).

Island schools should have network development sectors (SusCulture:T23S).
problems occurred they don’t know what to do and make they feel that it’s very easy to damage. They can’t solve it, can’t use it. We lack of IT services to help teachers. Teachers have skills but they are responsible for teaching they have no time to be IT services (BAHum:T3A).”

The problem in island school related to lacking of technician to solve computer problems (BAHum:T3A). Some problem related with the software problem for example:

“My problem related with file damaged, its effected from virus in our school don’t have any anti-virus software (BAInfra:T5A).”

It is very important that island schools should have technician to solve the hardware and software problems. Today, the teachers who have ICT skill are willing to help to solve problem in computer lab but not their job.

The school library has only one computer which is hard to book it. The student needs to wait until it free of use from others. Sometime, the computer is infected virus, student needs to wait for repairing it. The school did not have any antivirus software computer. However, the schools cannot change school time table by themselves, it needs the permission from ESA (BApolicies:T21S, HT1, HT2).

Another problem of computer services is the schools cannot open the computer lab services after school time because the ESA does not allow computers to be used much, ESA worry if use it long time computer will be broken faster (BAHum:T2A, HT1, HT2, HT3).

And also ESA did not agree with opening computer room because it needs to pay overtime for teacher who spends their time after school and weekend.

However, most of the schools open computer room after school time because teachers and students want to use it. Some school requested for volunteer teacher who can supervise students in computer room (BESoc:T1A, T2A, T3A).

Head teacher said that please concern about students’ misused Internet after school time, the use computer without teacher may be youth accesses inappropriate website (BACulture:HT1).

From Head Teachers and Teachers interviews implement ICT into island school sustainable development and sustainable
Most of school software is unlicensed. Most of legal licenses was installed and it make several problem, can’t update, virus infected. ESA should have the plan to buy licenses (BAInfra:T26S).

The computer room is not suitable for keeping computer, the temporary building doesn’t have wall or can’t protect windy and raining it’s effected to electronic device (BAInfra:T7A, T8A).

The students make loud noise in their computer room that has teachers table. It affects the teacher who works in the room. The teacher said that it is hard to concentrate on their work (BAMan:T8A, T6A).

Island schools should have permanent building for computer laboratory room, alternative energy, infrastructure maintenance policy, and green energy hardware (SusInfra:T1A, T2A, T5A, T8A).

Island schools should have their own curriculum and share course contents on e-learning and also have to make strong co-operate with local organisation, including public sector and private sector (SusAdm:T2A, T6A, T7A).

Factors including:

- Infrastructure, hardware, software, reliable systems, alternative technology (SusInfra:T1A, T2A, T5A, T8A)
- Human resources including, training, leadership (SusHum:T1A, T2A, T5A, T8A)
- Financial (SusFin:T1A, T2A, T5A, T8A)

The teachers suggested that island school developers should consider the strength point of island school such as strong society, students spend more time for learning, that is very useful for ICT development (SusCo:T3A).

The consistency of Internet and computer system plays an important role for island schools. The system could have provide teachers to use e-learning, share student information, and share course contents between each or others schools (SusCo:T3A).

The island schools have a chance to exchange the knowledge via Internet with other schools (SusCo:T22S).

“The schools have challenge that the teacher and students here living in schools from the morning until evening. If we have media..."
that support their learning they will increase their knowledge (SusInfra:T22S).”

Island schools should consider to set up their own curriculum that matches with the island school context (SusMan:T22S, T28S, T30S).

“We can design curriculum together. It might be in the form of web-based systems. We should have teacher developing centre or material centre or IT services centre (SusCo:T3A).”

The top organisation such as MOE should consider on the leader of ESA and the head teacher. The leader in society should be working together with educator in university or higher education institute for complete development (SusHum:T16K, T22S, T32S). In addition, the sustainable development needs cooperation between public sector and private sector as well (SusCo: T29S).

The developing plan should be clear, the data supported should cover all framework (SusMan: T22S). Moreover, ICT strategies plan should be better draw from bottom-up than top-down (SusMan: T32S).
### 5.2.3 TOP and Student Perspectives

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Technical(T)</th>
<th>Organisational(O)</th>
<th>Personal(P)</th>
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<tbody>
<tr>
<td><strong>Student perspectives</strong></td>
<td>Students often use computer on weekend and after school time (BESoc:S3S, S4S, S5S, S1A, S2A, S3A, S1B, S2B, S3B).</td>
<td>It is clear that the root obstacles are teachers leaving the island schools when a teacher leaves the students often lose their ICT class and other classes in which they are interested.</td>
<td>Island schools students spend time in schools more than mainland students (BESoc:S3A).</td>
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<td>“Basically, in daytime we around school for play, talk and have activities because our house very small and unfurnished, we go back home for only sleep (BESoc:S1A, S2A, S3A).”</td>
<td>“Last year we have very good ICTs teacher teaching us, in this year he move to mainland, no one can teach and fix computer like him (BAHum:S1A, S7A).”</td>
<td>“We use computer for Internet surfing, we know about news from newspaper online and computer for social network. In addition, we use computer for looking for job of apply for studying higher education (BESoc:S4K).”</td>
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<td>Students suggested that the school should increase computers numbers (SusInfra:S1A, S4K). They should have enough computers in a classroom and they can access Internet at least one a week (SusInfra:S1A, S2S).</td>
<td>“We leave schools for follow parents some time we can study other school but some school not allow to study in short time (BAMan:S2A).”</td>
<td>“I used computer for drawing, painting and watching movies, its make me exciting (BEEnt:S1A).”</td>
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<td>Students think that the school has slow Internet, the school should improve the Internet speed (BAInfra:S3S).</td>
<td>Students want to used computer for improve them after they come back, they leave from school long time and they can’t learn as well as their friends. However, the system not supports contents for them (BACulture:S1A).</td>
<td>Students use computer for Art, most of them like Art, they like program paint and graphic. In addition students year four – secondary use basic application and Internet</td>
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The students have a bit worry about some teachers give assignment to work with computer because of limited amount of computers and inadequate of infrastructure (BAMan:T4A).

Students need help from teacher who are responsible for lab room to suggest and teach them to use computer or advice when have any problems but not enough teachers and good ICTs skill for help them (BAHum:S3A).

I want to use computer in daytime and after school but depend upon teacher allow (BAMan:S3K).

“This is the first time that we can communicate with people on mainland by technology (BETLng:S2A,S3A,S2K,S3K).

“Most teachers lack IT skills. However, the research found that students required that the teachers should have good IT skills whatever in subject they are teaching (BAHumg:T3A).”

“This is the first time that we can communicate with people on mainland by technology (BESoc:P3S).”
## 5.2.4 TOP and Parent Perspectives

<table>
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<tr>
<th>Stakeholders</th>
<th>Technical(T)</th>
<th>Organisational(O)</th>
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<tr>
<td>Parent perspectives</td>
<td>Parents also have a perspective for focusing on new technology and are agreed with combining ICT into school curriculum (BESoc:P1A).</td>
<td>In the current trend of ICT at Adang Island, we found that ICT growth and development are being driven by private businesses tourism. The schools therefore need to drive very fast for teaching and training ICTs skill for their pupils to gain employment from the private sector (BESoc:P2A).</td>
<td>They want their children to familiar with new technology because they believe that ICT skills might help their children to apply for high salary jobs (BESoc:P3S).</td>
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<td>Parents thought that integrating ICT into island schools creates the best opportunities for their children to learn as well as in mainland schools. <strong>ICT is the only way for connecting island people to mainland people.</strong></td>
<td>Early year, island school students have never got the good opportunity to learn in higher education because they have not enough knowledge to pass the competition test. Today, we have more than ten students each year can continue their study on mainland (BESoc:P4S).</td>
<td>Today, island schools are the centre of learning and studying ICT in island because people believe that the schools should provide knowledge for society (BESoc:P3S).</td>
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<td><strong>ICT media is essential for knowledge sharing from old island professional to the next generation eg. songs, music, fishing skills, language preservation and weather prediction</strong> (BESoc:P2A).</td>
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<td>Government should give scholarship to the local students to be a island school teacher (SusHum:P4S).</td>
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<td>Technology help local people’s children improve their knowledge. Most of the parents want their children to get the good jobs and earn high salary (BESoc:P4S).</td>
<td>Head teachers and teachers in island schools are occasionally changed. Parents said that when the head teacher or teacher left the island school, it creates a problem for continuous learning (BAPolitics:P1A).</td>
<td>“My child talk about they use computer, they have fun and also his knowledge improved”. (BETLng:P3A).”</td>
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One way to eliminate the problem of education insufficiency of the teachers or principles in the school, parents agreed that island school
Parents commented that the technology is important for island school but the cost is expensive.

I think technology computer at Island school is not enough and useful, have several problem such as infrastructure and hardware software. In addition school not have money for fix and also all of parents are poor family don’t have any support to school (BAFin:P2A).

However, technology is not very good in some social point, it needs teacher to teach and guide to use them (BACulture:P4S).

Some families in island schools move nomadically around between islands in Andaman sea. They thought that the island schools should concentrate on cooperating or join the resources together especially teachers and materials on island school group (SusCo:P3S).

They are also fear that the Internet could corrupt the morals of their society through easy access to pornography and other culturally because school did not have any security program to protect that (BACulture:S2A).

First obstruct of developing ICT in island school come from the constant changing of leader (BAHum:P4S).

Second obstruct is the children missing classes and the teacher less concentrated on the students (BACulture:P4S).

The students copy their fashion from Internet, travellers or from the movies. They have change.

Their parents have comments that island schools lack of teachers who are local people. The teacher who came from mainland does not deeply understand island culture. The teacher may work on island very short time and move back to mainland (BAHum:P4S).

Local people have no chance to understand the government systems. They have no opportunity to complain and suggest. ESA has never concern about real situation (BAPolitics:P4S).
5.3 Summary of Findings

In this chapter, the perspectives of all stakeholders related to benefits, barriers and sustainability of ICT implementation in island schools were described. The final template from the data could be summarised into Table 5.1.

<table>
<thead>
<tr>
<th>Finding</th>
<th>Technical Perspectives</th>
<th>Organisational Perspective</th>
<th>Personal Perspective</th>
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<td>potential benefits of implementing ICT</td>
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<td>- communication</td>
<td>- teaching and learning</td>
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<td>barriers of implementing ICT</td>
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<td>sustainability of implementing ICT</td>
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Table 5.2 The important factors of implementing ICT into island schools

The major factors for implementing ICT in island school were presented. The potential benefits, barriers and sustainability of implementing ICT were classified. The most important findings of the present study for the sustainability of implementing ICT into island school include: 1) the policies; 2) the infrastructure; 3) the politics; 4) the culture; 5) the management; 6) human resources; 7) co-operation; and 8) finance.

In the next chapter, these findings will be discussed in comparison with other research studies so as to better represent the factors that are particularly important in developing countries.
6 CHAPTER SIX: DISCUSSION

6.1 Potential Benefits of Implementing ICT

What are the potential benefits of ICT implementation in island schools?

Examining the Potential ICT benefits is the first research question. Examination of the data revealed five possible categories of benefits. Generally speaking, the interviewees gave a good impression that the staff are in favour of technology utilisation in daily school activities. Overall the potential benefits can be described under the five categories: Communication, Teaching and Learning, Management, Entertainment and Benefits to society.

![Diagram showing the Potential Benefits of Implementing ICT]

Figure 6.1 Potential Benefits of Implementing ICT in island school

6.1.1 Communication

Information access made possible by technology gives teachers and students opportunities to work with an extraordinary array of authentic materials and up-to-date information that would not otherwise find their way into the classroom. Students with extensive access to technology learn how to organise complex information, recognise patterns, draw
inferences, and communicate findings. The students’ parents also confirmed that using technology gives a greater chance for improving learning performance and providing the same opportunities for knowledge enhancement as children in the mainland schools have. The Head teachers and teachers on the island have a very positive attitude about integrating ICT because it provides connections with the mainland. From the student’s point of view, this means they have more opportunities to contact friends or relatives on the mainland. From the head teacher’s point of view this means they are able to keep in contact with teachers and public sector agencies on the mainland via e-mail. Only two or three teachers indicated that they did not use the Internet regularly.

According to the director of the Education Service Area (ESA) on the mainland, ICT has dramatically improved the speed of communication which was used to take at least several days by boat compared to sending an email.

The Directors agree that e-filing is a good technology for helping to manage the island schools. Furthermore, Head teachers are able to quickly access the Internet from personal computers for sending important information required by the ESA such as absentee records, school milk and teacher absenteeism. The Education Service Area is also required to send information back on a daily basis.

Internet satellite dishes and the establishment of local Internet points within the community have made communication between the islands and the global community more efficient, accessible, reliable, affordable and time saving. However, those have, generally, only existed in the private sector. It has also reduced the cost of communications through email between community members and among schools. There has generally been enhanced communication with friends and relatives when the Internet service is available during the daytime. In addition, the community has been empowered to explore external markets for tourism.

6.1.2 Teaching and Learning

From the interviews, most of the teachers have been inspired to learn to use the technology and integrate it into the classroom. A benefit from this is that teachers have enjoyed learning because technology is an exciting new area for them to explore. They have used
computers in the computer’s room for some subjects: Science, Mathematics, Social Science, Sport, Astronomy, English and Art. The researcher also observed that nearly a quarter of teachers have their own notebooks and also installed with some general software such as Microsoft Office, email and multimedia. In addition, results from interviewing the teachers have showed all of them using a particular software called “Bookmark” for marking student scores.

Most teachers reported that they used computers for preparing some subject teaching in the form of slides and worksheets using course contents downloaded from the Internet or from existing resources found in the pioneer schools. Teachers tried to use computers in the classroom in order to teach the students. Using computers encourages students’ interest in their subjects. The interview data showed that the Internet helps teachers keep the material used in the classroom up to date and keeps them in live contact with important information, such as the news and the weather forecast. Previous research shows that teachers are more likely to adopt ICT when they are convinced of its benefit for their teaching and students’ achievement (Downes et al., 2001; Subhi, 1999). Therefore, the educational sector should dedicate more time and effort to convince teachers of these particular benefits of ICT for teaching and learning.

Most of the teachers saw the benefit of ICT in fostering open learning environments so that the different territorial areas could be engaged to their full potential. This means that lessons planned in one island school can easily be shared with any island school within the ICT group. The Educational actors i.e. the administrators, directors and teachers, need to allow their schools to develop into open learning centres using the added value that digital technology brings. Learning resources must be made available at the local territorial level so that there can be a transfer of educational and organisational know-how across the whole group in order to reach an optimum number (critical mass) of users and services.

Most of the teachers commented that they used computers everyday for at least three main purposes: managing documents, teaching and surfing in the support of daily life. They feel that it has helped to improve their teaching skills.
The researcher found that most of the students in key stage one like using graphics and 
drawing software. In contrast, students in key stage two and three like using the Internet 
and playing online games. Apart from school activities, ICT allows the island schools to be 
open for adults and former students to use the Internet on weekends if computers are 
available.

Most of the students commented that they use computers, after school, until 5pm for 
surfing the Internet, searching for data and doing homework. Teachers have the 
responsibility of opening the computer room after school has finished.

The Education Service Area (ESA) provides ICT course training every semester. Each 
school can manage to send at least one teacher to attend a training centre on the mainland. 
Some local universities on the mainland have provided training courses for island teachers 
but these are not yet consistently regular and the co-operation with the islands is not yet 
strong enough to give training to make each island project fully sustainable.

One head teacher believes that implementing ICT into island schools improves 
opportunities for local students to know about and to access higher education. Currently 
there are more island students who are seeking entrance into upper secondary schools (M4-
M6) and colleges on the mainland. ICT can benefit them by offering alternative online 
courses to prepare for this transition. ICT is also useful in career searches as well as finding 
places to study in higher education. One teacher recommends that having computer skills 
prepares students to participate in high schools or colleges on the mainland.

One teacher reported that an advantage of the mainland online courses centre provided by 
the ESA is that students are exposed to new opportunities. In addition, general exposure to 
available websites can be useful; for example, some students have learned how to play 
football from the Internet. Students can visit sites following their own choice at any 
convenient time.

The computer helps to store information. Therefore, the teachers have used it to develop 
databases from which to store and retrieve records on the performance of students/pupils; 
schemes of work, lesson plans, and syllabuses for use over the year. Moreover, computers
have helped the teachers in creating school reports. The Internet provides a huge data-base of educational resources that teachers can download and adapt for their classroom teaching. The teachers may use the computer as a library which can extend their knowledge base. Both teachers and students on the islands have reported that they are spending more time learning than those on the mainland. The teachers make good use of the computers for writing teaching materials and preparing worksheets. Students are making good use of the computers for doing homework.

6.1.3 Management

The Education Service Area (ESA) office provides a web-based system for managing documents called e-filing. From observations, the researcher found that head teachers and teachers were able to access the secure ESA website which links to other sites such as a web portal for e-books, contents, resource materials, e-filing, a web board and a school database. Most head teachers and teachers reported that they had used computers regularly and had used updated information from the ESA website and, as a result, formed a positive attitude towards the integration of ICT in their school administration, teaching and learning. The ESA website has become very useful for exchanging information between the islands and the ESA organisation on the mainland.

A large organisational benefit, coming from implementing ICT into island schools is the smooth exchange of students between the island schools. When families traditionally moved around the islands due to the nomadic nature of their work schools, the schools could not quickly accept the students into classes. Thus, their education suffered. ICT offers the benefit that schools can be more flexible because the teachers can consult with each other more easily about the progress of the students within the curriculum in the different schools.

One teacher reported a significant benefit of the ICT projects on the island is that her school used the system for managing and cataloguing library books. Other teachers have agreed that ICT has helped to improve the speed of organising and managing library book records.
6.1.4 Entertainment

Some teachers use the computers for checking news from the Internet and also for entertainment such as watching TV drama, movies, playing games and participating in social media networks in the context that there were no television or telephone links on these remote islands. In addition, nursery teachers have used multimedia for teaching nursery classes and the sea gypsy pupils were interested in the games and CD cartoons.

Social networking has become common amongst teachers from the islands who need to maintain contact with friends and family back on the mainland. Students in year four and five like to use computers for drawing and painting. The researcher found that most students like to draw natural scenes such as beaches, the sun, trees and mountains as an extension of their culture. Software drawing has become important because of the lack of materials, such as paper and coloured pencils.

6.1.5 Society

Island schools are a centre for children because they come to sit, talk and learn even after school hours. The island schools also provide a communal meeting point for children who no longer go to school. From research observations and interviews with students it is believed that the introduction of ICT has made these meeting points even more important and useful to youth on the islands because of the communication access. Computers have become the new technology on the islands and everybody wants to take part in something new. Moreover, the Internet can genuinely support and help the community to access information.

The previous report showed that the fact that ICT prepares students on the islands for higher education on the mainland is also an important social benefit. One group of students also reported that having access to ICT means they can continue to communicate with foreign travellers, teachers, and volunteers even after they have left the islands. The students see this as a social benefit. However, some teachers do not share the idea that this is a positive benefit.
Teachers and students have equally reported there are greater opportunities and greater salaries for children in the tourism industry if they can gain basic computer skills and good English communication. This is beneficial in solving some of the socio-economic problems and increasing the general income of the islands from tourism and the fishing markets.

According to some teachers ICT has improved social contact between the islands. For example, the smaller islands can keep in better contact with local government which is usually based on one of the larger islands. This is important because the local government takes control over important things such as school milk and budgets for teacher salaries. Also ICT links enable people on the smaller islands to have more access for voting during local government elections. Furthermore teachers on the smaller islands, who were previously isolated, now have the benefit of keeping in contact, and building stronger relationships, with teachers on other islands. These are some of the wider benefits of the ICT systems on each of the islands.

One informal interview took place in Ban Koh Adang school with a local island nurse at the invitation of the head teacher. He made comments about the possible benefits that ICT could make for linking the small health care resources on the islands with major health institutions in the region. This may also enhance the availability of basic drugs at the health centres in the schools as well as enabling wider access to information in emergencies to get a speedy response for help. Nurses could also exchange information with other nurses elsewhere for the purposes of reference and collaboration. It is also important to develop medical information systems for the health institutions within the region. Health institutions in the area will also be able to access the latest information on drugs and modes of treatment from all over the world. For example, information can be more widely available about the treatment for diving accidents such as the ‘bends’. Another example is getting advice for terminally ill patients and people with chronic skin diseases. There are benefits in establishing a community database with information on blood groups or HIV to educate vulnerable groups who may not know much about these dangers and their causes. Medical support on the islands is also important also because of the many tourists who visit.

The limited electric power available for ICT may not always be an obstacle. In fact some teachers saw this a benefit because, bearing in mind that none of the houses on the islands
currently have any electricity, even the limited power up until 9pm in the evening in the schools, due to ICT, can still act as a community resource to the islanders who treat the schools as a kind of evening camp.

Technology integration necessarily alters the traditional paradigm of the teacher providing wisdom and the student absorbing knowledge because the knowledge needed for tomorrow's jobs will change before many of today’s students enter the job market. Students today must learn how to search and discover knowledge for themselves, actively communicate with others, and solve problems so that they can become productive life-long members of our society (Bitner & Bitner, 2002).

In interviews with students some saw the benefits of ICT in preparing them for a more skilled job market. Today’s work force requires workers to think strategically, analyse information, and collaborate using 21st-century tools and to apply this knowledge to new situations. Technology in education is intended to improve student achievement in these areas while increasing student abilities to meet the demands of career and work force opportunities when they leave school. Well-trained and productive workers mean a stronger economy and healthier future for all of us.

In terms of future careers, most secondary school pupils who were interviewed felt that ICT would be important in the future; many pupils felt that all jobs would require ICT and that work with computers would increase rather than stay the same. Moreover, ICT in schools provides various higher education choices for pupils and opportunities to apply for the tourist related jobs after finishing schools. Students and parents alike think that if ICT is used in the schools, they will have more opportunity to get a more skilled job and gain a higher education since, traditionally, only two or three students on each island would normally continue their studies in high school. Moreover, ICT could help them gain more information and news which will be useful for the development in their island.

Wongbusarakum (2005) showed, in an important study, that, around the Adang islands, there have been losses of traditional practices and losses of knowledge and damage to the sustainability of cultural and natural resources. It examined the losses of traditional knowledge and skills due to the disruption and discontinuation of semi-nomadism and their
participation in a market economy via commercial fishery and tourism industries. However, during an interview with the head teacher on Adang Island the researcher found that he thought that computers could be a restorative key for preserving knowledge of the traditional island professions to the next generation such as its songs, music, fishing skills, language preservation and weather prediction methods.

For generations traditional knowledge was normally transmitted from the elders to the younger. In most cases, younger people observed and followed a family or community members who were more experienced, closely observing their behaviour and then tried carrying out the same activity by themselves. Knowledge in song and storytelling are very specific for this island context. Although, traditionally, the Urak Lawoi language did not have a written form, and the transmission of knowledge depended on oral traditions and direct participation, there is now a research interest in keeping the language in dictionary and electronic form and ICT may be a very suitable device for keeping records or making a multimedia teaching tutorial.

Some teachers saw the benefits and opportunities that the island schools can gain from foreign tourists. They have experience in ICT and they would like to collaborate and share their ICT knowledge and English language skills.

Teacher interactions and collaboration in schools can improve the rate of adoption and implementation of ICT (Fiszer, 2004). Through these activities, teachers may learn new skills from one another and verify their competence by reflecting on their own practices.

The researcher has commented thus “Technology has changed the way people communicate and has increased the amount of knowledge in society”. In education, all fields are experiencing enormous transformations through the introduction of e-learning, online boards and the use of digital tools such as computers, video and audio devices. These transformations have been helping education to overcome the barriers of time and distance, since information and content are accessible whenever and from wherever you are located. It is noticeable that the demand for a global focused education has been increasing. The economy, politics for whole societies have been becoming more globalised” (Maekawa et al., 2010).
6.2 Barriers of Implementing ICT

Examining the ICT factors which are barriers to implementation into the island school is the second research question. Further examination of the data revealed seven possible categories of barrier factors. Generally speaking, the stakeholders gave a good impression that the staff are in favour of technology utilisation in daily school activities. Overall the potential barriers factors can be described by the seven categories: Infrastructure, Island Culture, Political, Financial, Management, Policy and Planning Deficiencies and Human Resources. Each of the categories directly affects the implementation of ICT. Those themes are now discussed in the context of this research question.

*What are the barriers factors of ICT implementation in island schools?*

![Figure 6.2 Barriers of implementing ICT in island school](image)

According to Earle (2002), integration of ICT is not a product but a process and furthermore, Yalin (2007) points out that integration of ICT into schools requires effectiveness and efficiency in all dimensions of the process including providing the
necessary infrastructure, devising appropriate teaching programs and creating good teaching-learning environments.

It has been noted that, although computer technology has a great intrinsic potential to reform or even transform education, barriers may come in the way of achieving success especially when it is not effectively integrated into teaching and learning (Keengwe et al., 2008).

The next section gives an overview of the use of technology in education with a particular focus on the barriers.

### 6.2.1 Infrastructure

The act of integrating ICT into the island schools is a complex process and one that raises a number of difficulties because of the specific context. These difficulties, also known as barriers, are defined as any condition that makes it difficult to make progress or to achieve an objective. The objective in this case is to successfully integrate ICT into the island schools which already have many related technical problems such as a lack of continuous electric power, unsuitable buildings for housing delicate equipment, inadequate telephone lines and Internet connections, inferior hardware and software, low technical support and maintenance and inadequate financial support. Once the computers have been supplied the teachers generally have limited access to ICT materials because most of these have to be shared with other teachers and students.

One factor that affects how teachers use the computers is the location of the computers within the school building. The researcher observed that the rooms in the island schools provide ineffective protection for a computer laboratory because the buildings are temporary, the walls are not full height and the window spaces are open to allow the sea breeze to cool the building.

Further observations revealed that, on three islands, the schools had an insufficient number of computers for all the tasks of teaching, learning and administration. Some of these barriers could be overcome if the limited computer resources were better organised.
The researcher also observed that nearly a quarter of the computers were waiting for repair. In some cases the computers needed to be sent back to the mainland because the hardware had failed sometimes due to the low quality of the hardware. If the teachers generally had more skills to solve very basic problems, such as operating system (software) errors then some of the “out of service” computers could be easily fixed.

These problems are exacerbated by the fact that technology changes rapidly and hardware becomes obsolete very quickly. The researcher noted that many of the teachers have not been trained at the same rate as the technology change. Furthermore, when new versions of software are released the hardware cannot support the changes and there becomes an incompatibility when trying to share information with the mainland which often has upgraded equipment. Teachers would be able to solve some of these problems if they had or were given the training in higher skills to give them confidence.

Currently all the island schools have been supplied with the same infrastructure opportunities such as solar power, satellite dishes, computer hardware and software and computer networking devices. However, observation has shown that success very much depends on how the infrastructure has been used due to the attitudes and experience of teachers/head teachers on the different islands.

For example, on Sarai Island the head teacher has shown strong leadership in ICT from his own experience and also the deputy head has had a lot of training hardware/software and shown a lot of commitment to remain at the island school even though, with his experience, he could have gone to work on the mainland.

Teachers on several islands reported that access to the technology in school was a barrier to effective use. The gypsy children do not have electricity at home and the only way to gain access to multimedia and the Internet was to use the school computers. From observation this usually results in long lines of students waiting for a chance to use the few computers at school. Since some of these children are now too old to attend school the schools typically offer access to the school computer labs when the computers are available during free periods or after school.
Access to the computers is still available during the long school break in the six-month rainy season but this is very limited by bad weather (computers need to be protected from the rain and wind) and the more limited solar energy supplies due to lack of sunlight. Teachers and Head Teachers alike have reported these difficulties which all compound together to cause major barriers to progress.

Many teachers expressed the need for more personal and private access to ICT in the teacher’s common room. In one teacher’s words “I believe that we need computers provided especially for teachers when doing reports and typing exams... it seem like no privacy when we share computers with our students.” By observation, inadequate facilities have a strong negative effect on the morale and productivity of the academic staff. If teaching staff are to successfully integrate ICT into their teaching they will not only require more access to the computers but they will need up-to-date hardware and software to meet their needs. For example, one teacher complained that useful teaching materials on CD obtained from Bangkok could not be installed on the limited hardware available.

Technical problems that impede the smooth delivery of lessons or the natural flow of the classroom activity were found to be a major barrier in teaching. These technical barriers are mostly trivial including waiting for websites to open, failing to connect to the Internet, printers not printing and generally malfunctioning computers, and they often arise because teachers have to work with old equipment. Most teachers have reported this difficulty and would like to have more ICT technical support or maintenance contracts. Previous research emphasizes when schools are provided with more and varied IT equipment, there will also be the need for more and relevant technical support to maintain the system (Loxley & Julien, 2004).

A teacher highlighted another problem that if teachers learned how to overcome these problems they may then get called upon by other teachers to help them and their workload would become impossible and, anyway, their salary would not be increased. This is not just a simple problem related to infrastructure alone but it is a barrier to progress.

This implies that supplying infrastructure alone is not enough. The researcher observed cases of inadequate security where computers did not have any software or systems to
protect pupil’s from predators who often target young people; the very ones who are likely to be using computers at schools. Predators on the Internet have been present since the beginning of Internet technology. They fish in chat rooms, message boards and e-mail. The need for Internet security is essential in any strategy for defending against web-based threats. Most of the teachers viewed that this would only create further barriers to the computers being used when they could not be supervised by staff in the room. Children on these islands are very vulnerable due to their long isolation from the mainland.

The researcher found that the ratio of students to computers in class was generally up to three or four students per machine. This problem, caused by inadequate infrastructure provision of computers, is a large barrier to learning. Many teachers have commented about this because it means that only one child in four is effectively gaining skill in the classroom from hands on use while the rest can only observe passively.

In summary, the inaccessibility of ICT resources is not always merely due to the non-availability of the hardware and software or other ICT materials within the school. It may be the result of a number of factors such as poor organisation of basic infrastructure, poor organisation of resources, poor quality hardware, inappropriate software, or lack of a maintenance plan. Inadequate technical support is a specific barrier in the island school situations. Without good technical support in the classroom and whole-school resources, teachers cannot be expected to overcome the barriers preventing them from using ICT.

6.2.2 Management

In interviews with provincial directors of education and head teachers there were reports that the MOE in Thailand is a complex organisation with top-down management to centralize every school requirement from the bottom up and this is very time consuming. The decision makers and policy makers at national level do not understand the school context, especially on the islands.

One of the directors reported that ICT policy is only organised at the national level and lacks detail policies at the provincial level, district level and school level. The researcher discovered that in implementing ICT projects in the island schools some ICT equipment was mismatched for the specific school context and also some of the additional, second
projects were not related to any previous project. In addition the researcher also observed that some of the ICT equipment was superfluous such as modems and Novel Netware V.5 software and this was not needed because there were no phone lines on any of the three islands visited or any need or skills to manage a local network. In the interviews one director and three head teachers, concerned with ICT school projects, reported that these were only short term projects and they lacked strategic plans and project consultation, and the projects had inconsistencies with no coherence and lack of research and assessment. In addition the head teachers commented that when the MOE provided a budget they gave high priority to the leading school in each district on the mainland leaving only a very small budget to the entire group of island schools. The interviews with the head teachers revealed that local responsibility for the budget was mostly not delegated by the MOE to them. This also means that the island schools have to wait a long time for any decision to be made for them. The MOE system has become very centralised and bureaucratic where every problem has to be reported to the Satun Office Service Area.

The researcher observed that the schools had at least one quarter of the total number computers waiting for repair. Since the repair process needs to be approved by the ESA on mainland then users end up are waiting for more than 6 months with non functioning equipment. As a result the school has allowed teachers and/or students to make repairs by themselves (Appendix E10). If they cannot be repaired then the head teacher was forced to pack up and take the broken equipment back to the shops on mainland. Broken satellite dishes and solar power systems required a special service visit from the provider technician on the mainland but these were often subject to long delays.

From this researcher’s point of view MOE top-down management obstructs school development and creates a huge gap between the national level and the school level. Many teachers expressed the view that the authorities at the top level ignore the significant strengths of the island schools and they are more interested in the city schools.

Many teachers have reported the problem that the educational calendar is provided nationally by the MOE but the island school terms are very dependent on local weather and therefore many of the island school staff miss ICT training courses and workshops because
their terms on the islands have to continue into the national holiday period when the courses are organised.

Island Schools, like many other educational institutes, are organisations and the use of ICT challenges the organisation at many different levels in the organisational process from the personal and student level right through to the curriculum, methods, buildings and financial levels which all need to be collaborated. The researcher found agreement with previous literature that an important emphasis needs to be placed on the organisational dimension of ICT implementation, as barriers to innovation are often more related to organisational issues than to technological problems.

6.2.3 School Culture and Environment

The island schools are located very far away from the mainland and have a very different culture from the mainland schools. They speak Chaw-lay which is their own unique language but when the children go to school they have to study in Thai and learn English.

By observation most of the pupils use the local language for communicating with each other and three of the teachers have reported in interviews that there is a language barrier during the key stage one (KST1).

Many teachers have commented about the youth in early secondary school misusing the Internet in school as it is difficult to control or monitor because school does not have any ICT support staff or a security system.

The island pupils have never usually had adequate facilities for everyday life. They are, on average, poor and have a different religion from other areas in Thailand. In addition the island schools lack access to other media such as TV or newspapers. As a consequence teachers with the right technology skills will not travel far away from the mainland to teach in island schools which lack convenience and facilities. Most professional teachers who originally came from the mainland to the island schools want to move back to the mainland as they think that living on the island risky due to the weather and natural disasters and also far from civilization. Most teachers will leave the island before the five months monsoon
season and come back again in the summer. ESA do not offer many opportunities for further training for teachers in monsoon season.

The schools have limited subjects mainly because the teachers’ skills are limited and the taught subjects do not relate easily within the cultural context of the island schools. The schools lack further knowledge support such as museums or a central library.

Not much research has been interested in the island schools because it is difficult to access the remote areas and there are risks from the weather in storms and disasters. This is the main reason why the top level of national management generally do not know much about the school situation on these islands.

The pupils always miss the schools because, within their culture, parents move around the islands to follow local traditional patterns of nomadic life and work. This researcher found that the problem could be resolved by schools networking to enable nomadic families to keep their children in a school network rather than missing their host school for months at a time.

The teachers told about their experiences in the monsoon when every room in school became vulnerable to wet weather including the computer room and necessitating that computers should be covered with plastic bags for five or six months at a time. One suggestion from this researcher is that the inadequate facilities of the buildings may be replaced by a ships container which can be protected from rain and storm.

The researcher noted that most of the head teachers and teachers originally come from the mainland and they often want to move on because they lack the motivation to teach on the islands due to separation from their family, the lack of provision for basic needs and also because the island schools are frequently located in areas of disaster. In only one case there was a teacher who was happy to remain and this is because she was a pupil of one of the island schools and this gave her a lot of motivation for developing her school. This researcher comments that where the islands lack teachers or have a high turnover of teachers, the problem of staff shortages may be solved by giving a scholarship for any students who want to be a teacher. By observation the researcher also found a positive
context on the islands where there is a very strong social bonding between the staff and students who live in school like a family and share knowledge and food.

6.2.4 Policies

During interviews a director and three head teachers have all independently commented that the MOE has only one national ICT policy. The lack of flexibility in ICT policy at the provincial, district and school level has become a huge obstruction to development in ICT education. Furthermore the MOE added to the problem by piloting a project for ICT use in schools and training teachers without having a clear framework. Therefore the island schools do not have their own ICT vision and plan as the ICT infrastructure and training are generally directed and given by the MOE. It is crucial to involve those who have a stake in the outcome (teachers, parents, students and the community) to allow them to assist in the creation of the strategy and ICT plans by contributing their skills, knowledge and positive attitudes. An ICT vision that is accepted by all becomes a shared vision, which is critical to successful implementation of ICT in a school setting.

Furthermore the island schools lack a policy for human resource development, student mobility between the islands, Internet security and computer and hardware maintenance.

In the view of this researcher, it becomes all the more important to study the lessons learned when considering any new investment in setting up an ICT infrastructure and to avoid re-making mistakes and losing good opportunities.

During the research interviews there was a conflict of views between the director of the Education Service Area (ESA) and two head teachers. The head teachers considered that there were inadequate funds to service basic needs (school food, buildings and contents) and ICT at the same time. However the director justified the small budget by saying that the first priority of the ESA is to provide for school food, class materials, buildings etc. If any of the budget is left it can be used to purchase ICT equipment. In this case the leadership of technology planning (i.e. the director) is focused on the provincial vision but unfortunately is not allocating funds fairly across the province so that the island schools receive a smaller proportional budget than the mainland schools. The head teachers see this incompatibility of funds across the province and are not satisfied.
During the same interviews with the director and three head teachers, they commented that all the island schools lack strategic ICT plans at the school level and also at the provincial and district levels. The national ICT policy for education, designed by the MOE, is often not suitable for the specific school context. The head teachers have, together, commented that most projects are run only in the short term and are not related with other projects and projects invariably stop when education leaders at the various levels are moved around or retired. Many teachers have reported a lack of master planning when guiding investment. For example, in some cases equipment for new projects is ordered when existing equipment (e.g. printers, generators) from old projects is still in place and is still usable. In another example printer ink is not supplied and then new printers are supplied even though the old printers can still be used.

From the literature most ICT policies in developing countries seem to be mismatched with the country’s context and culture. Furthermore, the native policy makers in the developing countries do not make full and effective use of the media technologies which are supplied. They do not take into account nor consider the ‘macro-level contextual dimensions’ of their societies (Obijiofor, 2009). Developing countries need to learn within their own environment to find a way in which IT policy can be created and applied to serve their own country’s needs (Pradhan, 2002).

In addition Aune and Sørensen, (2002) suggested that policy formulation should not only include recommendations on the use of computers, but it should also include infrastructure development, workload distribution and the development of a vision on the importance of computers in education.

6.2.5 Politics

The last decade has seen vast changes in the Thai educational system such as the extension of compulsory education through the primary grades and the attendant need for teachers, the movement toward a comprehensive secondary school and a corresponding inclination of the schools toward manpower development, the transfer of responsibility for compulsory education to the Department of Local Administration of the Ministry of the Interior and the reorganisation of the Ministry of Education. However, in the three years before 2008 there
was a political reversal so that 90% of responsibility for education was returned to the Ministry of Education, MOE (Prasopsuk, 2008).

In interviews with head teachers and teachers during 2008 they were not clear about the details of budget provisions and personal promotions during the changes to a ninety percent oversight by the MOE and a ten percent oversight by the MOI.

Many teachers nationwide were strongly resistant to oversight by the MOI. However, the decision to transfer back most of the oversight to the MOE at that time was still not complete. In the provinces the situation is still very confused.

Many teachers have reported that as representatives of the Ministry of Education they also have the duty of advising primary school teachers with regard to teaching. Although the Ministry of Education no longer has control over the teachers, it still has the responsibility of controlling the curriculum and the improvement of the quality of instruction in the primary schools.

The interviews with three head teachers and many teachers have shown that it is not clear to whom they are responsible. In the past relationships between the ESA (under MOE) and the Sub district Administrative Organization (SAO) (under MOI) were delicate, but the schools could always look to the ESA and its departments for support. However, the relationships are now extremely sensitive. The governors of both the ESA and the SAO can move directors, head teachers, teachers, maintain and discontinue schools, appoint and dismiss teachers, increase salaries and increase and decrease monies for local schools. However, the real power lies with the ESA even though the SAO exerts some shadow power. This produces confusion at the local school level and a barrier to school development.

Three teachers have reported that politics is a major problem and the low transparency about the process of promotion causes de-motivation amongst school staff to development, salaries, position and teacher recruitment. In addition the processes of ICT purchases are often mixed with corruption and affect the schools at the level of receiving inefficient systems and unqualified technical support.
The researcher found that much of the literature encountered in this study focused on the experiences, attitudes and beliefs of those with formal, structured responsibilities within schools and that local politics influences teachers at every position in the schools. Moreover, in this case, the politics of the Education Service Area is still complex and local staff changes depend on government officials who win a national election. Although, the school directors may request a position for a teacher who has experience in ICT they may still get an unqualified teacher.

6.2.6 Human Resources

From an academic view, McGee (1987) suggests that one reason for the failure in implementing technological innovations might be because of the administrators’ lack of understanding of the importance of the implementation process.

Five teachers reported that implementation of ICT in the island schools is unsustainable because the educational leaders at every level are not interested in ICT and they have low vision, are unqualified, they often move back to the mainland and have low ICT skills. Previous research emphasizes the essential role of school leadership in integrating ICT into the whole of the education process, and shows how leadership can obstruct or facilitate each school member’s adoption of ICT (Earley et al., 2004; Fullan, 1993, 2003b). Earley et al. (2004) also commented that leadership and management are significant factors in the extent to which policy becomes practice and developments in ICT become embedded into the life of the school and experiences of the staff and pupils. From observations in the island schools, the political dimension is often missing from education.

Many teachers have reported that delays in integrating ICT into island schools occurred because the head teachers were only functioning for a short-time between six and twelve months before they moved on and the new head teacher invariably initiates a new project all over again.

The most significant human resource barriers include inadequate teacher training, limited access to technology, the lead time to learn and use technology in the classroom, and a lack of a vision for technology use.
During interviews three head teachers and ten teachers commented they wanted to move away from the island schools to work on the mainland because they lacked the motivation to work productively. This researcher found that lack of staff motivation has become the main human resource obstacle for integrating ICT in the island schools. Therefore the MOE has to think about how to improve motivation and develop more interest for local teachers to remain on the islands more permanently.

In interviews with the director of the ESA and three head teachers this researcher found that the established structure of the MOE was fixed before the ICT era and therefore cannot provide any positions for technical support. This researcher found that nearly a quarter of the computers in each school were of out of service due to the lack of technical support, resulting in a higher risk of technical breakdowns. The teachers in the island schools were spending some of their free time after school personally checking and maintaining the computers. However, in general, teachers who have those high ICT skills take their work contracts onto the mainland before their time is finished.

Many teachers have commented they lack ICT training because the island schools are far away from the training centres and also the ESA training courses on the mainland are held while the island teachers are still teaching. This problem is not helping to improve human resources.

The researcher also observed that the ESA has no ICT training policy and the training of staff only happens spontaneously on the mainland but never on the islands. The majority of teachers interviewed expressed their concern that they would like to see a clear training policy. Moreover, the policy should be clear and provide definite milestones for continuous staff development with an emphasis on local training needs. This is especially important if ICT is to be integrated effectively into teaching and learning.

However once training is provided it then becomes the teacher’s responsibility to use it. Published literature shows that most teachers are expected to implement the skills that they develop from ICT training in the classroom and that training should result in using these skills in a real teaching environment (Mathew et al., 2002). The training must provide teachers with a knowledge of the very basics of computer use. This includes a working
knowledge of all the standard input and output devices such as the keyboard, the mouse, the hard disk, the memory stick, the CD/DVD devices, the speakers and the printers which are all equally important. It is also important that they know how to perform basic system operations such as program installation, deletion and the backing up and recovery of files. They also need to know about the basic software applications such as Microsoft Office, antivirus software, driver software and as well as having a basic understanding of directory structures. It is easy to over-look the need for very basic training for teachers when it is assumed that their computer knowledge is at some standard level, regardless of whether or not that is the case. One writer has recommended that personal productivity skills can be used as a means to foster the teacher's interest (Bitner & Bitner, 2002). Those who use personal productivity programs such as word processors, spreadsheets, databases, graphics programs, and so forth, on a regular basis, become increasingly familiar with computer operations.

6.2.7 Finance

During the interviews the director of the ESA and three of the head teachers have commented that the budgets and ICT equipment have come from several different organisations such as the local administration (under the MOI), the ESA (under the MOE) and at one time, on one island, the Thai Navy contributed eight computers. These sources were not coherent. The problem of diverse support is that the supported projects are not related. This researcher believes that diverse budgets are not the best way forward because the different budgets are not allowed be merged into one big project which would be a better investment and would allow individual schools to merge money into other useful purposes such a building.

Two head teachers reported that the ESA does not allow the school to gain income from tourism. In one case a school wanted to use their land and facilities for a restaurant, Internet cafe and to allow camping to raise funds from the income. Also direct donations from tourists were banned by the ESA who would only allow donations to be given directly to the ESA itself. However, the ESA would then discount the following year’s budget by the amount of donations given. For the same reason individual schools do not want to get support from the business sector. The business sector prefers direct donations because the
process of donating to the ESA is very bureaucratic. These difficulties have prevented some interesting co-operatives between schools and local business such as the sponsorship of school lunches and the development of buildings.

Many teachers raise the problem of training support. Although the teachers said that they were offered free training on the mainland, they were expected to provide their own transport and accommodation costs. The return ticket alone could be nearly a half of one month’s salary.

Many teachers commented that they lack motivation for working on the islands because the government gives inadequate special financial support for living expenses. They receive the same salary as teachers on the mainland but the cost of living for fresh food and water is much higher because all chicken, beef, vegetables and rice are imported.

6.3 Sustainability of Implementing ICT

Fullan (2005) identified eight elements that are essential for leading sustainable innovation efforts. Educational leaders need to ensure that all of these conditions are met to make reform efforts system. However, Passey (2002) argues that concepts of sustainability are wide and different in each particular context. Therefore, the major key elements in this study are different from Fullan and Passey concepts because the context of the study is different.

Examining whether ICT implementation is sustainable on the island schools is the third research question. Further examination of the data revealed eight possible categories of elements. Generally speaking, the stakeholders gave a good suggestion that the staff is in favour of technology utilisation in daily school activities. Overall, the way ICT can be integrated sustainably can be described in eight categories: infrastructure, policies, political, culture, management, human resources, co-operation, and financial. Figure 6.3 shows the possible ICT sustainable framework for island schools. Those themes are now discussed in the context of this research question:

*How can ICT implementation be sustainable for island schools?*
Heeks (2002) noted that when implementing information systems (IS) projects in developing countries the sustainability failure rate was high and (Kitiyadisai, 2000) especially reports that the Tax Computerisation Project in Thailand is an example of an implemented system that was in a state of partial failure. In addition, Krishna (2005) found that the successful implementation of public information systems involves managing processes at several levels in complex contexts. Furthermore, implementers of IS systems in developing countries need to address the specific contextual characteristics of the organisation, sector, country or region within which their work is located.

This section will describe the criteria of sustainability and the perspective of different stakeholders as indicative of successful implementation of ICT in an island school context.

### 6.3.1 Infrastructure

The head teachers reported that the MOE should install permanent infrastructure such as buildings and ICT networks in addition to computer hardware and software. The
availability of hardware and software resources is crucial for technology to positively influence student achievement (Dexter et al., 1999)

Most of the computers in the schools use traditional CRT monitors that consume energy. The MOE should look for alternative sources of electric power and alternative types of low energy computers such as cloud computers or notebook computers. This researcher suggests that the main technical barrier to sustainability is the limited amount of energy available. For sustainable development in island schools, the director of the ESA should ensure that all purchased computers consume a minimum amount or low rate of energy compared to traditional equipment. In one research discussion with school staff they preferred low energy portable devices to help solve the problem of limited electric power.

Previous research has shown that the use of portables in conjunction with a wireless network can have a significantly positive impact on classroom organisation and teaching style. Portable devices can be carried for use within the classrooms and can more easily fit with the teacher’s preferred style of classroom organisation. Teachers can act more as facilitators and peer tutoring can become more commonplace if teachers and students are open to and ready for these developments. The simplicity of setting up and using wireless technologies allows teachers to focus on learning objectives, rather than on the technology itself (McKenzie, 2001; Moseley & Higgins, 1999).

The technical problems with computers were another important issue in ICT used in island schools. After interviewing many teachers, they pointed out the existence of different technical problems and reported that nearly a quarter of the computers in each school were out of service due to the lack of technical support. They suggested that there should be some computer experts (one or two person) within the island groups, to be responsible for the maintenance of the computers and to help teachers in case of technical problems. Tondeur (2009) has noted that integrating ICT is a complex process of educational change, and the adoption of ICT applications in schools is still extremely varied and, in many instances, very limited.

In addition, most of the teachers suggested that the ESA should have a monthly ICT maintenance strategy. The schools should ensure that technical support is available on a
timely basis. Technical support and the urgency of resolving problems are critical in maintaining consistency of use. It was noted that schools that are dependent on a single external service provider suffer from insufficient technical support (Lorien Miller et al., 2006).

In terms of software management, ESA should provide e-learning courses for the island schools in order fit better with the nomadic culture.

It has been clearly documented in this study that effective use of ICT in teaching and learning depends crucially on high quality technical support. More importantly the evidence from this research is that such technical support needs to be sourced within the school and that the people who are providing the service need to adopt a more personal approach to those they are helping. The range and varied use of ICT across the school also calls for different levels of ICT support. Finally, the director and head teacher should have an ICT maintenance plan and keep a budget for technician support as well.

### 6.3.2 Policies

The MOE should begin to allow each level of the organisation, right down to the school level, to develop detailed policies in line with the guidance given from the levels above instead of just following a top down imposed policy. Each level needs to be coherent with other levels and the detailed policies must be long term covering ICT, human resources and maintenance. In particular, this researcher suggests that the educational actors are students, teachers, trainers, administrators and school directors who together need to participate in creating a sustainable ICT policy.

Niemi (2000) and Niemi (2003) point out that the need for linking ICT strategies between the schools and communities requires the development of school specific policies.

The director of the ESA suggested that any school using the Internet should have a policy regarding acceptable long term use, and should also provide guidelines for teachers and advice for parents or guardians. The researcher suggests that such a policy should be approved by the school governors and shared with all staff, pupils and parents and that any pupil using the Intranet/Internet without close supervision should have the signed
permission of a parent. In addition, the researcher also observed that all the island schools lack strong Internet protection policies which should be a direct and urgent concern for the MOE. Furthermore, schools are responsible for developing their own quality control policies, educational policy, student participation policy, curriculum content, ICT-policy, professional development policy, etc. The government predefines a number of financial boundaries, puts forward minimal criteria to meet educational standards and a system of external quality control.

A professional ICT-policy should be planned to include elements on vision building, professional development, ICT curricula, planning and evaluation. In the interviews with the director and three head teachers, they commented that the success of computer use in island schools is related to policy factors. Furthermore, Hadjithoma-Garstka and Eteokleous (2007) noted that guidance and advice from the policy level to educators in schools seems to be important.

In addition, Tondeur et al. (2008) noted that the structural school characteristics (i.e. infrastructure, planning and support) factors require the development of a local school policy in order to guarantee a sustainable change process.

There are still major gaps in schools’ plans to provide access and capacity not only for the community, but also for their students and teachers. Head Teachers are asking for more support in developing policies, strategies, and appropriate management models. The activities conducted in areas of policies and strategic planning under ESA and this study provided an important platform for stakeholders to share their views, exchange ideas, and gain experience in developing a model. However, more support in this area had been requested.

6.3.3 Politics

Anantho (2001) commented that the development of media reforms in Thailand specifically to promote education was a result of cooperation among academics and senior educators in issue networks dealing with the uses of technology for education. The author concludes that, among various factors influencing the recent reforms, politics proved to be the most significant. The top levels of authority within the MOE, MOI, ESA and local
administration must be strongly transparent. The director of the ESA has commented that
the government should make some immediate national decisions to move all schools back
under the single authority of the MOE rather than leaving ten percent with the MOI.

6.3.4 Social and Culture

It has been reported in the literature that successful leaders have learned to view their
organisations' environment in a holistic way. This wide angle view is what the concept of
school culture offers principals and other leaders. It gives them a broader framework for
understanding difficult problems and complex relationships within the school. By
deepening their understanding of school culture, these leaders will be better equipped to
shape the values, beliefs, and attitudes necessary to promote a stable and nurturing learning
environment (Stolp, 1994).

The top level of the ESA organisation should adjust their ideas and curricula to be more in
line with the local cultures, languages and traditions around the schools. For example in
2006 all of the island schools received a motorised plough. When the head teachers
suggested that a small boat would be more suitable for the maritime culture there was no
flexibility in the ESA policy. Preserving traditional values is one way to ensure that
changes are sustainable.

The interview results indicated that there was a lack of concern about cultural factors when
attempting to implement ICT in the schools and this is confirmed in studies from the
national ICT policy. In addition, this research showed that the school principals and head
teachers, are the most influential actors in defining both the culture and organisation of a
school. Kennewell et al. (2000), is one of a number of researchers who confirmed that
school principals are the key players who foster reflective and critical thinking about the
school culture and organisation and about whether these can or ought to be changed
(Grace, 1995).

Furthermore, other researchers have commented that, most importantly head teachers must
nurture the traditions, ceremonies, rituals, and symbols that already express and reinforce
positive school culture and, as an example, Tearle (2003) suggested that ‘school culture’ is
an important consideration in terms of ICT integration.
The nomadic movement of parents is the main obstruction to improved attendance of students in classes. Implementing ICT into island schools may help to solve this cultural obstacle by offering online courses.

### 6.3.5 Management

Most of the teachers have suggested that the MOE should decentralize their organisation to improve the speed of management decisions and to increase the responsibility from the bottom up. Furthermore, the researcher has commented that empowering managers in MOE could be a prelude to the introduction of more de-centralised school management and governance practices.

Many teachers have made the original suggestion that an Internet system may enable students to move nomadically with parents around the island schools. If ICT is to be seen as an integral part of the teaching and learning process in the island schools then the school must provide Internet access. The purpose is to help students to continue their studies when they move to other schools when the parents move from one island to another. One reason for this is that the island schools can keep more accessible records. This is supported by two head teachers who have suggested to the ESA that they use ICT in each school to create databases of student records to track progress to support the students in their studies. Another benefit is that students who are away for just a short time can catch up with work on-line.

The previous research done internationally has demonstrated the important roles of school leaders and administrators in providing an enabling environment for school change. The introduction of ICT into teaching and learning faces the same requirements as other school-reform interventions. The nature of ICT, impacting on all of the key aspects of school life, learning, teaching and administration and management, makes it even more critical for school administrators to carefully plan, model, support, and monitor its introduction (UNESCO, 2007).

Strigel et al. (2007) reported that head teachers clearly need more than admirable enthusiasm and willingness; they also need ongoing, appropriate training. Head teachers participating in this research specifically requested training at a central location, away from
their everyday work environment and responsibilities, to allow them to fully concentrate on developing their skills. This should be blended with ongoing on-the-job support. However, those teachers travelling from island schools need more transportation cost support, and therefore, the cost should be included in the training courses.

From observations the researcher found that the head teachers have had low computer skills. ESA could be concerned about requiring training including: computer skills management and business planning for head teachers, including a detailed analysis of usage and cost figures to properly manage the centre leadership and support the integration of pedagogy, curriculum and technology.

6.3.6 Human Resources

Creating a system that sustains innovation requires leadership capacity building and collaborations with and among multiple stakeholder groups. Networks of like-minded individuals sharing common visions about the future provide the requisite synergy to expand innovation and support its sustaining influences (Browne-Ferrigno et al., 2006).

During the interviews ten teachers have suggested that the MOE has to provide consistent ICT training leadership at every level in the organisation in order to improve school development. This researcher believes that leadership vision is certainly important for understanding how to implement ICT and suggests that the director of the ESA should consider that existing academic staff members in the schools who successfully integrate ICT into their teaching and learning are those who are able to assist others. These staff members could be contracted for training teachers in their own school for a period of not less than two years. This is important for sustainability.

Educational leaders have a major responsibility for initiating and implementing school change through the use of information and communication technology and can facilitate complex decision to integrate it into school administration, teaching and learning. Educational leaders can have a major impact on the success, coherence and sustainability of the change process (John, 2003). Therefore, ESA must provide an “...adequate, ongoing, intensive professional development for school leaders and teachers in the area of ICT implementation and management” (Flanagan & Jacobsen, 2003).
The schools also struggle with their own limited capacity to optimise use of the technology to enhance teaching and learning, due to a lack of appropriate professional development. Although, some basic computer skills has been developed by some of teachers, they have to date not received enough training to use the technology for their own productivity and even less so to enhance the learning of their students.

Two head teachers believe that ICT teacher training has positively benefitted their students’ achievement. The head teacher pointed out that the most important thing should be to improve the mainland training schedules and set up courses that match teacher requirements on the islands. Nevertheless all the training courses should be kept up to date and locally available to teachers. In addition, ESA should have financial support for transportation costs because the cost of transportation from island schools to the training centre is high. Failing that, ESA should set up training on an island school in order to save transportation costs.

The ESA should give ICT scholarships to students who have grown up on the islands to become teachers. These students would return to the islands under a contract and this will improve ICT in schools in a more sustainable way. This researcher believes that the longer they work in one place the more experience they can gain and may become educational leaders.

6.3.7 Co-operation

The ESA should have co-operation with local organisations such as universities, technical colleges or public sector bodies such as science centres who can support schools in teacher training and ICT technical support.

Many teachers have also commented that the ESA should promote interaction between schools, parents and the community. These teachers would also like the ESA to send head teachers who are more able and experienced in making contact with the community. Two parents have commented that island schools should be in co-operation with partner agencies from the government and private sectors for support in ICT implementation.
According to Colle (2000), who commented that the role of government policy and political leadership needs to be incorporated in order to account for the crucial impact that they have on a country’s development activities, including appropriate regulatory environments. Also, the role that partnerships can play appears to be critical; particularly international agency partners and local champions.

From the researchers perspective the ESA or schools should have strong co-operation with world education organisations including the embedding of new technologies in schools and emphasising the role of Information Technology in transforming teaching and learning. Not only world organisations, but also global market companies, such as Microsoft, Cisco, should be joining the promotion of the embedding of ICT in education. In addition in schools there should be strong collaborations among the key players - teachers, school heads, students, and the community.

The researcher commented that some island schools have linked and shared resources together, for example, Adang island school already has a computer room and a strong professional ICT expert. Thus, linking the secondary school with other island schools would mean that they could share materials available in local languages on a real-time basis. This will help the schools and community to collaborate in the enhancement of computer literacy, usage, and exchange of information. Internet links also enhance educational services.

6.3.8 Finance

During the interviews two head teachers and five teachers commented that the government should be giving enough budgets from only one organisational source. They should keep a database to record how much ICT equipment has been supplied to each school and make plans for what to provide in future. Furthermore the MOE should quickly process requests for equipment from schools with less bureaucracy.

Three head teachers complained that the ESA decided its budget by calculating from the numbers of students in each school rather than considering the location and context of the school as well. The island school context is different from the mainland and has different needs for an ICT infrastructure, buildings and additionally the students are poorer.
Many teachers have commented they should be given salaries higher than the normal rate because they have greater living costs than on the mainland and also have commented the local government are considerably and more concerned about financial significant barriers.

Both these complaints and comments are directly relevant to providing sustainable ICT in the island schools.

This researcher believes that the ESA could allow schools to gain a self generated income by co-operating with parents who can, for example, open restaurants for tourists. This extra income may solve the problem that the schools lack money to provide students with lunches every day. In interviews one head teacher and three teachers have commented MOE and ESA have to promote schools for getting donations from overseas countries.

The previous report shows the fact that financial contributions will enable the ICT in Education programme to sustain its activities and plan for the future. Donations of equipment, materials and services will assist the programme in achieving specific project objectives. Sharing of information, knowledge and expertise will facilitate project implementation (UNESCO, 2005).

The Directors have commented that schools could co-operate with local private businesses for support funding. However, the head teachers are afraid of the conflict between private business and the schools. Therefore, the sustainable solution should be under the way that the ESA explains the important of sharing services and resources in the island.

In education, the installation of Internet access points within the community means that the community and the students will be able access information with institutions of higher learning from within the country and worldwide.

6.4  The Differences between the Research Findings and Literature Reviews

6.4.1  Benefit Gap

The result showed that the stakeholders in island schools perceived the importance of the communication benefits because the Internet was the only way to communicate to the mainland. In addition, by using the island schools as a centre of sharing Internet access, the
Internet was the first means of communicating with the outer world. Most of the research focused on the benefits of the Internet in urban or city areas that has other channels of communication, such as landline telephones, mobile phones, facsimile, high speed cable, etc.

The island people were found to benefit from using the Internet in terms of entertainment, again, because the island is located far from the mainland and lacks basic infrastructure and any other entertainment tools, such as television, audio, film, etc. The teachers and the students use the computers in schools to entertain themselves. Implementing ICT into islands schools creates a big change in everyday life. People in the island schools have found that the Internet is an essential resource for acquiring information and entertainment at the same time. The island students felt that they lacked entertainment equipments. Computers in the island schools have provided good opportunities for the students in terms of bridging the gap between receiving knowledge and the entertainment. The island students thought that computers increased their opportunities of receiving different types of entertainment in the similar way that television did to the mainland students.

6.4.2 Barrier Gap

The stakeholders revealed that there were two important barrier factors:

First, the complexity of top-down function from the upper school level seems to be the main barrier in implementing ICT into the island schools. The power of two organisations, MOE and MOI, and the unsynchronised management of both organisations affected the implementation of ICT into the island schools.

Second, the lack of human resources who have adequate ICT skills in the island schools seems to be another obstacle. Most previous research focused on the problem of lacking ICT skills that are usually found on the mainland schools. However, the poor management of human resources have also been found to be the main problem in the island. The island schools lack ICT skilled people because most of the ICT skilled people tended to work on the mainland. In addition, some skilled teachers have always moved away from the islands because they felt the islands were not convenient. Therefore, the island schools should
encourage local students to work in the island schools after they graduate from a mainland institute or university.

6.4.3 Sustainable Gap

This study has found the components in sustainably implementing ICT into island schools that some of the previous research failed to do so. The components that other research did not provide any detail are: a) the poor management and b) the lack of co-operative between public and private sectors.

First, the poor management is the major obstacle of sustainable implementation of ICT into the island schools. The recent report from UN-APC ICT (2010) shows that a number of managing projects is challenged because of the poor project design and management. Therefore, the process and resources should be investigated and managed responsibly.

Second, previous research has discussed co-operation between public and private sectors within the context of poor infrastructure. This research typically found that the co-operation between those sectors has made a significant change in implementing ICT into the island schools. Implementation of ICT into the island schools needs to involve both the management and co-operation components.

6.5 Chapter Summary

This chapter reported results from the interviews with the various stakeholders and found potential benefits of implementing ICT in the island schools emerging along categories of benefits in communication, teaching and learning, management, entertainment, and society. Most of the stakeholder’s agreed that communication is important because in the island schools ICT is the only tool through which they can communicate with the mainland. They also reported potential benefits in entertainment which emerged differently from the literature review because island people lack TV or film playing facilities. Multimedia technology is becoming increasingly popular in the field of education.

The interviews also reported results showing barriers to implementation of ICT in the schools emerging in the infrastructure, the management, the school culture and
environment, the policies, human resources and finance. One actor that emerged differently from the literature reviews was the management because top down management was reported which emphasizes the power of the director at the top level of the education ministry which is forcing the local operation in the schools against what is actually needed. School culture and environment were also reported as barriers because the context of the islands is quite unique to the normal politics of education in Thailand and which, anyway, is changeable depending on which government party officials win a national election.

The sustainability of implementing ICT in the islands was reported as depending on providing sustainable infrastructures, policies, politics, management, social culture, human resources, co-operation and finance. The factors that emerged differently from the literature reviews were in the areas of management, politics, human resources and co-operation because the island schools need to co-operate with both the private sector and the public sector for support in terms of finance and knowledge.
7  CHAPTER SEVEN: CONCLUSION

7.1  Introduction

This final chapter endeavours to bring together and summarise the conclusions and major findings of the study. The first section concludes the benefits of integrating ICT into the island schools and the factors specific to the island schools in remote areas and other developing countries which have integrated computer education. The second section looks at the implications of the study and makes recommendations, and the final section includes suggestions for further research in this field.

This chapter summarises the results of the research with respect to the impact and benefits of integrating Information and Communication Technology, ICT, into the island schools group in South-West Thailand. These conclusions also provide insights about the obstacles of implementing ICT into these schools. All these findings have been discussed with the school administrators and the head teachers, teachers, parents and students in order to ensure that the future policy will reflect the challenges of rapidly evolving ICT.

The essential descriptions and terminologies behind ICT implementation in education are:

a) Technology; which includes the infrastructure, hardware, software, and supporting services. The latest and most pressing development in this area is the emergence of networks and particularly the Internet;

b) Organisation; which includes writing local and national policy and the management of financial and other resources to ensure that the ICT implementation is successful and

c) Stakeholders; meaning the directors, the head teachers, the teachers, students, and parents. Staff development is crucial because of the challenge of developing ICT skills, both technical and pedagogical, that will require funding, facilities, incentives, and the setting of priorities.
7.2 General Conclusions

This research has examined the critical criteria that influence the implementation of ICT into the island schools. Traditional studies of technology development often focus only on the ICT used and/or obstacles of the implementation. Not only has this research shown the benefits of the ICT used and its obstacles, but it has also suggested that ICT integration needs to have a sustainable framework for the island schools and other developing countries. The following section draws some useful conclusions from the results of this study.

7.2.1 Benefits and ICT Impact in the Island Schools

The schools perceived the benefit of implementing ICT for using computers by means of education management and school administration. This research found that there are some important benefits to the education sector at the provincial level and school level. First, integrating ICT into the island schools provided fast communication via electronic document systems between the Education Service Area (ESA) and the island schools. Second, an ICT system enabled communication between staff working on the island and their families on the mainland. Computers and the Internet made the teachers feel happy and more motivated to work against the stress of working in remote areas with poor infrastructure. They felt happier and more motivated to stay longer on the islands. Third, ICT in schools helped the teachers to keep up with new developments in their subject areas and gain new knowledge, which resulted in higher expectations regarding their teaching quality. Fourth, Teachers will have to include ICT skills in their course structures and emphasise the use of the Internet and e-mail for global communication. Fifth, teachers were able to use ICT for marking and keeping records of students. Finally, the teachers had a better opportunity to advance their academic positions by writing books and papers.

Overall, most teachers had a positive attitude toward implementing ICT into the island schools.

ICT has created a meeting point in the schools for communication access through the Internet. Also, the access to the Internet provides communication with foreign travellers and teaching volunteers after they left the islands.
The students thought the benefits come from the usefulness of ICT in terms of their future careers because high ICT skills are required by most jobs. The students absorb knowledge through the Internet and are opened up to finding choices of a future career, i.e. ICT in school provides students with more higher education choices and opportunities to apply for tourist related work. Most students also perceived the usefulness of social networking and the Internet for entertainment. Knowledge improvement after perceiving its usefulness increases general knowledge in society, i.e. for life-long learning, higher education, and careers.

Parents focused on the social benefits more than any other point. The island people perceive social benefits from many aspects. First, integrating ICT into the island schools creates the best opportunities for their children to learn as beneficially as may be able to in the mainland schools and, conversely, gives them the essential opportunity to share and preserve their knowledge of island crafts and professions with the next generation e.g. the songs, music, fishing skills, language preservation and weather prediction. Second, ICT provides e-learning opportunities for students who travel nomadically with their families between the islands. Third, ICT can help solve socio-economic problems and increase income from tourism and fishing markets. Fourth, e-learning changes the social perspectives just as the Internet changed the world. E-learning not only provides a learning experience for students but also creates a learning society. The implementation of ICT creates life-long learning activities and a positive attitude to continuing higher education studies. Fifth, the people on the islands believe the island schools are the centre of knowledge transfer for their society.

The fact that most of the stakeholders (including students) are positive to the implementation of ICT is unusual because in most developing countries they are resistant and quite negative. This is maybe because they have never seen ICT and the communication aspects are quite a novelty.
7.2.2 Barrier Factors of Implementing ICT into Island Schools

The research also found that several types of barriers existed when considering ICT implementation in the island schools which could occur both during and after implementing ICT.

- Technical Barriers

Most island schools are located very far away from the mainland and the technical barriers include the lack of continuous electric power, unsuitable buildings for housing delicate equipment, inadequate telephone lines and Internet connections, inferior hardware and software and insufficient technical support and maintenance.

The barriers from the directors and head teachers’ perspectives involved the lack of an infrastructure which is frequently a problem in remote areas. However, the teachers’ have a different perspective which relates to the problem of managing and administering what little infrastructure exists.

In the island schools, there are always an insufficient number of computers for all the tasks of teaching, learning and administration. This is especially problematic because technology changes rapidly and hardware and software become obsolete very quickly.

The students in school faced hardware problems from having insufficient hardware to hardware not being available for use.

Inadequate technical support is a specific barrier in the island school situations. Without good technical support in the classroom and whole-school resources, teachers cannot be expected to overcome the barriers preventing them from using ICT.

These technical barriers are mostly trivial including waiting for websites to open, failing to connect to the Internet, printers not printing and generally malfunctioning computers, all of which often arise because teachers have to work on old equipment.

In addition, it includes inadequate security where computers did not have any software or systems for the child protection of pupils from predators who often target young people; the very ones who are likely to be using computers at schools.
Organisational Barriers

The main organisational barrier of implementing ICT is top-down management. MOE in Thailand has a complex organisational structure with top-down management to centralise every school. The decision makers and policy makers at the national level do not understand the context, especially on the islands and this creates a huge gap between the national (Toprakci, 2006) level and the island schools (Downes et al., 2001) level. The MOE system has become very centralised and bureaucratic where every problem has to be reported to the Satun Office Service Area i.e. requests to get a computer repaired could take several weeks or months. In addition, the ESA lacks policies at the provincial level and the school level. Moreover, ESA has full power to move teachers in and out of the island schools. The frequent move of teachers from the schools back to the mainland affects the learning progress of students.

Because the implemented infrastructure on the island schools has no coherence and is unsustainable, the schools have lost good opportunities to continue the ICT projects. Most projects lacked strategic plans and project consultation, and the projects had inconsistencies, i.e. no coherence and lack of research and assessment.

Furthermore, the schools have a lack of financial support; some support funds come from different organisations and they are small budgets. In addition, the MOE provides a budget but they give a higher priority to the leading school in each district on the mainland leaving only a very small budget to the entire group of island schools.

Island schools lack of co-operation with local public sector and business sector. Support does not progress very well because leaders do not try to co-operate. The Thai ministry of education is currently divided into two organisations which have unequal authority; the MOE and MOI. This has created problems because this political inequality often denies the smooth running of budgets especially in the upper school.

Moreover, the complex top-down function has affected the efficient implementation of ICT into the islands. Lack of human resources in the area was another barrier to implementation. Most of the teachers commented that they need more technical support. The island schools should be allowed to have policies to improve human resource management.
Personal Barriers

The island schools lack ICT professionals at the provincial level and the school level. Leadership and management are significant factors for the implementation of ICT in schools. The computers in each school are often out of service due to the lack of technical support. Although the schools have some teachers who are willing to spend their free time to maintain the computers, it also creates a higher risk of technical breakdowns.

Human resource is the main obstacle for integrating ICT into the island schools. The MOE should take into account trying to improve motivation and encourage young local people to be teachers.

This research found that island school staff lack motivation to live in the schools. Therefore, the schools are always short of teachers. A lack of skilful teachers is one of the main barriers that the parents had commented on during the observations because the parents have a close relationship with teachers and students. The students report that they often miss school classes because the teachers have left the schools because there are no new contracts.

Lack of an ICT training policy and the fact that training courses happen on the mainland make it difficult for teachers to have access to improve their ICT skills. Furthermore the training calendar is mismatched to the island term dates and teachers have even more difficulty attending the training courses.

Furthermore, the head teachers are only functioning for a short period of time before they move on and the new Head Teacher invariably initiates a new project all over again and ICT plans may change if the new position is replaced by other people.

Parents on the islands reporting conflict between the schools and the MOE. The conflict relates to the lack of a full range of physical and intellectual resources and a lack of understanding the complex cultural, psychological and political characteristics of people on islands before implementing ICT into the schools.

Language is barrier for implementing ICT into the island schools because the students have limited understanding between Thai and English language.
7.2.3 ICT Sustainable Development

The ICT sustainable factors draw from information regarding the discussion from the Chapter Six which is drawn from interviews and observational data. Since an ICT system is large and a heavily dependent system with many components, a change in any component of the system will impact on several other components. Thus, it is important that decisions are informed by understanding the organisation and culture of the impacts on the whole ICT system. This section will answer this research question:

*How can ICT implementation be sustainable for island schools?*

Based on the findings of this study, the following are recommendations for improving ICT use in an area of poor infrastructure.

To integrate ICT in island schools, developers need to be concerned about 1) ICT systems and infrastructure; 2) Policies; 3) Politics; 4) Culture; 5) design and management of the organisation; 6) human resources; 7) co-operation between organisations and 8) finance.

7.2.3.1 Infrastructure

The island schools need computers that save energy. The director also confirmed that alternative hardware and software should be selected appropriately for the island schools, i.e. Netbook, PDA and alternative power sources such as the windmill farm.

The infrastructure must include more permanent buildings, a network, low energy computers, and energy generation technologies, i.e. a hybrid wind and solar system. Increasing the number of computers is another requirement from the students’ point of view. Due to the important connection between the islands and mainland, a reliable computer network is required in this area. Moreover, implementing infrastructure needs technical support. Therefore, the ESA should provide ICT technical support for the island schools.

7.2.3.2 Policies

From the stakeholders’ perspective, the top-down approach has a demoralising effect on the motivation and trust of school leaders. The ICT policy should come from the “bottom up”,

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i.e. from the head teacher or teacher. This will require a change and a new way of thinking. Although this bottom up approach might seem common sense, the reality is that many (government) efforts to improve the quality of education are still driven from the top down. However, this researcher also believes that school leaders and teachers cannot be held solely accountable for integrating ICT and therefore still will need support from the top level of the ESA. Therefore, some policies should be flexible to work in an island context, i.e. school term, school timetable. There must be strong linkages and dialogue between the school community and the local policy makers and supportive people within government structures (ESA and MOE).

7.2.3.3 Politics
Authority must be strongly transparent so that schools can trust them. This is very important, especially in relationships between governors at the top level and the educators at the island school level. More clarity of authority is needed. At the moment authority comes from the MOE rather than local administration. Some mainland and city schools are already under the authority of the MOE and the funding of these schools is then more steady. This would be a better arrangement for the island schools.

7.2.3.4 Culture
The MOE must be able to understand the island school culture and tune the education system to be appropriate for local needs such as the holistic application of the curriculum. ICT, to be sustainable, must be useful to the island lifestyle. For example, using ICT to improve communication between the island schools will help nomadic children to have more consistent education. The curriculum in school should support the culture and society. To preserve the traditional culture, ICT could be a restorative key for preserving knowledge of traditional island professions to the next generation such as its songs, music, fishing skills, language, and weather prediction method. Moreover, ICT could be used for linking the small health care resources on the islands with major health institutions in the region. It is also important to develop medical information systems for the health institutions within the region.
7.2.3.5 Management

Decentralising decisions will motivate the head teachers to keep equipment working. For example when computer repairs are needed there could be a local budget available for small repairs. Head teachers currently do not know how much money is being held in the ESA accounts for them each year.

The ESA should have ICT to link the databases among island schools with information related with education issues. The database should be publicly available for free use. Local and international researchers, government agencies and other educational organisations could use its information to support decision-making, intervention strategies, and awareness campaigns about educational projects, and they could also contribute to this knowledge pool. ICT offers the benefit that schools can exchange students between the island schools when the families traditionally move around the islands due to the nomadic nature of their work. Creating online courses and children database may help to manage teaching and learning in the island schools. The students and teachers who are away for just a short time can catch up with work online.

7.2.3.6 Human resources

The schools need training, i.e. for computer skill management and business planning for head teachers. Providing ICT training to head teachers and directors is important so that they will have more vision to implement ICT at local levels. Moreover, the training should include a detailed analysis of usage and cost figures to properly manage the centre leadership and support of the integration of pedagogy, curriculum and technology. Teachers with ICT experience should be given allocated time to teach their peers as part of their normal teaching load. Head teachers should have the vision to see this as a valuable investment.

Training for teachers is another important sustainable requirement. The ESA should include basic training courses, not only for head teachers, but also for teachers. Moreover, the training should be set up at the island schools to save training costs even though training in specific subjects may need occur on the mainland. It is necessary to ensure that the mainland training centres are open for training during the October school holidays because
this is the most likely time that the island school teachers will be free and the weather is good enough to travel. In addition, for training on the mainland, ESA should support transportation costs for teachers as well.

Sponsoring local students to become future teachers on the island schools is useful because they may have more local motivation and understanding of culture to help the islands. These sponsorships normally require the teacher to come back to teach for at least twice the amount of time spent studying on the mainland.

7.2.3.7 Co-operation

Developing stronger links with mainland organisations such as universities, colleges and the Thai Navy is very important. So, the island schools can receive ICT equipment and visits from mainland trainers who can bring ICT knowledge and support. In return, the researcher has observed that the visiting lecturers can receive the benefit of a greater understanding of island culture which can be used to improve their own knowledge and to write books. Parents’ perspectives highlight the need for strong co-operation between the head teachers and ESA. They believed that it may solve the infrastructure management problem.

The co-operation should include material and knowledge exchange. However, the schools should have an organisation for planning and managing the supporters. There should be stronger community volunteer links developed between parents and schools to help with building projects and between schools and local business (such as tourism) to improve school funding for ICT.

7.2.3.8 Finance

The MOE should have long term plans for future ICT developments to ensure that the initial introduction of ICT equipment is maintained and improved. It is essential to create independent school boards to manage local budgets allocated by the MOE/ESA for island school.

MOE/ESA should allow local businesses to generate income for the schools by running useful services such as local restaurants and using some areas of the school grounds for
tourist camping. This has been controversial. It worked for one school but the MOE did not benefit from it and the initiative was stopped. Moreover, the schools need to find financial support from private sectors and other supports from the local university to improve the teacher learning skills.

7.3 Contribution of the Research

The major contribution of this study can be assessed from three perspectives: theoretical, methodological and practical. This research found the most important contribution of this research was the contribution from the multi-perspective theory in terms of exploring the sustainability integrating ICT into island schools. The following sub-section would further drawn in each contribution.

7.3.1 Theoretical Contribution

The findings of this study have illustrated, in contrast with the general belief that people lack an awareness of the potential value of the Internet, or indeed of the benefits of Information Technologies generally. The people in the island have a positive view of implementing ICT and they have thought beyond to the future.

In South-West Thailand a few research has been done directly about the sustainability of implementing ICT especially in remote area such as island schools (SKRU, 2005). In addition, Kitiyadisai (2000) states that most of ICT project implementation in Thailand not sustainable development, had been fail after implemented. One aspect of development programmes that is often neglected is sustainability.

Though there have been many general frameworks on ICT integration, there has been an absence of an empirically based framework for sustainable ICT integration into the island schools. The framework should be based on the extensive data derived from this research. This study expands the knowledge base of the education director, and the stakeholder’s perspectives of the effective use of technology for educational improvement. The previous frameworks integrated ICT in an educational focus on ICT using in classroom and lack of sustainable element.
The suggested framework is a sustainable ICT on the island schools with a poor infrastructure. Figure 6.3 is a representation which was empirically derived from the data obtained in this study for the purpose of answering the specific research questions, the numerous issues which have arisen from the emerging themes and relevant contemporary theory on education technology. The constituents of this model are explained in the next paragraph.

This model will attempt to provide key principles and elements of sustainable ICT implements into island school. This framework shows clarifying factors that affect the sustainable implementation of ICT into the island context and provide an additional valuable source of knowledge for the local education policy makers in Thailand and other developing countries.

Passey (2002) reported that managing sustainability should include and the implications that arise for the future. Concepts of sustainability are increasingly emerging in educational systems with regard to ICT. His study looks at three issues for managing sustainability: 1) financial; 2) equipment maintainability; and 3) access to resources.

Passey (2002) also argued that the concepts of sustainability are wide and different in various contexts. Therefore, the specific context may need a specific sustainable issue to implement ICT, particularly in developing countries.

An ICT sustainable framework for remote schools have eight elements: 1) planned infrastructure, 2) sound policies, 3) supportive politics, 4) cultural relevance, 5) responsive management, 6) relevant human resources, 7) co-operation, and 8) sufficient finances as seen in Figure 6.3 (see chapter six). Each component has key elements that make up the sustainable development not only for island schools but also for other general remote areas. One of the basic principles of this particular model is that each component is unable to be standing alone but needs strong and sustainable support from the others if the adoption of ICT for school administration, teaching and learning is to occur.

When island schools and remote areas are used as a standard for others to achieve the successful integration of ICT, the results from this study also suggest that evaluation efforts
which establish success must fully explore the systemic capacity of the multi perspective view that, through-out, all levels are involved in the context. Achieving successful technology integration remains a challenge, and one that may not yet be a goal that the schools can achieve without significant assistance beyond what has been available to them to date. Funding alone is not a clear indicator, schools lacking in such capacity will be hard pressed to catch up. Educational progress is not served well by underestimating the complexity of the technology and the range of changes in the sustainable issues of planned infrastructure, sound policies, supportive politics, cultural relevance, responsive management, relevant human resources, co-operation, and sufficient finances The study also found some potential benefits and barriers that infuse into the island schools context. When examined by interpretive case studies through real phenomenon, better results were achieved in the context. There are very few research studies trying to propose this methodology. The next topic will describe the details of the methodology contribution of this research in details.

7.3.2 Methodological Contribution

The central focus of this study is the investigation of implementing and integrating ICT into the island schools. The study was carried out using case studies and qualitative research methods to validate the research findings.

This research suggested that the TOP model (Linstone, 1989) could be used as an important tool to answer the research questions in the way of data collection and analysis method. The model used to explore and interpret the benefit factors and barrier factors of implementing ICT into island schools. Applying the TOP model makes the problem detection easier and assists the implementation planner to be affluent in quality point of view. The multiple perspectives help to draw the problem in the variety of dimensions to achieve a goal.

Besides these, the qualitative analysis on the integration of ICT in the island schools of South-West Thailand contributes to the body of knowledge which clarifies the key factors that influence the adoption and integration of ICT into management, teaching and learning.
The new theoretical framework is mainly derived by referring to a multiple perspective approach, which helps the systems practitioner bridge the gap between analysis and action, between model and the real world. To the best of my knowledge, little previous research has been done by using a Multi-perspective model to investigate the implementation of ICT into remote schools. The organisational and personal perspectives also focus more attention on the problems of implementation. The concept has served as an effective and practical vehicle to overcome the limitations of systems analysis in dealing with complex real-world situations (Linstone, 1989). In addition, it is important to gain perspectives from all the stakeholder groups who are considering the implementation of ICT, and who foster and help the planning process. In addition, the actor network theory also allowed me to stress the importance of complying with the investigative base of human and non-humans in the implementation of ICT in remote areas. This study expands the knowledge base of the educational director and the stakeholder perspectives in the effective uses of technology for educational improvement.

### 7.3.3 Practical Contribution

This section discusses the key practical contributions that have arisen from the thesis. The integration of ICT into the island schools is the significant contribution of this study. This research has provided a theoretical framework so that the innovation has a greater possibility of success and sustainability. The framework embeds the concept of interfacing research, policy and practice as a triad in order to maximise the potential of ICT for transforming the impact on educational systems. The research clarifies the process of implementation that, in the island context, provides an additional valuable source of knowledge for the local education policy makers.

This thesis has promoted innovative research models and applications for ICT integration in education and learning processes that are especially suitable for developing countries. The purpose of our knowledge building and research activities is to empower educational experts and stakeholders in the development of innovative solutions on the use of technology to address challenges in the different contexts of their educational systems. Innovative practices developed by different stakeholders can be verified and generalised
through the evaluation, research and development processes in Thailand and other
developing countries.

7.4 Limitations of the Research

There are some limitations that the researcher found during conduct this research study. Any future studies need to understand the limitations because they may lead to preparation and consideration in the future work. The limitations in this study include:

a) The island school groups are located in the Andaman Sea in South-West Thailand which is far away from the mainland and has a unique context. For that reason these remote areas lack some control from educational authorities on the mainland and the quality of education assessment is lower than the school located in the city. The implementation of ICT into the island schools is similarly complex compared with other developing countries. The context is very limited and difficult to generalise.

b) The time frame for fieldwork in the islands was limited because they only provide transportation during the monsoon season from May to October. Moreover, the time taken to get to the remote islands is up to 8 hours and the cost is very high.

c) This study used interview data and the finding of the study are based on the perceptions of the stakeholders and the assumption that the stakeholders have responded honestly and that the interpretations are a valid instrument of the stakeholders intentions. In addition, during the field work study, only one head teacher was reluctant to give an interview when talking about the problems of politics in the educational organisations.

7.5 Research Lessons Learned

Conducting this PhD research required much effort to focus on objectives that would make a valuable contribution to the wider academic world. Throughout the period of the PhD the researcher has tackled many issues. These could be summarized under three headings: theoretical, methodological and practical.

Theoretically, commencing from the literature review, this research proved to be an extremely challenging task concerning the amount of reading. First, there was much very
relevant literature and most was published under three very broad themes: The Thai Educational Reforms, ICT Integration in Education and ICT in Developing Countries. Most of the important and relevant literature surrounding the subject was reviewed to cover the research questions. Therefore, this research has fulfilled the theoretical discussions required in this field. Secondly, a theoretical framework (TOP) was adapted by the researcher from the published model which consisted of using the three components, Technical, Organisational and Personal perspectives, as a lens to examine the viewpoints of the five group stakeholders who play an important role in ICT implementation. This model, was applied in the research as an initiator to further research in this educational sector.

Methodologically, the interpretive research case study was a challenging attempt to understand the complex phenomena of introducing ICT sustainably into a very remote group of island people who already appreciate the value of education. The interpretive case study was the right approach to use because interpretive methods of research are aimed at producing an understanding of the context of the information system, Walsham (1995) through the meanings behind the way that people interact within the context or with each other (Boland, 1991). Research in this particular area has rarely been studied qualitatively and therefore, a profound understanding towards the topic has been thickened and deepened. Moreover, during the data collection process, the researcher was aware of the need to act as a teacher, an ICT consultant and a researcher in order to assure the validity and reliability of the data collected.

Practically the great opportunity presented for gaining valuable data through the selected methodological strategies required learning some of the Chaw Lai language and engaging with its culture. Probing the questions using academic words alone would not easily obtain the answers looked for and this kind of obstacle is a relevant issue for any individual researcher in fieldwork. Furthermore, collecting the field data required great flexibility and careful attempts of the researcher to access and approach the informants.

Therefore, flexible planning of the researcher is very essential. Finally, the challenging geographical and physical nature of the field site are also vital to consider for research implementation. This could even affect the compatibility of period of time for data collection.
In conclusion, the lessons learned from this research range from theoretical, methodological and practical aspects. These lessons learned ascertain the possibility of better future research. The mistakes and advantages discovered from doing this research has created a firm platform for prospective future research.

### 7.6 Suggestion for Further Research

The big gap between the top organisational level and the school level requires more feedback research such as action research. The organisation needs to bring knowledge from this research into action research in the future of ICT projects because action research has been identified as being particularly well suited to the study of innovation, and in particular the use of ICT in education (Somekh, 2000). Action research involves iterative cycles of identifying a problem, planning, acting and evaluating (Argyris et al., 1985). In addition, action research is described as a strategy used to develop new skills or new approaches and to solve problems with direct application to education or a working world setting. Action research have been seen as particularly desirable for IS research and closely link research to the real-world concerns of practice (Baskerville & Wood-Harper, 1998). The strategy has the aims of improvement and involvement where, ‘involvement refers to the participation of practitioners in all phases of planning, acting, observing, reflecting; improvement in the situation in which a particular social practice takes place, the understanding practitioners have of their practice, the practice itself, or all of these’ (Schwandt, 1997, p. 2) One way of promoting the wider use of ICT is by encouraging practitioners to take part in and share their experiences through action research (Selwood & Twining, 2005).

A sustainable framework for ICT, in this research outcome, could be a basis for future work. The integration of ICT for instructional purposes could improve educational change. In addition, the alternative, action research method, could be fitted to the study through the complexity of the management of change, and also the improvement of teaching, the multiple stakeholders interaction (sometimes in a collaborative manner), and negotiating the process of conflict. This research showed that the integration of ICT into the island school context is one in which multiple stakeholders interact as part of complex systems which include: planned infrastructure, sound policies, supportive politics, cultural
relevance, responsive management, relevant human resources, co-operation, and sufficient finances

Future researchers should focus on sustainable ICT integration in many ways such as the uses of ICT to enhance school administration, effective teaching and learning. Some potential topics in the area of instructional practices for supporting nomadic people might include: distance learning, on-line learning and ICT for remote communities. While people like Bailey and Lumley (1997) are researching effective technology staff development programs, more research needs to be done. As new technologies are developed, researchers will be required to assess a suitable framework for integration of technology for incorporation into educational practice.

In addition, further research related with ICT in education will be very important. The researchers should shift away from only looking at the infrastructure development to understanding the social context and the people who use the technology in the particular context. Finally implementing ICT into a specific context needs a sustainable framework for success.
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Appendices
Appendix A Letters

Appendix A1 Letter to director of ESA

Manchester Business School
The University of Manchester
Booth Street West
Manchester
M15 6PB
www.mbs.ac.uk

05 February 2008

Subject: Request for your kind assistance with my research study

Dear Director The Office of Satun Educational Service Area

My name is Mr.Aumnat Tongkaw. I am a PhD student at the Manchester Business School, The University of Manchester, United Kingdom. My research topic is " The Integration of Information and Communication Technology into Island schools: Case study of Satun Province, Andaman Sea, South of Thailand. I have been sponsored by the Faculty of science and technology, Songkhla Rajabhat University, Thailand.

The purpose of this study is to investigate used ICT in island schools relating with education Management and teaching and learning. I am writing to seek your help with a research study through interviews, context study and observation.

I would like to conduct taped interviews with you and your staff

I do hope that you will feel able to assist in this research study. I am looking forward to your response. I shell be happy to provide any further details that you require. Please contact Mr.Aumnat Tongkaw. The telephone is 074-322809, 074 - 337558 and Email: aum1967@yahoo.com

Yours sincerely,

Asst. Professor Aumnat Tongkaw
Appendix A2 Reply Letter

The Office of Satun Educational Service Area
Address : 884 Yontrakankamthorn Rd. Tambol Khongkud Maung District Satun Province 91000 Tel. 0-7472-1380, 0-7471-1239, 0-7471-1237, 0-7472-1885 Fax 0-7472-1224
www.osesa.net

03 March 2008

Subject : The research study for Ph.D. Course
Re: Letter: The University of Manchester, dated 05 February 2008

Dear Sir/Madam

This letter refer Mr.Aumnat Tongkaw, a lecturer of Department of Computer Science, Faculty of Science and Technology, Rajabhat Songkhla University, Thailand, who is studying for his Ph.D. Program at Manchester Business School, The University of Manchester, United Kingdom. His is collecting data for his research in topic: The integration information and communication technology into island school, South of Thailand. The researcher selects case studies at Satun provinces under authorize by The Office of Basic Education Satun Province, Thailand.

The Office of Basic Education Satun Province considers that expected outcomes of the study will be beneficial to the development island school group. The Office of Basic Education Satun Province appreciates to give any information which will be beneficial too his research study.

Sincerely Yours,

Mr.Adinan Pakbara
Director
Appendix B Consent Form

CONSENT FORM

Title of Research: “The Integration of Information and Communication Technology into Island schools: Case study of Satun Province, Andaman Sea, South of Thailand.”

• I confirm that I have been given and have read and understood the information sheet for the above study and have asked and received answers to any questions raised

• I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason and without my rights being affected in any way

• I understand that the researchers will hold all information and data collected securely and in confidence and that all efforts will be made to ensure that I cannot be identified as a participant in the study (except as might be required by law) and I give permission for the researchers to hold relevant personal data

• I agree to take part in the above study

___________________________________   _______________________________ __________
Name of person taking consent                                      Signature                                 Date

Position:______________________________________________________________________

Name of Organisation: __________________________________________________________

Job Experience: _______________________________________________________________

Mr. Aumnat Tongkaw  ____________________________________________ __________
Name of Researcher                                                        Signature                                 Date
Appendix C Interview Questions

Interview Questions (Director of The Satun ESA)

1. ท่านช่วยบอกรายละเอียดเกี่ยวกับท่านและประสบการณ์การทำงานทั้งหมด
   Can you tell me some personal details including your background and experience in your careers?

2. ท่านช่วยเล่าประวัติการดำเนินการติดตั้งไอซีทีในกลุ่มโรงเรียนบนเกาะทั้งหมด พร้อมบอกรายละเอียดที่เกี่ยวข้องมาทั้งหมด
   Can you describe the history of ICT implementation in your island school with some details?

3. ทำไมโรงเรียนบนเกาะต้องติดตั้งระบบไอซีที ระบบนี้สำคัญอย่างไร
   Why do island schools need ICT implementation? Why is it important?

4. ท่านได้ใช้ไอซีทีโพลีซีหรือไอซีทีแปลนสำหรับการติดตั้งไอซีทีบนเกาะหรือไม่
   Have you used any ICT policies or strategies to plan guidelines for implementation on the island schools?

5. ท่านช่วยบอกรายละเอียดของประโยชน์ของการติดตั้งไอซีทีสำหรับกลุ่มโรงเรียนบนเกาะว่ามีประโยชน์อย่างไร
   Can you explain the benefits of ICT implementation on the island schools?
   In your opinion, is ICT implementation on the island schools worth the investment?

6. การดำเนินงานเกี่ยวกับโครงการทางด้าน ICT สำหรับโรงเรียนบนเกาะประสบความสำเร็จมากน้อยเพียงใด มีอุปสรรคอะไรบ้าง
   How about the success of the ICT projects that are running on the island schools? What factors have obstructed the development?

7. ข้อผิดพลาดที่เกิดขึ้นในระหว่างการดำเนินงานเขตโรงเรียนบนเกาะในการใช้งาน ICT ว่าแตกต่างกันอย่างไรบ้าง
   What differences are there in using ICT in the mainland schools and on island schools?

8. ในการทำงานของท่านมีการใช้งานไอซีทีอย่างไรบ้างและไอซีทีได้ช่วยอะไรบ้างในหน่วยงานที่คุณทำงานและรวมถึงการทำงานคัดเลือกสาระไปยังโรงเรียนเกาะด้วย
How does your organisation utilise ICT? How has your organisation improved as a result of using ICT? Please comment particularly on any communication improvements island schools have with the outside world.

9. ท่านช่วยช่วยแนวทางการบริหารงานของกระทรวงศึกษาธิการในขณะนี้เหมาะสมหรือไม่ มีผลกระทบต่อหน่วยงานของท่านอย่างไร
Can you elaborate on the current administrative policy of the Ministry of Education? Do you think it is appropriate? How does it affect your organisation?

10. ท่านคิดว่าโครงสร้างการบริหารของโรงเรียนบนเกาะในปัจจุบันมีความเหมาะสมต่อการพัฒนาหรือไม่อย่างไร
In your opinion, does the administrative structure of each island school effectively facilitate development? How?

11. ท่านคิดว่าไอซีทีนอกจากช่วยงานการบริหารจัดการของโรงเรียน งานทางด้านการเรียนการสอนแล้ว ท่านคิดว่าไอซีทีมีประโยชน์ต่อสังคมของเกาะ หรือหน่วยงานอื่นๆ ถูกหรือไม่ อีกมีเหตุผลอย่างไร
Other than usefulness for school administration and teaching/learning, what other benefits does ICT have on the local organisations or island society in general?

12. ให้ท่านช่วยบอกแนวทางบริหาร การจัดการโรงเรียนแบบมีประสิทธิภาพ โดยเฉพาะไอซีทีท่านมีแผน ระเบียบ หรือยุทธศาสตร์อย่างไร และต่างจากโรงเรียนบนฝั่งอย่างไร
Can you describe the administrative policy for all the island schools, especially for ICT? What plans, rules, or strategies do you have? How are they different from those used for mainland schools?

13. ให้ท่านช่วยบอกถึงแผน ระเบียบ หรือยุทธศาสตร์ที่ท่านใช้ในปัจจุบันอย่างไร และท่านคิดว่ามีวิธีการปรับปรุงอย่างไร
Can you describe the advantages and disadvantages of the current plans, rules, and strategies? How should they be improved?

14. ท่านคิดว่ามีปัญหาอะไรบ้างที่เป็นอุปสรรคในการพัฒนาระบบ ไอซีทีในโรงเรียนบางๆ ให้ท่านช่วยบอกรายละเอียดว่าอุปสรรคนั้นเป็นอย่างไร เกิดขึ้นเพราะอะไร เมื่อไร และอย่างไร
In your opinion, what obstacles have been found in implementing ICT in the island schools? Can you describe the obstacles in details (what, when, how, and why)?

15. ท่านช่วยบอกความแตกต่างระหว่างโรงเรียนบนเกาะกับโรงเรียนบนฝั่งในเรื่องที่เกี่ยวกับอุปสรรคการใช้งานไอซีทีว่าเหมือนกัน หรือแตกต่างกันอย่างไร เพราะเหตุใด
Can you describe any similarities and/or differences in the obstacles met when using ICT in the context of island schools and mainland schools? Please explain the reasons behind these similarities and differences.

16. ท่านช่วยบอกรายละเอียดของงบประมาณสนับสนุนทางด้านไอซีทีสำหรับโรงเรียนบนเกาะได้มาจากทางใครบ้าง อย่างไร
Can you describe the sources and methods of funding for ICT in island schools?

17. ท่านคิดว่าปัญหาทางวัฒนธรรมของคนบนเกาะเป็นอุปสรรคต่อการพัฒนาโครงการไอซีทีหรือไม่ อย่างไร
In your opinion, do any cultural problems on the island have any impact on ICT implementation? In what way?

18. คุณคิดว่าในปัจจุบันการใช้งานไอซีทีในโรงเรียนบนเกาะนั้นประสบความสำเร็จมากน้อยเพียงใด อย่างไร
In your opinion, how successful is the island schools’ current ICT program?

19. คุณคิดว่าในอนาคตการติดตั้งไอซีทีสำหรับโรงเรียนบนเกาะเพื่อให้มีการพัฒนาแบบยั่งยืนมีปัจจัยอะไรบ้างที่ต้องคำนึงถึง และข้อถกเถียงและข้อตกลงของปัจจัยทั้งหมด และต้องทำอย่างไร
In your opinion, which factors contribute to the successful and sustainable implementation of ICT in island schools? Please describe each factor in details.

20. งบประมาณทางด้าน ICT สำหรับบนเกาะเพียงพอหรือไม่ คุณคิดว่าการลงทุนทางด้าน ICT น่าจะได้มาจากทางใดบ้าง และปัจจุบันได้อย่างไร ได้รับอยู่ในจุบบันนี้ได้รับประมาณเท่าไรเปอร์เซ็นต์ เมื่อเทียบกับความต้องการ
Is the budget enough for ICT in the island schools? Are there ways that you can increase the ICT fund? How can you get that funds?

21. คุณคิดว่าในอนาคตการนำ ICT มาใช้งานสำหรับโรงเรียนบนเกาะนั้น น่าจะเป็นรูปแบบใด และต้องมีอะไรมาเกี่ยวข้องบ้าง
Can you describe the appropriate ICT for island schools in the future? What are the factors that should concern you? Why?

22. ในปัจจุบันการซ่อมแซมเครื่องคอมพิวเตอร์ของโรงเรียนมีการดำเนินการอย่างไร ทำไมปัญหาจะเกิดขึ้น และคุณคิดว่าถ้าไม่มีประสบการณ์นักจะดำเนินการอย่างไร
Do you maintain and fix ICT equipment in the school? How?
Interview Questions (Head Teacher)

1. ท่านช่วยบอกถึงอาชีพที่ทำมาและประสบการณ์การทำงานทั้งหมด
Can you tell me some personal details including your background and experience in your careers?

2. ให้ท่านช่วยบรรยายการทำงานทั้งหมด วิธีการทำงาน พร้อมบอกรายละเอียดที่เกี่ยวข้องมาทั้งหมด
Can you describe the history of ICT implementation in your island school with some details?

3. ทำไมโรงเรียนบนเกาะมีความจำเป็นต้องมีระบบ ICT สำหรับนั้นสำคัญอย่างไร
Why do island schools need ICT implementation? Why is it important?

4. ท่านได้ใช้ ไอซีที โพลีซี หรือ ไอซีที แปลน สำหรับการติดตั้งไอซีทีบนเกาะหรือไม่
Have you used any ICT policies or strategies to plan guidelines for implementation on the island schools?

5. การดำเนินงานเกี่ยวกับโครงการทางด้าน ICT สำหรับโรงเรียนบนเกาะประสบความสำเร็จมากน้อยเพียงใด มีอุปสรรคอะไรบ้าง
How about the success of the ICT project that have been implemented in your school? What factors have obstructed the development?

6. กุ้งช่วยอธิบายว่าโรงเรียนของท่านบริหารโดยกระทรวงศึกษาธิการ สำนักงานเขตพื้นที่ และ องค์การบริหารส่วนตระบถ ดีหรือไม่ดีอย่างไร
What do you feel about being under two authorities, ESA and SAO?

7. ในโรงเรียนของท่านมีการใช้งานไอซีทีอย่างไรบ้าง แล้วไอซีทีได้ช่วยอะไรบ้าง ที่โรงเรียนมีประสิทธิภาพที่ดีขึ้นกว่าเดิม
How does your school utilise ICT? What are advantages and disadvantages of ICT?

8. กุ้งได้ใช้คอมพิวเตอร์ในการบริหารงานในโรงเรียนอย่างไรบ้าง
In what way do you use the computers for management in your island school?

9. กุ้งได้ใช้คอมพิวเตอร์ในการเรียนการสอนหรือไม่
Do you integrate ICT into your curriculum? How?
10. Can you elaborate on the current administrative policy of the Ministry of Education? Do you think it is appropriate? How does it affect your organisation?

11. In your opinion, does the structure of the island school administration effectively facilitate development? How?

12. Other than usefulness for school administration and teaching/learning, what other benefits does ICT have on the local organisations or island society in general?

13. Have you ever been trained in any specific topic of ICT? Please describe?

14. Can you describe the advantages and disadvantages of the current plans, rules, and strategies? How should they be improved?

15. In your opinion, what are the obstacles in implementing ICT in your school? Can you describe any obstacles in detail?

16. Can you describe any similarities and/or differences in the obstacles met when using ICT in the context of island schools and mainland schools? Please explain the reasons behind these similarities and differences.

17. Can you describe the advantages and disadvantages of using ICT in the context of island schools and mainland schools? Please explain the reasons behind these similarities and differences.
Can you describe the sources and methods of funding for ICT in your school?

18. ผ่านคิดว่าปัญหาทางวัฒนธรรมของคนทำเป็นอุปสรรคต่อการพัฒนาโครงการไอซีทีหรือไม่ อย่างไร  In your opinion, do any cultural problems on the island have any impact on ICT implementation? In what way?

19. คุณคิดว่าปัจจุบันการใช้งานไอซีทีในโรงเรียนบนเกาะนั้นมีประสิทธิภาพมากหรือไม่ อย่างไร  In your opinion, how successful is your schools’ current ICT program?

20. คุณคิดว่าอนาคตการติดตั้งไอซีทีสำหรับโรงเรียนบนเกาะนั้นประสบความสําเร็จมากนั้นเพียงใด อย่างไร  In your opinion, which factors have contributed to the successful and sustainable implementation of ICT in your school? Please describe each factor in detail.

21. งบประมาณทางด้าน ICT สำหรับบนเกาะเพียงพอหรือไม่ คุณคิดว่าปัจจุบันการมีการจัดหางบประมาณ ICT น่าจะได้มาจากทางใดบ้าง และปัจจุบันได้มีการจัดหาได้อย่างไร ได้รับจากองค์กรหรือโครงการใดๆบ้าง ที่สามารถให้กองทุน ที่ได้รับได้มาจากความต้องการ Is there enough budget for ICT in your school? How do you get your funds? Which way that you can increase ICT fund?

22. คุณคิดว่าอนาคตการนํ้า ICT มาใช้งานสำหรับโรงเรียนบนเกาะนั้น น่าจะเป็นรูปแบบใด และต้องมีอะไรเกี่ยวข้องบ้าง Can you describe an appropriate ICT profile for your school in the future? What factors should you be concerned with?

23. ในการซ่อมเครื่องคอมพิวเตอร์ของโรงเรียนนี้มีการตั้งค่าในการเรียกใช้ไม่ คุณคิดว่ามีปัญหาอะไรบ้าง และ คุณคิดว่าที่เกิดปัญหาได้มีการแก้ไขได้อย่างไร How do you maintain and fix ICT equipment in your school?

24. ท่านคิดว่าปัญหาที่เกิดขึ้นกับ ICT ที่หน่วยงานในโรงเรียนของท่านที่ประสบในปัจจุบันมีอะไรบ้าง What problems, if any, relate to ICT in your school?

25. โรงเรียนเคยมีแผนพัฒนา ครูทางด้าน ICT หรือไม่ ท่านอยากให้เป็นอย่างไร Do you have any human resource development plans for improving the ICT knowledge of your teachers?

26. เด็กนักเรียนมีโอกาสในการเข้าถึงคอมพิวเตอร์มากน้อยเพียงใด ท่านได้แก้ปัญหาอย่างไร (ตอบเป็นสัดส่วนก็ได้)
Do you have any comments about the ratios of student to computer access in your school?

27. ท่านเห็นด้วยหรือไม่หากจะมีการร่วมมือระหว่างโรงเรียนเกาะต่างกันเพื่อพัฒนาระบบ ICT ที่เหมาะสมสำหรับพื้นที่และติดต่อสื่อสารแลกเปลี่ยนเรียนรู้ที่ดีกว่ากับการเรียนการสอน หรือการจัดการโรงเรียน และมีโอกาสเป็นไปได้มากขึ้นอย่างไร

Do you think the twelve island school committees, that support ICT development in specific areas, can communicate well with each other, when they meet, about teaching, learning and knowledge sharing?

Interview Questions (Teachers)

1. ท่านช่วยบอกรายละเอียดเกี่ยวกับตัวท่านและประสบการณ์การทำงานทั้งหมด
Can you tell me your personal details including your background and experience in your careers?

2. ให้ท่านช่วยกระทำการการติดตั้ง ไอซีที ไปโรงเรียนบนเกาะ พร้อมบอกรายละเอียดที่เกี่ยวข้องมากที่สุด
Can you describe the history of ICT implementation in your island school with some details?

3. ทำไมโรงเรียนบนเกาะจะมีความจำเป็นต้องติดตั้งระบบไอซีทีสำหรับนั้นสาคัญ อย่างไร
Why do island schools need ICT implementation? Why is it important?

4. ท่านช่วยบอกประโยชน์ของไอซีที ที่ติดตั้งในโรงเรียน ว่ามีอะไรบ้าง มีประโยชน์อย่างไรบ้าง
What are the main benefits of implementing ICT into the island school?

5. การดำเนินงานเกี่ยวกับโครงการทางด้าน ICT สำหรับโรงเรียนบนเกาะ ประสบความสำเร็จมากน้อยเพียงใด มีอุปสรรคอะไรบ้าง
How about the success of the ICT project that have been implemented in your school? What factors have obstructed the development?

6. คุณช่วยอธิบายว่าโรงเรียนของท่านบริหารโดยกระทรวงศึกษาธิการ สำนักงานเขตพื้นที่ และองค์การบริหารส่วนตำบลดีหรือไม่ดีอย่างไร
What do you feel about being under two authorities, ESA and SAO?

7. โรงเรียนของท่านมีการใช้งานไอซีทีอย่างไรบ้าง แล้วไอซีทีได้ช่วยอะไรบ้าง ที่โรงเรียนมีประสิทธิภาพที่ดีขึ้นกว่าเดิม?
How does your school utilise ICT? What are advantages and disadvantages of ICT?
8. คุณได้ใช้คอมพิวเตอร์ในการบริหารงานในโรงเรียนอย่างไรบ้าง

In what way do you use the computers for management in your island school?

9. คุณได้ใช้คอมพิวเตอร์ในการเรียนการสอนหรือไม่

Do you integrate ICT into your curriculum? How?

10. คุณเคยได้รับการอบรมบางหน่วยงานหรือไม่ อย่างไร

Have you ever been trained in any specific topic of ICT? Please describe?

11. คุณได้ใช้คอมพิวเตอร์ในการบริหารงานของกระทรวงศึกษาธิการในขณะนี้เหมาะสมหรือไม่ มีผลกระทบต่อหน่วยงานของคุณอย่างไร

Can you elaborate on the current administrative policy of the Ministry of Education? Do you think it is appropriate? How does it affect your organisation?

12. คุณคิดว่าโครงสร้างการบริหารของโรงเรียนบนเกาะนี้เหมาะสมหรือไม่ อย่างไร

In your opinion, does the structure of the island school administration effectively facilitate development? How?

13. คุณคิดว่าไอซีทีนอกจากช่วยงานการบริหารจัดการของโรงเรียน งานทางด้านการบริการการสอนแล้ว คุณคิดว่าไอซีทีมีประโยชน์ต่อสังคมของเกาะหรือไม่ หรือหน่วยงานอื่นๆ หรือไม่ อีกทั้งยังมีผลกระทบต่อการพัฒนาหรือไม่ อย่างไร

Other than usefulness for school administration and teaching/learning, what other benefits does ICT have on the local organisations or island society in general?

14. ให้คุณช่วยเล่าเต็มๆ แผน ระเบียบ หรือ ยุทธศาสตร์ ที่คุณใช้ในโรงเรียน แล้ว คุณคิดว่ามีวิธีการปรับปรุงอย่างไร?

Can you describe the advantages and disadvantages of the current plans, rules, and strategies? How should they be improved?

15. คุณคิดว่ามีปัญหาอะไรบ้างที่เป็นอุปสรรคในการพัฒนาระบบ ไอซีที ในโรงเรียนคุณ ให้คุณช่วยบอกรายละเอียดว่าเป็นอุปสรรคที่เป็นอย่างไร เกิดขึ้นเพราะอะไร แก้ไขได้หรือไม่ และอย่างไร

In your opinion, what are the obstacles in implementing ICT in your school? Can you describe any obstacles in detail?
16. ท่านคิดว่าความแตกต่างระหว่างโรงเรียนบนเกาะกับโรงเรียนบนฝั่งในเรื่องเกี่ยวกับอุปสรรคการใช้งานไอทีที่ว่าเหมือนกัน หรือแตกต่างกันอย่างไร เพราะเหตุใด
Can you describe any similarities and/or differences in the obstacles met when using ICT in the context of island schools and mainland schools? Please explain the reasons behind these similarities and differences.

17. ท่านคิดว่ารายละเอียดของงบประมาณสนับสนุนทางด้านไอทีสำหรับโรงเรียนบนเกาะได้มาจากทางใดบ้างอย่างไร
Can you describe the sources and methods of funding for ICT in your school?

18. ท่านคิดว่าปัญหาวัฒนธรรมของการสมัครเป็นอุปสรรคต่อการพัฒนาโครงการไอทีหรือไม่ อย่างไร
In your opinion, do any cultural problems on the island have any impact on ICT implementation? In what way?

19. คุณคิดว่าในปัจจุบันการใช้งานไอทีในโรงเรียนบนเกาะนั้นประสบความสำเร็จมากน้อยเพียงใด อย่างไร
In your opinion, how successful is your schools’ current ICT program?

20. คุณคิดว่าในอนาคตการติดตั้งไอทีสำหรับโรงเรียนบนเกาะเพื่อให้มีการพัฒนาแบบยั่งยืนมีปัจจัยอะไรบ้างที่ต้องคำนึงถึงและมีผลกระทบที่อาจเกิดขึ้นอย่างไร
In your opinion, which factors have contributed to the successful and sustainable implementation of ICT in your school? Please describe each factor in detail.

21. งบประมาณทางด้าน ICT สำหรับโรงเรียนบนเกาะเพียงพอหรือไม่ คุณคิดว่ามีเงินลงทุนทางด้าน ICT น่าจะได้มาจากทางใดบ้าง และเงินนั้นได้มาอย่างไร
Is there enough budget for ICT in your school? How do you get your funds? Which way that you can increase ICT fund?

22. คุณคิดว่าในอนาคตการใช้ ICT มีการสมัครโรงเรียนบนเกาะนั้น น่าจะเป็นรูปแบบใด และต้องมีอะไรมาเกี่ยวข้องบ้าง
Can you describe an appropriate ICT profile for your school in the future? What factors should you be concerned with?

23. ในปัจจุบันการซ่อมแซมเครื่องคอมพิวเตอร์ของโรงเรียนมีการดำเนินการอย่างไร มีปัญหาอะไรบ้าง และคุณคิดว่าถ้าให้มีประสิทธิภาพน่าจะดำเนินการอย่างไร
How do you maintain and fix ICT equipment in your school?

24. ท่านคิดว่าปัญหาที่เกี่ยวข้องกับ ICT พื้นที่ของโรงเรียนของท่านที่ประสบในปัจจุบันมีอะไรบ้าง

What problems, if any, relate to ICT in your school?

25. โรงเรียนเคยมีแผนพัฒนา ครูทางด้าน ICT หรือไม่ ทานอยากให้เป็นอย่างไร
Do you have any human resource development plans for improving the ICT knowledge of your teachers?

26. เติมนักเรียนมีโอกาสในการเข้าถึงคอมพิวเตอร์มากเกินเพียงใด ทานได้แก่ปัญหาอย่างไร (ลองเป็นตัวตัวก็ได้)
Do you have any comments about the ratios of student to computer access in your school?

27. ทานเห็นด้วยหรือไม่ หากจะมีการร่วมมือกันระหว่างโรงเรียนกันเก่งด้วยกัน เพื่อพัฒนาระบบ ICT ที่ เหมาะสมสำหรับพื้นที่ และติดต่อสื่อสารกับนักเรียน หรือที่เกี่ยวกับการเรียนการสอน หรือการจัดการโรงเรียน และมีโอกาสเป็นไปได้มากน้อยแค่ไหน
Do you think the twelve island school committees, that support ICT development in specific areas, can communicate well with each other, when they meet, about teaching, learning and knowledge sharing?

Interview Questions (Students)

1. นักเรียนช่วยบอกหน่อยว่าได้ใช้คอมพิวเตอร์เรียนวิชาอะไรบ้าง
In which subjects do you use computers at school? Please give examples.

2. นักเรียนช่วยบอกหน่อยว่าได้ใช้คอมพิวเตอร์ในชีวิตประจำวันอย่างไรบ้าง พร้อมทั้งประโยชน์อื่นๆ ที่เจอ
How else do you use computers in your everyday life? Please give examples.

3. นักเรียนช่วยบอกรายละเอียดปัญหาการใช้งานคอมพิวเตอร์ในโรงเรียนว่ามีปัญหาอะไรบ้างอย่างไร
Could you explain, in some detail, the kind of problems that arise when you use computers in school?

4. คุณได้เรียนรู้อะไรใหม่จากครู บ้าง หลังจาก โรงเรียนติดตั้งไอซีที
Have you learnt anything new from your teachers after your school implemented ICT?

5. เคยใช้คอมพิวเตอร์นอกเวลาเรียนบ้างหรือไม่ ใช้ทำอะไร
Do you ever use the school computers outside scheduled school time? If so what do you use them for?
6. How do you think ICT might solve any problems that arise when nomadic students move with their fishermen parents from one island to another?

7. What are some of the advantages and disadvantages for students using ICT in the island schools? Please describe in some detail.

8. What do you think is an appropriate future profile for ICT in the island schools? What improvements do you think can be made in your school?

Interview Questions (Parents)

1. Has your school told you in any detail about implementing ICT in your children’s school (and how they can be used)?

2. What are the advantages and disadvantages of installing computers in to your children’s school? Why do you think this?

3. How do you think ICT might solve any problems that arise when nomadic students move with their fishermen parents from one island to another?

4. Does your child ever tell you in any detail about how they are using ICT in school? If so, what they use them for?

5. What are the good things about implementing ICT implementations in your children’s school? Why do you think this is?
6. Could you explain in some details any problems that arise when using computers in school? How does this happen?

7. What are the advantages and disadvantages for students using ICT in the island schools? Please describe any details?

8. What do you think is an appropriate future profile for ICT in the island schools? What improvements do you think can be made in your school?
## Appendix D1 Initial Template

### Finding Technical (T) Organisational (O) Personal (P)

<table>
<thead>
<tr>
<th>Potential benefits of implementing ICT</th>
<th>Technical</th>
<th>Organisational</th>
<th>Personal</th>
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<tbody>
<tr>
<td>tool for teaching and learning</td>
<td></td>
<td></td>
<td>uplift economic</td>
</tr>
<tr>
<td>tool for school administrator</td>
<td></td>
<td></td>
<td>uplift social</td>
</tr>
<tr>
<td>enhances education administration</td>
<td></td>
<td></td>
<td>developing society</td>
</tr>
<tr>
<td>reduces bureaucracy</td>
<td></td>
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<td></td>
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<tr>
<td>uplift economic</td>
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<td></td>
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<tr>
<td>uplift social</td>
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<table>
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<th>Personal</th>
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<tr>
<td>inadequate infrastructure</td>
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<td></td>
<td></td>
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<tr>
<td>limited computer</td>
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<td></td>
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<tr>
<td>limited software</td>
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<td>inadequate technologies</td>
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<td></td>
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<tr>
<td>policy</td>
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<td></td>
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<td></td>
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<tr>
<td>political Restrictions</td>
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<td></td>
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<tr>
<td>Restrictions</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>shortage of skilled manpower</td>
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<tr>
<td>lack of coordination</td>
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<td>lack of trained teachers</td>
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<th>Personal</th>
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<tr>
<td>should set up policies</td>
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<td></td>
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<tr>
<td>economic</td>
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<td>political</td>
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### Appendix D2 Second Template

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<td>• enhances education administration</td>
<td>• uplift economic</td>
</tr>
<tr>
<td></td>
<td>• tool for school administrator</td>
<td>• reduces bureaucracy</td>
<td>• uplift social developing society</td>
</tr>
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<td>• lack of financial resources</td>
<td>• shortage of skilled manpower</td>
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<td>• policy Restrictions</td>
<td>• lack of coordination</td>
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<td>• political Restrictions</td>
<td>• lack of trained teachers</td>
</tr>
<tr>
<td>sustainability of implementing ICT</td>
<td>• infrastructure,</td>
<td>• should set up policies</td>
<td>• social and cultural understanding</td>
</tr>
<tr>
<td></td>
<td>power electric, telephone line, broadband,</td>
<td>• economic</td>
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</tr>
<tr>
<td></td>
<td>hardware and software.</td>
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### Appendix D3 Final Template

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Appendix E Pictures

Appendix E1 Disaster Monitoring Sign

Appendix E2 Gypsies travelling map
Appendix E3 Internet Satellite and Solar Cell
Appendix E4 Her Royal Highness Princess Maha Chakri Sirindhorn

Appendix E5 Gypsy house
Appendix E6 Adang Island

Appendix E7 Gypsy Settlement
Appendix E8 E-filing program
Appendix E9 Observation (computer room)
Appendix E9 Observation (island school context)
Appendix E10 Students fix computers
Definition of Terms

Educational technology: Educational technology involves using technological resources to aid school administrator, teaching and learning through the use of technology.

Implementation: In this study, implementation means how the teachers and students used technology; how often various technological tools were used; where technology was used; and to what degree or extent was technology being utilized.

Integration: Integration in this study was defined as the process of blending technology into education.

Mainland: Mainland is a name given to a large landmass in a region (as contrasted with a nearby island or islands). Sometimes its residents are called "Mainlanders". As a result of the usually larger area of mainland, there are significantly more mainlanders than islanders, and mainlander culture and politics sometimes threaten to dominate those of the islands.

Information and Communication Technologies (ICT): For this study technology is the myriad of electronic tools used to enrich the educational experiences of students. It includes, computers, laptops, digital cameras, scanners, projectors, and printers.

Technology integration: Technology integration is the process of using technology to achieve educational objectives and to cause students to engage in more meaningful learning experiences.

Technology training: Teachers expand their repertoire by learning to use word processing, databases, spreadsheets, and presentation graphics to enhance classroom teaching and learning activities.

Sea Gypsies or Sea Nomads refers to the semi nomadic boat people of the Malay language group which live in Adaman Sea, South-West Thailand. There have five sub groups, Chawlay, Urak Lawoi, Mawken, Moklen, Uraklawoi. The sea gypsies live in small settlements around the mangrove forests and their traditionally move around the islands due to the nomadic nature of their work, fishing and shell collecting. These peoples in fact each have distinctively different origins, culture and language.
Remote school refer to schools that located in remote area, lack of facilities, lack of basic infrastructure and lack of transport at least three months during the monsoon season.

Island school refer to island school group (twelve schools) located in Andaman Sea South-West Thailand and under Satun province authority.

Education Reform: A process designed to bring about change throughout the educational system.

Technology in the Classroom: For this study, encompasses the use of computers or other computer-related software and Internet.

Technology plan: a written document developed by MOE or Education Service Area using a formal planning process that contains the blueprint for implementing educational technology in province.