EMPIRICAL STUDY OF INFLUENCERS OF DEVELOPMENT OF BHUTANESE EDUCATION TECHNOLOGY

Mr. Sherab Tenzin

A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science Program in Computer Science and Information

Technology

Department of Mathematics and Computer Science

Faculty of Science

Chulalongkorn University

Academic Year 2013

Copyright of Chulalongkorn University

การศึกษาเชิงประจักษ์ของสิ่งที่มีอิทธิพลต่อการพัฒนาเทคโนโลยีการศึกษาของชาวภูฏาน

นายเซเร็บ เทนซิน

Thesis Title	EMPIRICAL STUDY OF INFLUENCERS OF DEVELOPMENT OF BHUTANESE EDUCATION TECHNOLOGY
By	Mr. Sherab Tenzin
Field of Study	Computer Science and Information Technology
Thesis Advisor	Assistant Professor Pattarasinee Bhattarakosol, Ph.D.

Accepted by the Faculty of Science, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

....Dean of the Faculty of Science

(Professor Supot Hannongbua, Dr.rer.nat.)

THESIS COMMITTEE

....Chairman

(Assistant Professor Nagul Cooharojananone, Ph.D.)

....Thesis Advisor

(Assistant Professor Pattarasinee Bhattarakosol, Ph.D.)

....External Examiner

(Kanokwan Atchariyachanvanich, Ph.D.)

เซเร็บ เทนซิน : การศึกษาเชิงประจักษ์ของสิ่งที่มีอิทธิพลต่อการพัฒนาเทคโนโลยี
การศึกษาของชาวภูฏาน. (EMPIRICAL STUDY OF INFLUENCERS OF
DEVELOPMENT OF BHUTANESE EDUCATION TECHNOLOGY) อ.ที่ปรึกษา
วิทยานิพนธ์หลัก: ผศ. ดร. ภัทรสินี ภัทรโกศล, 66 หน้า.

บทคัดย่อ

    ผลจากการพัฒนาทางเทคโนโลยี นักการศึกษาทั้งหลายจึงมีความปรารถนาที่จะใช้
ความสามารถของโลกดิจิทัลเพื่อสร้างประโยชน์ให้แก่ระบบการศึกษา ยุคของโลกดิจิทัลได้ให้
โอกาสที่ไม่เคยเกิดขึ้นมาก่อนในการสนองตอบต่อความฝันที่ได้สร้างขึ้น พลังแห่งโลกดิจิทัลได้
ส่งเสริมให้นักเรียนสามารถเชื่อมต่อถึงกันได้ตลอดเวลา ในทุกขณะแม้อยู่ภายนอกห้องเรียนก็
สามารถเรียนรู้ผ่านระบบการศึกษาได้ในมิติที่แตกต่างกัน และยังนำไปสู่ช่องทางที่เรียบง่ายต่อการ
สอนและการเรียนรู้ นอกจากนี้แล้วยังเป็นการสร้างบรรยากาศในการเรียนการสอนให้มีความ
เพลิดเพลินสนุกสนานได้อีกด้วย ผู้ปกครอง ครูและนักเรียนมีความคล้ายคลึงกันในส่วนที่มีความ
ปรารถนาอย่างแรงกล้าที่จะทำงานและเรียนรู้ในโรงเรียนที่มีการใช้คอมพิวเตอร์เป็นอุปกรณ์ช่วย
ในการเรียนรู้อย่างสมบูรณ์ นักวิชาการหลายท่านได้ศึกษาและให้ข้อสรุปไว้ว่า การใช้เทคโนโลยี
เพื่อเป็นส่วนหนึ่งของระบบการสอนและการเรียนในโรงเรียนเป็นสิ่งที่พึงกระทำ นอกจากนี้แล้ว
บางงานวิจัยยังได้ให้ข้อสรุปไว้ว่าเทคโนโลยีสารสนเทศและการสื่อสารจำเป็นต้องประยุกต์ใช้เพื่อ
การศึกษาเพื่อสร้างความเชี่ยวชาญสู่เยาวชนรุ่นใหม่ ความเชี่ยวชาญในทศวรรษที่ 21 มุ่งเน้นให้
นักเรียนเป็นศูนย์กลางแห่งการเรียนรู้ ตอบสนองต่อคำว่าระบบการศึกษาเพื่อเด็กทุกคนและเพื่อ
บุคคลทุกคน ปัจจุบันชาวภูฏานกำลังอยู่ในยุคแห่งการปฏิวัติทางเทคโนโลยี นักการศึกษาของ
ภูฏานสามารถใช้เทคโนโลยีเสมือนระบบสนับสนุนในการช่วยนักเรียนให้บรรลุความเป็นมืออาชีพ
ในทศวรรษที่ 21 ได้ งานวิจัยนี้ได้ค้นหาความจริงในมุมมองของการใช้เทคโนโลยีสารสนเทศของ
นักการศึกษาในประเทศภูฏานและยังพิจารณาถึงการบูรณาการเทคโนโลยีสารสนเทศนี้สู่การสอน
ในชั้นเรียน ผลการศึกษาได้แสดงให้เห็นแนวทางสู่การวางนโยบายและการออกแบบหลักสูตรใน
โรงเรียน นอกจากนี้แล้วการสำรวจในงานวิจัยนี้ใช้กลุ่มตัวอย่างจำนวน 466 คนที่เลือกจาก
คณาจารย์ทั่วประเทศ ซึ่งได้ข้อสรุปว่า คณาจารย์เหล่านั้นมีความเต็มใจที่จะเรียนรู้และบูรณาการ
เทคโนโลยีในการสอนของตน

ภาควิชา	คณิตศาสตร์และวิทยาการคอมพิวเตอร์	ลายมือชื่อนิสิต	....
		ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก	....
สาขาวิชา	วิทยาการคอมพิวเตอร์และเทคโนโลยีสารสนเทศ		
ปีการศึกษา	2556		

5572612823 : MAJOR COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
KEYWORDS: BHUTAN / ICT / TEACHING

SHERAB TENZIN: EMPIRICAL STUDY OF INFLUENCERS OF DEVELOPMENT OF BHUTANESE EDUCATION TECHNOLOGY. ADVISOR: ASST. PROF. PATTARASINEE BHATTARAKOSOL, Ph.D., 66 pp.

Since the development of technology, educators have aspired to leverage the power of digital advantage to enhance their education system. The digital age has brought unprecedented opportunities to pursue that dream. The power that the digital world offers to keep students connected every time, even while on the move has provided a different dimension to the education system and provided path to simplify teaching and learning. It has made learning and teaching enjoyable and fun. Parents, teachers and students alike are fascinated to work and study in schools that are well equipped with computing tools. Many scholars have carried out studies and concluded technology should be a part of teaching and learning in the schools. In addition, some have concluded that ICT needs to be applied in education to provide new skills to the new younger generation. These 21st century skills focus on student centered learning toward the "whole child", the "whole person" education system. Currently, Bhutanese lives in an era of dramatic technological revolution. Bhutanese educators can use technology as a support system to help students achieve proficiency in 21st century skills. This research investigates the perception of ICT by Bhutanese academic staff and also it's integration into classroom teaching. The result provides guidance to the policy and curriculum designers of school. A self-report survey amongst 466 randomly chosen teachers around the country revealed that teachers are willing to learn, and integrate technology into their teaching.

Department:	Mathematics and Computer Science	Student's Signature	....
Field of Study:	Computer Science and Information Technology	Advisor's Signature	....
Academic Year:	2013		

ACKNOWLEDGEMENTS

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Background and importance

Traditional method of teaching is not the preferred method of instruction since the learners who assume a passive role can remain fully concentrated only for about 15-20 minutes (Damodharan & Rengarajan). New modern methods emphasizing on collaborative learning, communication skills, and problem based styles to stimulate critical thinking are emerging and adopted in schools. Technology can play a pivotal role in helping teachers to migrate from traditional to modern methods of teaching. According to Gyeltshen (2013) integrating ICT in classroom "creates stimulating and empowering learning experience, hone creativity and critical thinking skills, teacher enjoys a more varied and challenging teaching experience, creates ownership of their learning, and enhances learning resources". Khan and Hasan (2012) pointed out that ICT carries the potential to change the nature of education.

Figure 1.1: Primary school students

The Education Ministry, Royal Government of Bhutan have recognized the benefits of ICT integration in education and included plans to increase ICT facilities in schools and teacher training colleges in the 10th Five-Year Plan (BICMA, July 2004). With the 10th Five-Year Plan ended, many schools have been equipped with basic IT infrastructures and almost every teacher has been trained in the use of ICT resources through various projects, workshops, SBIP (School Based In-service Program), and trainings. A module called FIT (Functional IT) is offered for every teacher trainee in the Teacher Training College. Despite these various efforts from the government, it is not clear if ICT adoption into the classroom is taking place. Ward (2003) found that even in very strong ICT Schools, ICT integration in the classroom was found to be minimal. No study has been conducted to measure the extent to which adoption of technology has taken place in Bhutan. The survey carried out with 466 teachers across different schools in Bhutan aims to find out to what extent Bhutanese teachers practice ICT in their classrooms, study the factors impacting technology integration in teaching and then suggests recommendations to ensure utilization of ICT in classroom.

Figure 1.2: Primary school students enticed with technology(Reporter, 2013)

1.2 Problem Formulation

Many factors contribute to actual integration of technology into the classroom by teachers. However, studies around the world have revealed that some factors

matters more than others. Also the differences in factors that affect ICT integration exist from country to country. In case of Bhutan, ICT is just getting introduced in the schools and into the school curriculum. Many schools do not have ICT policy formulated yet. The findings from this study are encouraging. It has shown that Bhutanese academic staffs are ready and willing to welcome the introduction of technology in the teaching/learning process. Attitude of teachers towards technology and technology use is positive, which is considered one of the major obstacles to ICT integration in the classroom teaching. Yet there are hindrances as well in which not unexpected. The hindrance identified by the study is mainly with regard to lack of ICT facilities in schools and budget shortages or unavailability for resource development. Teachers seem to be lacking in ICT skills. ICT training is not conducted regularly and those few that are conducted seem inappropriate or seem to be lacking quality, either training duration is too short or inappropriate to their subject. This study seeks to answers those inquisitions with the hope and wishes that it may aid the development of better Bhutanese education system.

1.3 Objective

The objective of this research is to identify perceptions of Bhutanese academic staff towards the ICT usages and to identify factors that influence the integration of ICT in classrooms by Bhutan academic staff. The different demographic details such as gender, teaching experience and ICT trainings will be associated with different factors and will be analysed to extract differences in the ICT adoption due to these factors.

1.4 Scope of thesis

Scope of thesis is as listed below:

1. 34 items questionnaire was designed. 6 questions inquired the demographic background of the respondents, 28 were items that the respondents needed to rate their feelings on statements presented on a 5 point scale.

2. The questions were written and presented in English to all the respondents.

3. Volunteers involve in the study are teachers ranging from primary school to higher secondary schools in all parts of Bhutan.

4. The total data collection period was approximately 1 month.

1.5 Benefit

Since this study would identify the shortcoming of the education ministry as well as the teachers' errors pertaining to technology integration, and provide corrective suggestions to enable formulation of policies and plan to integrate ICT in classroom teaching, it would help teachers spice up their teaching with the use of technology. Students would benefit the luxury of experiencing verities of teaching and learning methodologies eventually maximize their learning outcome.

1.6 Limitation of the study

The author is aware of many factors that may have significant impact that are not included in this study. The sample included in the study is too vast. It includes all teachers irrespective of their teaching subject and the grade level they teach. The study would have yielded much better understanding of the problems if the methods chosen were a combination of survey and case study as it was shown by Gable (1994) that it is always best to utilize several methods of data collection to adequately address the impacts of information technology.

1.7 Thesis structure

The thesis is organized following the structure described below:

Chapter1: This chapter contains introduction wherein background and importance, problem formulation, objective, scope of thesis, benefit and limitation of the study are explained.

Chapter2: This chapter deals with all the fundamental knowledge and review of literature associated with the paper.

Chapter3: This chapter describes the methodology adopted to carry out the study.

Chapter4: In this chapter, analysis methods adopted are explained.

Chapter5: Result and discussion forms contents.

Chapter6: The paper ends with conclusion.

CHAPTER 2

LITERATURE REVIEW

This chapter will present background information regarding ICT in the country and in the schools. It will be followed with review of recent literature on factors affecting teachers' technology adoption in classroom teaching and related aspects.

2.1 Internet in Bhutan

The Internet service in Bhutan started in June 1999 which was provided by the only ISP Druknet in the entire kingdom. In the year 2000, only 3000 computers existed in the country(Tshering, 2013). Though the Internet was introduced late in the country, it spreads rapidly and is now accessible throughout the country and almost everybody who wishes can have access to the Internet from a number of services provided, especially via cellular network.

2.2 Overview of ICT in schools of Bhutan

Bhutan has 553 schools, 176,647 students, and 7932 teachers as of May 2012. 3912 teachers have laptops and 687 have desktops(Gyeltshen, 2013). There are 137 computer laboratories and 3046 working computers in different schools(Education, 2012). 136 schools do not have electric connectivity. 118 schools do not have working land line phones. 409 schools have the Internet connection. 155 have the Internet access only to school administration while 245 provide access to teachers and students. Most schools that are connected to the Internet use dialup connection which is too slow for distribution into the school lab. A few MSS and HSS have now access to lease line(Education, 2012). 35 HSS are connected to lease line. 194 schools have projectors and 124 schools have scanners(Gyeltshen, 2013).

2.3 Areas of Technology use in Teaching

Maintaining students' record, compiling students result and developing question paper remains the prime use of technology by teachers in the schools of Bhutan. According report by Gyeltshen (2013), academic usage of technology in Bhutanese school is dominated by preparing question papers with more than 60% of teachers reported to have used technology for the purpose. Almost 50% of the teachers

reported to have used computing technology for compiling results. The report also shows teachers do sometimes use technology for making classroom presentation, search information using Google and develop lesson plans.

2.4 ICT integration

ICT integration means the use of ICT tools to complement and assist teaching and learning(Buabeng-Andoh, 2012; Reid, 2002). IT adoption in teaching has to be innovative to bring about change in learning and teaching and not just to supplement textbooks and chalk board(Ward, 2003).

Many studies have pointed out that the success to implement ICT in classroom teaching depends on a number of interrelated factors and not on any single factor(Drent & Martina, 2007). Al-Senaidi, Lin, and Poirot (2009) identified five factors in their study of 100 teachers to identify the barriers to adopting information and communication technologies in Omani higher education. The factors are lack of equipment, lack of institutional support, disbelief of ICT benefits, lack of confidence, and lack of time. In a qualitative study with teachers who were highly innovative, skilled and educated with technology, Bauer and Kenton (2005) through the study discovered that these technologically efficient teachers were not successful in implementing technology on a daily basis for teaching or to aid learning. The reasons they pointed out were students' limited ICT skill which was worsened by shortage of time to practice ICT skills. Teachers also needed extra time for lesson planning. Lack of proper and appropriate software, difficulties in solving technical issues and hardware getting outdated and being unable to replace with latest ones were other reasons they identified.

2.5 Teacher at the centre of ICT implementation

The persons that are directly involved in driving changes in a classroom are the teachers. When it comes to implementation with regard to bringing changes in the classroom, it is the teachers that are responsible; hence the centre of ICT implementation should also be the teachers. Studies have shown despite ample resources and support from management and ministry, teachers interest and attitude would decide the actual adoption in the classroom. If teacher believes that the effort required to use technology is more and observes limited advantage of technology use in the classroom and decides not to use, the fate of the technology

driven teaching and learning is doomed. Mumtaz pointed out that ICT integration would be limited and would remain a distant goal if teachers are not the focus of such project. The study also stated that teachers should be at the core of ICT integration projects. In another study, Frank, Mary, and Dzomeku (2011) agreed teachers to be the centre of the ICT implementation. Their finding showed that the technological skills of the teachers greatly affected how ICT implementation benefited the students. The student responses in their study indicated that they were not really benefiting when the technological skill of the teachers were limited.

2.6 Attitude

Studies have found that attitude explains more in technology adoption by teachers in their classes (Afshari, Bakar, & Luan, 2009). Abdulkafi (2004) pointed out that "teachers' attitudes toward computer are major factor related to both the initial acceptance of computer technology as well as future behaviour regarding computer usage". Afshari et al. (2009) said that teachers need to possess positive attitude to use technology if they wanted to be successful in technology use in their classes. If a teacher does not see the advantage of technology over their traditional teaching they would not bother to take the additional burden to learn and use ICT. Attitude of teacher is linked to other factors such as their ICT skills and confidence. A teacher who is incompetent will be on unfamiliar ground while using technology and out of his or her comfort zone. In a study by Snoeyink and Ertmer mentioned in BECTA (2004), it is important for a teacher to be comfortable while teaching even at the cost of avoiding the best teaching method. Therefore, it is understandable that attitude of teachers towards ICT can be a reason why teachers resist change to a better and current method of teaching with technology. Baylor and Ritchie (2002) found in their work, that teacher's openness to change and technology integration have strong correspondence. Their study revealed those teachers who were open to change easily accepted to adopt technology integrated teaching. Some studies have shown if teachers have positive attitude towards technology, they managed to integrate technology in spite of resource shortages.

2.7 Training

Positive attitude Afshari et al. (2009) could be developed only when teachers are sufficiently comfortable and knowledgeable on its use, stressing the need for proper

training. Other studies also suggested that a proper training is necessary to bring about the required change in the attitude of teachers (Al-Senaidi et al., 2009). Reid (2002) also found that professional development activities to meet teachers' need were important to foster successful ICT integration. The research suggested that appropriate computer trainings for teachers should be carried out in the schools. Serge et al. (2009) found many teachers willing to be trained in ICT, probably to boost up their confidence in ICT by feeling qualified and feeling the advantages of ICT in their classes. To alter the view of computer use and foster positive change on attitude, Nair and Das (March 2012) also stressed the need to train teachers on ICT use. Inadequate preparation to use technology is cited by Afshari et al. (2009) as one of the reason why teachers do not use computer in their classroom. Almalk and Williams (2012) specifically stressed on the need for specific ICT trainings for teachers. Teachers in Bhutan are aware of existence of a world of useful information on the web, but fail to retrieve due to lack of skill and knowledge. With proper training teachers can be introduced to these tools and resources. Khan and Hasan (2012) observed that in-service teacher training as necessary and something that requires serious attention. Training would keep them in contact with the technology and their level of confidence and comfort would grow.

2.8 Social Influence

Many teachers come to know about the different ways to make use of technology or about technology through their friends. Friends and colleagues, including principal, provide knowledge and share the advantages that technology provides in teaching, which encourage teachers to use technology. It may be possible that social influence play a major role in leading teachers to adopt technology in teaching. Social influence has been a part of Bhutanese society for generations. Community vitality stressing on the importance of social life in Bhutan has been considered as one of the nine domains of Gross National Happiness, the development philosophy of Bhutan (Droji, 2013), so we can argue that socialization is an intricate element that is strongly ingrained in every Bhutanese. It is therefore thought that social influence in Bhutan plays a vital role in influencing teachers to adopt technology in teaching. Thus, social influence is considered as one of the factor envisaging that its study is crucial to fully understand the attitude of teachers toward technology.

2.9 Facilitating Condition

Facilitating conditions or resources would include hardware, software, internet and even the technicians and teachers who use the resources. Providing ICT equipment to schools or teachers will not necessarily lead to differences regarding ICT adoption in classroom(Guoyuan, Martin, Johan van, Jo, & Chang, 2010; Higgins). Baylor and Ritchie (2002) stated that the use of technology will not happen unless faculty members have the right skill, knowledge and attitude regardless of the amount of technology or its sophistication. However, Serge et al. (2009) identified technical hardware dependence or unavailability as a major concern in their study. Result of a study by Frank et al. (2011) showed despite a significantly high percentage of teachers (92%) being computer literate, less than 15% of these teachers adopted the Internet to innovatively improve teaching and learning. The reason they said may be attributed to lack of Liquid Crystal Display projectors in schools, emphasizing the fact that hardware unavailability could hinder ICT usage which contradicted the finding mentioned by Baylor and Ritchie (2002). In the same study, limited numbers of computers in the school were cited as a reason for teachers' not organizing computer based lessons.

BECTA (2004) found that it is not always the absence of resources in the school, but the access granted to those resources, such as the improper management of the resources, or the hardware and software that are not up to date and of poor quality. Misuses of facilities such as allowing internet access to only a few influential persons and refusing to grant access to others are some concern facing resource accessibility in schools. It is difficult to have sufficient number of hardware in schools of Bhutan and it has been the main obstacle to regular ICT use by teachers in their teaching. In addition obsolete, outdated hardware that are in dire need of maintenance which are prone to constant breakdown are yet another problem related to ICT adoption in schools. Software that is specific to subject and perfectly designed for teaching purposes is few and hard to find. Poorly designed software waste time and provides little to enhance teaching and learning. Software is expensive and teachers needs time to learn the software. Lack of skill and time to develop software are predicament facing successful ICT integration into classroom teaching.

2.10 Technical assistant

Technical problem is cited to be another reason why most teachers avoid using computers. System crash, slow system during a lesson waste time, and if immediate help is not available students and teachers becomes frustrated and lose confidence in technology leading to negative attitude to technology. Maintenance would require more than one trained fulltime technician(Reid, 2002). Uncertainty that surrounds technology, fear that it may breakdown in the middle of lesson causing valuable time and effort wastage, and teachers fearing that they may cause damage to systems keeps teacher away from trying to use ICT in their lessons long before the actual problem arises. BECTA (2004), suggested that there is strong connection between teacher's fear of doing damage to equipment and lack of ICT confidence. Some of the responses in their survey include "problems with getting it to work, glitches which are 'unexplained', not always reliable"; "computers that freeze while in the middle of a lesson"; "technology that doesn't work". When there is no technical support in the school, technical maintenance will not be carried out increasing the chances of technical disruption during lessons. If this kind of failure occurs again and again, both teachers and students would not wish to be involved in such lessons. Technical assistant therefore is deemed highly necessary to support teachers who are on their quest to adopt ICT into their classroom teaching.

2.11 Time

In a study by Reid (2002), teachers expressed that technology use in teaching needed more time. Teachers involved in their study expressed that extra effort and time were required to learn new software and to create new products. New technology evolves at a rapid pace so teachers have to be a constant learner to keep up with the current ICT trend in education. Grainger and Tolhurst (2005) found additional training, support, and preparation time to be significant to make teachers confidently use technology. Increase preparation time especially without reward was also identified to be a concern to teachers in a study by Serge et al. (2009). Teachers need to explore resources, software and hardware to a great extent before implementing in the class. Additional time is needed to attend ICT training, learning new software and hardware, practice the skills learnt and to locate resources from

internet etc. Therefore, ICT implementation poses greater demand on the already limited time that teachers have. Hence, time constraints for implementing technology into teaching have been echoed as a barrier by many teachers as also evidenced by studies such as BECTA (2004), Reid (2002), Grainger and Tolhurst (2005), Serge et al. (2009) etc.

2.12 Teaching experience

Younger teachers seem to use technology more in the class room compared to older teachers as stated by Afshari et al. (2009)in their study. They explained that the reason could be because younger teachers are exposed to technology early in their life. Young teachers are much experienced with computer use and thus have positive attitude toward ICT use in the classroom(Ying-Shao Hsu, Wu, & Hwang, 2007). This view was also supported by Fethi and Deborah (2010) and claimed that teachers with higher teaching experience tend to use computer less frequently. Younger teachers are also by nature more enthusiasts about technology and hence they are more likely to use technology than older teachers but recent literatures finds no correlation between age and ICT usage as was stated by BECTA (2004) in their paper. They said that age difference is becoming less and less important as technology evolves and becomes convenient for all ages to handle.

2.13 Gender, academic rank, and academic field

Al-Senaidi et al. (2009) found gender, academic rank, and academic field to have no relation to ICT usage in the classroom, but their study did revealed that males who used computer less, believed to encounter more barriers than did the females.

BECTA (2004), in their literature review found, higher percentage of females feel greater technology related anxiety and less percentage of females make use of technology. With regard to academic field Sarah (2011) mentioned that ICT use can be influenced by the belief that teachers have about the nature of subject and pedagogical practices. Computer teachers who are computer literate are not only aware of the benefit of the technology in teaching; they are also aware of locations of resources and have the skills to locate or to develop teaching resources that are

suitable for their lessons. In Bhutan resources for the subject Dzongkha 1 is limited and hence these teachers use of technology is limited for the subject.

2.14 Administrative support

Administrative support is a critical factor to drive and keep teachers using ICT. Role of management is vital while endeavouring for successful ICT implementation in the school and cannot be underestimated. The most influential person in the school is the Principal. Principal has the potential to influence and affect the views and perception of other teachers regarding ICT implementation. Studies have reported that the willingness to integrate ICT in the classroom by teachers can be influenced by the attitude of principal towards the technology. Principal's support would also eventually control the resources to drive any new initiatives. Principal's lack of interest in the technology integration may not lead him/her to commit to it. Frank et al. (2011) recognized lack of support from leaderships would kill the initiatives of teachers. If principal is unaware of the ICT benefit, he or she may not feel the need to develop ICT facilities in the school and see it as an added burden to the teacher's time and school budget. Almalk and Williams (2012) suggested principals to be trained to increase their capability and understand the impact of ICT.

2.15 Teachers' confidence

Lacking confidence in their ICT skills could discourage a teacher to integrate technology in their teaching. The fear of being ridiculed by their students at their incompetent ICT skills while failing to deal with issues that arises during the lesson and the lesson rendering unsuccessful after an unsuccessful attempt to rectify technical failure are reasons enough for teachers who are not ICT competent to steer clear of technology in teaching. Teachers should be provided appropriate training with enough duration to try and practice the skills acquired during their training to make them feel competent at ICT skills. Ultimately when teachers feel that they have the skills required they would feel confident which would drive them eager enough to try and implement technology into their teaching.

---

[1] National Language of Bhutan

2.16 Grouping Factors

Different studies have made several distinctions between factors such as, Manipulative and Non-manipulative factors (Afshari et al., 2009), External Factors and Internal Factors, and School Level Factors and Teacher Level Factors (BECTA, 2004). The tables showing these groupings are displayed in Table 2.1.

Table 2.1: Non-manipulative and Manipulative factors

Non-manipulative Factors	Manipulative Factors
Age	Attitude of teachers
Gender	ICT knowledge and skills of teachers
Teaching Experience	Commitment of schools towards implementation
Computer Experience	
Government Policies	Availability of ICT support

Non-manipulative factors are factors that cannot be influenced directly by the school. On the other hand, manipulative factors refer to factors that the school may be able to influence.

Table 2.2: External and Internal factors

External Factors	Internal Factors
Lack of access to resources	Lack of confidence
Lack of time	Resistance to change & negative attitudes
Lack of effective training	No perception of benefits
Technical problems	

According to Table 2.2, External and Internal factors are also termed as first order and second order factors. First order factor can influence second order factor as already mentioned, for example, appropriate training can develop positive attitude and have an influence on the teacher's confidence. It is also suggested that if the teacher lacks positive attitude towards ICT, it will be a waste developing resources in the school as it will not be utilized and be of any advantage to the school and students.

Table 2.3: School Level and Teacher Level factors

School Level Factors	Teacher Level Factors
Lack of time	Lack of time
Lack of access to resources (lack of hardware, inappropriate organization, poor quality software)	Lack of confidence
	Resistance to change & negative attitudes
Lack of effective training	No perception of benefits
Technical problems	Lack of access to resources

Referring to Table 2.3, understanding individual level factor and institution level factor separately can help in determining proper solution to tackle the problems. The policy makers can have direct influence on solving the school level factors, whereas teacher level factors are greatly dependent on the individual and becomes difficult for the policy makers to tackle. However, providing training and resources can influence the confidence and attitude of teachers directing them towards acceptance of technology and increasing the chances of utilization in their teaching methodologies.

CHAPTER 3

METHODLOGY

This chapter describes the method that was chosen as the choice for the study. Characteristics of the survey and different aspects of the data collection such as target population, the instrument, details of the process employed and procedures that are used are all explained in this chapter.

3.1 Data collection instrument

A questionnaire based survey instrument was chosen for data collection. A self-report questionnaire based survey consisting of 34 items, 5 scale Likert-type (5 rated strongly agree, 4 rated agree, 3 rated neutral, 2 rated disagree and 1 rated strongly disagree) statements were constructed for collecting data to study the teachers' perception of ICT and its integration in classroom. Likert Scale type questionnaire was used since it has the advantage of being easily understood as it is the most universally used method and also because teachers of Bhutan are familiar with such rating. It is also one of the cheapest methods of data collection. The items adopted were mostly utilized in previous studies and found to be reliable. They were extracted from two different papers Ying-Shao Hsu et al. (2007), Teo (2011) and slight modifications were carried out to make it suitable to the Bhutanese context. The questions are divided into two sections. First section deals with demographic background of the participants. The next section contains questions related to examining the factors that affect ICT integration in classroom. Out of many factors discussed in previous research works, five factors which appear to affect the Bhutanese teachers most were considered while developing the questionnaire. They are:

Perceived usefulness: Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her job performance(Davis, 1989). If a teacher believes that technology use will benefit him or her, they would be willing to make use of it. Fuad and Sharifah (2013) pointed out perceived usefulness as a direct determinant of technology use.

Social influence: Social influence refers to the influence on one's emotions, opinions, or behaviours by others action or behaviour especially by somebody who is important in one's life. In schools, principal can have significant effect upon the behaviour of teachers in their school. A teacher sharing success story of technology integration can raise curiosity of their fellow colleagues. A group of teachers supporting each other by sharing resources, pedagogical practices and helping each other will have greater chance of successful integration than a teacher who is not extended any support for their effort.

Resources or facilitating conditions: Resources refers to hardware, software and even technical assistant. Most schools in Bhutan has a single computer lab with an average of 15 computers in higher secondary schools, 13 computers in middle secondary schools, 9 computers and 3 computers in lower secondary schools and primary schools respectively(Education, 2012). With a large number of students in schools, it will be difficult to grant computer access to every class with single computer lab. Many researchers in the field felt that every class should be equipped with a system and a projector to be able to utilize technology while teaching, which would remain a distant dream for the Bhutanese education system. Availability of hardware should be supported by suitable software to be of benefit. Technical assistant is yet another important element necessary to aid and support the teaching faculty in their effort to integrate technology. The success rate to integrate technology into teaching would drop significantly if any of the aforementioned factors is not present in the school. A study by Kinley, Zander, Georseen, and Choeda (2013) indicated that lecturers in Samtse College of Education, a teacher training college in Bhutan, pointed out internet as an important recourse to encourage them to engage in adopting technology.

Teacher's attitude towards ICT: Attitude is defined as teacher's perception towards technology in teaching. It is also defined as the positive or negative feeling of an individual and the effect the feeling have on their behaviour. Attitude is one of the main factors that can directly influence the behaviour intention to use the technology. Several studies conducted in institutions that were well equipped with

technology (hardware and software) has revealed attitude towards technology to be an important factor influencing adoption of technology in teaching.

Perceived ease of use: Perceived ease of use is defined as the degree to which a person believes that using a particular system would be free of effort(Davis, 1989). It directly influences teacher's behaviour intention to use the technology. Teachers would not risk making mistakes in their teaching by using technology that is difficult to use. They will not risk exposing their weakness to be taunted by the students. Hence teachers will make use of those systems that are easy to perfect and which they can have total control and confidence to use.

Seven items measure perceived usefulness of which 5 were adopted from Hsu, et al., two items measure social influence both from Hsu, et al., four items measure availability of resources, three items were adopted from the measurement defined by Hsu, et al., and one from Teo, seven items measures attitude of teachers towards ICT, of which three items were adopted from Teo, two items from Hsu, et al. and the other two were developed by ourselves, two items measuring ease of use were adopted from Teo, one item for measuring behaviour intention to use was adapted from Teo, and all four items to measure high interaction practices were from Hsu, et al.. In the demographic background, questions regarding gender, teaching subject and experience, access to computer at school and at home, and ICT trainings acquired were presented. Age of the participants were omitted to reduce the number of questions since teachers could be grouped as young or old by looking at the number of teaching experience. A pre-test to identify any flaw in the questions was carried out where 10 participants were requested to filled up the questionnaire and provide comments and feedbacks regarding the clarity of the question. The pilot survey was constructed using form in Google docs. The link to the questionnaire was then distributed to teachers through Facebook instant massaging facility. This ensured that friends were asked to respond to the survey immediately which shortened the total duration to collect the required pre-test data. Discussions regarding the clarity of the question were also carried out on Facebook chat with the friends that responded for the pre-test survey. A number of changes were suggested by this group of friends. The questions were modified to incorporate the suggestions from the pre-test survey.

3.2 Research Participants

The survey was administered to teachers from different schools in the country after obtaining approval from Ministry of Education, Royal Government of Bhutan. The survey data was collected from 5th March 2013 to 30th March 2013. Questionnaire were printed and submitted to schools through friends who after obtaining permission from their principal distributed to those teachers willing to participate in the study. Effort was put to collect responses from all schools in the country, but due to a number of unforeseen obstacles it did not materialized. However, the survey did cover the schools in entire region of the country, i.e. schools in southern, western, eastern, and central Bhutan. It also does not limit to a particular level, respondents includes teachers teaching in primary school to higher secondary school. 499 teachers completed and returned the filled questionnaire. After obtaining the responses it was punched through a form created using Google Docs into an excel sheet. 466 responses were accepted after rejecting those that were incomplete.

The accepted responses were subjected to analysis using SPSS 17 statistical package. 62.2% were male and 37.8% were female. A major number of respondents were young teachers with few years of teaching experience, 32.4% with 1 to 5 years of teaching experience, 43.6% with 6 to 10 years, and 24% with greater than 10 years teaching experience. 93.6% of the respondent have computer at their home and 88.4% agreed to having access to computer in their school. 6.4% does not have access to computer at home and 11.6% doesn't get access in their school. 88.6% of the respondents have attended at least one form of ICT training while 11.4% have responded that they have not received any training on ICT.

CHAPTER 4

ANALYSIS METHOD

Two different tests were carried out, i.e. chi-square and regression analysis. Chi-square analysis provides comparison between different items against demographic details of the research participants. Regression analysis shows the effect of independent variables on the dependent variable. Four independent variables and one independent variable which are discussed in greater details later are considered for regression analysis.

4.1 Test 1:

In Test 1, the final data was subjected to SPSS version 17 analysis. 466 responses were approved for the analysis after filtering the incomplete responses. The objective of the analysis was to study the characteristics of ICT integration in classroom by Bhutanese teachers. Categorical analysis using chi-square and cross tabular data is employed to make comparison between gender and teaching experience with various factors that affect ICT integration in classroom. The statistical analysis used significance level of 0.05 to get 95% accuracy. The minimum number of respondents for any item also should be equal to or greater than 5 to be considered for chi-square analysis.

Cross tabulation is a statistical process used in the survey research. It summarizes categorical data to create a contingency table that displays joint distribution of two or more variables. For example, a gender table with 290 male and 176 female and another table listing teachers computer access at home where 436 teachers agreed to getting access to computer at home and 30 teachers disagreed to getting access to computer at home can be combined together to get single table displaying information of both the separate tables as shown in Table 4.1.

Table 4.1: Result of crosstab between gender and computer access

Gender	Have access to Computer or Laptop at home.		Total
	Yes	No	
Male	262 (**90%**)	28 (**10%**)	290
Female	174 (**99%**)	2 (**1%**)	176
Total	436 (**94%**)	30 (**6%**)	466

Chi-square is the way to compare the data you collect to find out if the variation in the data is due to chance or is it due to one of the variables that you are testing. It is one of the most used members of the no parametric family of statistical tests. The equation shown below is used to calculate chi square.

$$x_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

x_c^2 : Chi Square

O_i: Observed Value

E_i: Expected Value

For the chi-square analysis described above, since there was less number of respondents under the age group 11 – 15 years, 16 – 20 years and 21 years and above, these three age groups were clubbed together which represented response rate of only 24%. Therefore, the final age groups used in analysis are 0 – 5 years (32.4%), 6 – 10 years (43.6%), and 11 years and above (24%). Similarly there were very few respondents who selected Strongly Disagree, Disagree, and Neutral option from the entire Likert type question and hence these three options were omitted where ever required.

4.2 Test 2:

Attitude toward ICT adoption in classroom teaching has been identified by several studies as the major factor that leads to integration of ICT in the classroom teaching. Hence regression analysis is employed to try to discover factors that positively affect attitude of teachers towards acceptance of ICT. Technology Acceptance Model, postulated by Davis (1989) is the base for the model adopted for the analysis. Two additional factors, Social Influence (SI) and Facilitating Conditions (FC) were considered taking into account the context of Bhutanese society besides the other two factors, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) proposed in TAM model. The extended TAM model proposed for the analysis is shown in Figure 4.1.
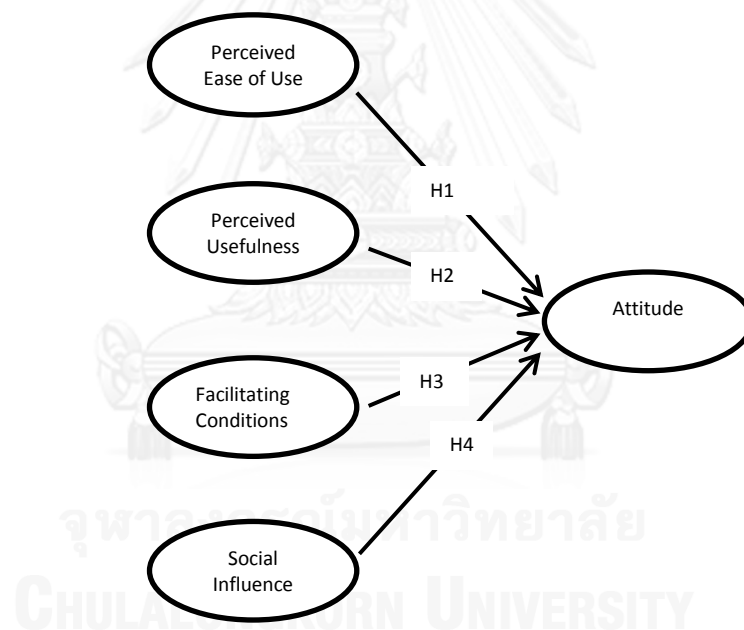
Figure 4.1: Research Model

The proposed model has four independent factors viz. Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Facilitating Condition (FC) and Social Influence (SI). Attitude (ATT) of teachers towards ICT adoption in teaching is the lone dependent factor.

The following four hypotheses were drawn:

H_1:   Perceived Ease of Use has a significant effect on attitude towards adopting ICT in teaching.

H_2:   Perceived Usefulness has a significant effect on attitude towards adopting ICT in teaching.

H_3:   Facilitating conditions has a significant effect on attitude towards adopting ICT in teaching.

H_4:   Social Influence has a significant effect on attitude towards adopting ICT in teaching.

Reliability analysis with accepted Cronbach's alpha value set at 0.7 to test the reliability of the questions was carried out. Then, factor analysis to group the questions under different factors was carried out. Finally, regression analysis was performed on the four factors loaded after factor analysis, to validate the hypothesis drawn for the study. The results of this analysis are discussed under result and discussion in Chapter 5.

CHAPTER 5

RESULTS AND DISCUSSION

Result and discussion are divided into four different sections. First displays the demographic details, next section shows the descriptive statistic associated with various factors and in the third section, chi square analysis is used to predict and generalize the findings. The final section discusses the effect the independent factors have on the dependent factor as a result of regression analysis.

5.1 Demographic details

Total of 466 samples was collected from different schools around the country. The details of the 466 teacher volunteers are as follows:

There were total of 290 males and 176 females.

The total number of teacher volunteers with different teaching experience is shown below:

- 1 year – 5years : 151
- 6 years – 10 years : 203
- 11 years and above : 112

The number of teachers who have attended different IT training is as follows:

- Chiphen Rigphel Training: 333
- Post Graduate Certificate in Teaching of Information System: 9
- Functional IT: 161
- WIRED Program (Singapore Project) : 6
- Class Mate PC Orientation : 1
- Education Portal orientation SAMS (school administration and Management System) : 6
- Training on EMIS (Education Management Information System): 12
- Others : 22

- None: 53

Numbers of teachers according to the subject are:

- English: 202
- Math: 156
- Dzongkha: 68
- Physics: 50
- Chemistry 65
- Biology: 67
- Geography: 78
- History: 62
- Commerce: 9
- Accounts: 3
- Economics: 28
- Computer: 14
- EVS: 11
- Other: 30

Number of teacher getting access to technology at:

- Home: 436
- School: 412

5.1.1 Graphical representations of the demographic details, as shown in Figure 5.1 – Figure 5.6.
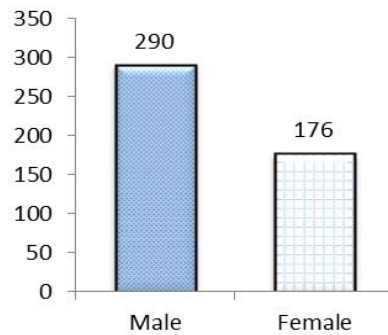
Figure 5.1: Gender based categorization

The graph shows respondents according to their gender. 290 males and 176 females participated in the study.
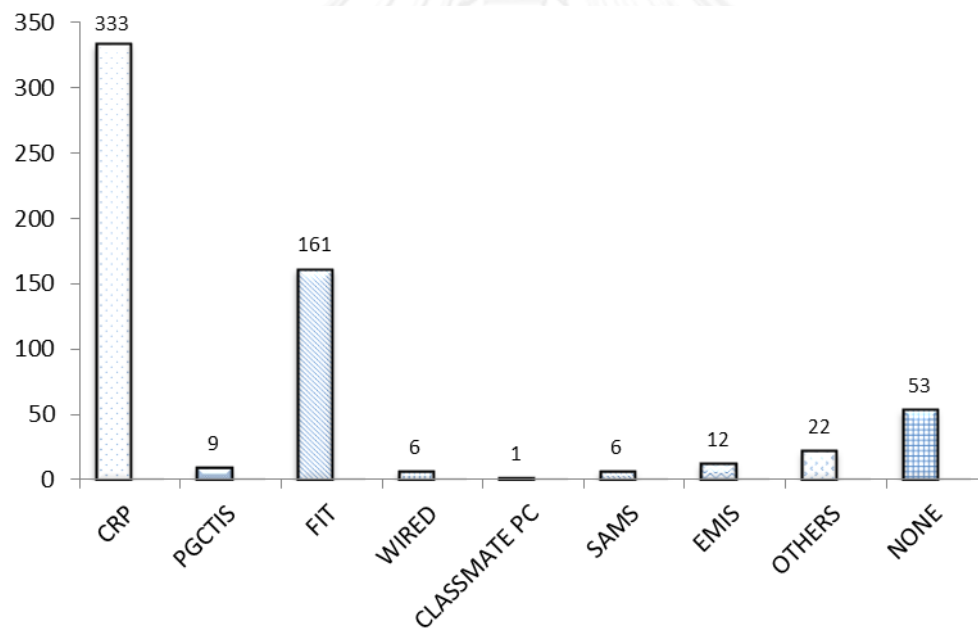
Figure 5.2: Training based categorization

The graph above illustrates ICT trainings undertaken by the teacher respondents. Chiphen Rigphel Project (CRP) is compulsory training provided to all Bhutanese teachers to impart basic information technology skills like Microsoft Word, Microsoft PowerPoint, web 2.0 etc. which is why most teachers have taken this ICT course. Functional IT (FIT) is an IT course offered at Education College.
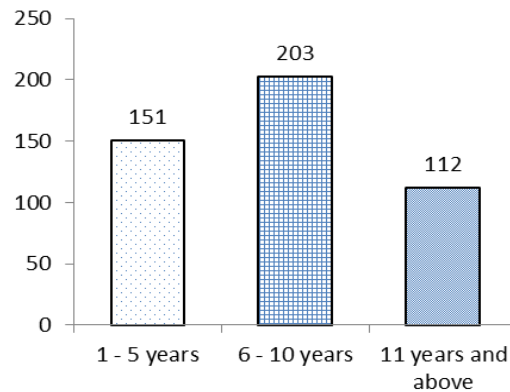
Figure 5.3: Teaching Experience based categorization

This graph (figure 5.3) illustrates respondents according to their years of teaching experience. 151 teacher respondents have 1 – 5 years teaching experience, 208 have 6 – 10 years teaching experience and 112 have greater than 10 years teaching experience. Teachers with teaching experience greater than 11 years are expected to be above 40 years old; these people are busy with high level decision activities like attending meeting and have less time for other activities and therefore the participants for the study is less from this group of people. Younger teachers are also more willing to participate in such studies.
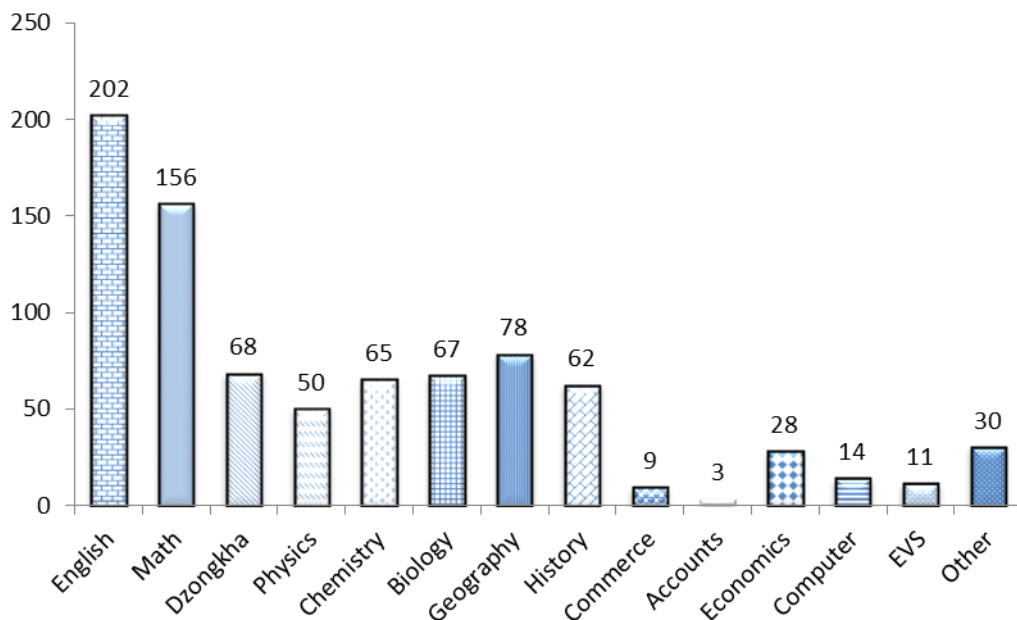
Figure 5.4: Subject taught based categorization

Figure 5.4 shows teachers based upon their teaching subject. More number of English and Math teachers participated in the study because the number of these teacher are more since the number of teaching hour required for this subject is comparatively more per week (6 hours) compared to science subjects (3 hour) for grade ten level.

Figure 5.5 shows 436 teachers get access to computer at home. 30 teachers say that they don't have access to computer at home. Figure 5.6 shows 412 teacher respondents access computer at school and 54 says they don't get access at school. The reason for few teachers not possessing computer at home and at school may be teachers in remote schools without access to electricity and telephone line.
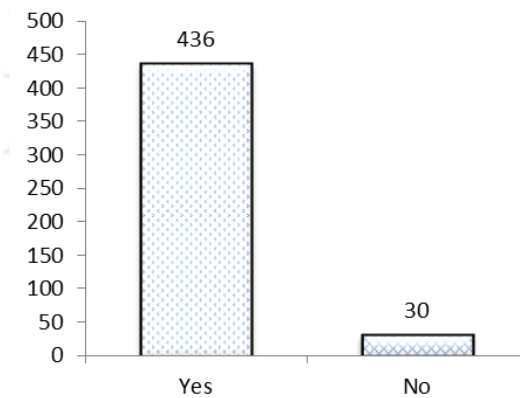
Figure 5.5: Computer access at home
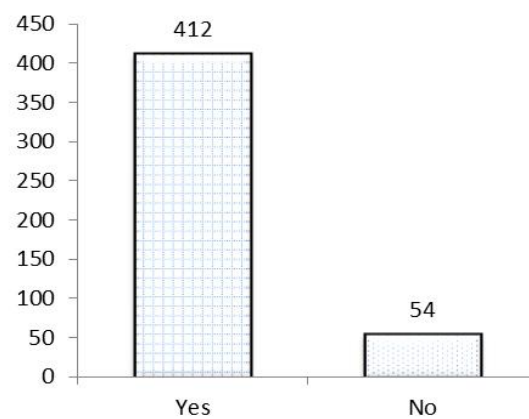
Figure 5.6: Computer access at school

5.2 Descriptive Statistic

The questionnaire asked teachers about their ICT skills and use in pedagogical practices. High percentages (88.6%) of teachers are IT literate having attended some form of ICT training. 93.6% of the respondent have computer at home and 88.4% of teachers get computer access in their school. This finding implies that majority of the teachers are well equipped with technology skills to undertake computer based teaching. Table 5.1 shows the responses to the items measuring interaction practice of teacher with technology.

Table 5.1: High interaction practice (behaviour)

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have designed activities that allow students to learn through the Internet.	64 (13.7%)	108(23.2%)	143(30.7%)	121(26.0%)	30(6.4%)
I have used pictures, audios, videos, animations and educational software to promote learning.	21(4.5%)	66(14.2%)	118(25.3%)	177(38.0%)	84(18.0%)
I have used document management software, such as Word and PowerPoint, in classrooms.	46(9.9%)	78(16.7%)	98(21.0%)	159(34.1%)	85(18.2%)
I have used email or Face book to interact with my students	114(24.5%)	114(24.5%)	95(20.4%)	93(20.0%)	49(10.5%)

The percentage of respondents designing lessons or tasks that require the use of the Internet is less. Interaction through Facebook or email that requires the Internet

connection is also limited to only a small percentage of the respondents. This implies that teachers keep themselves away from any activities that involve the use of the Internet connection. The reason could be due to lack of access to the Internet connectivity or could be due to limited internet bandwidth and slow speed.

The use of technology is mostly concentrated in the use of multimedia and document management software like word and PowerPoint as was also found by Gyeltshen (2013) in his annual report, which showed the use of technology as concentrated in question paper development. The finding corresponds with finding by Frank et al. (2011) who also reported that teachers use ICT for routine jobs such as writing lesson plans, recording and calculating student's grades, and for communicating with other teachers and colleagues? The reason for most of them not organizing technology based teaching could be because of lack of appropriate software, hardware, and technical help. Though majority of the teachers agreed that they get to use computer in the school, there may not be sufficient number of computers for students to use or could be due to lack of projectors in the school. The response to the items measuring availability of resources clearly shows that resources are not available in the schools as shown in Table 5.2.

Table 5.2: Resources Availability

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Hardware Support	48(10.3%)	99(21.2%)	165(35.4%)	125(26.8%)	28(6.0%)
Software Support	49(10.5%)	108(23.2%)	174(37.3%)	112(24.0%)	23(4.9%)
Technical Help	45(9.7%)	93(20.0%)	126(27.0%)	148(31.8%)	54(11.6%)
Financial Support	104(22.3%)	147(31.5%)	134(28.8%)	60(12.9%)	21(4.5%)

The items to measure social influence are displayed in Table 5.3. Social influence occurs when one's emotions, opinions, or behaviours are affected by others. The study shows only a handful of their colleague use and share amongst themselves about technology. This finding would also support why teachers do not use technology since there seems to be no support from their colleague. In Bhutan, encouragement and suggestion from friends and people having influence plays a major role in the uptake of technology. Since it is lacking in the schools of teachers responding to my questionnaire, which involves several school, we can conclude social influence to be lacking, thus hindering the uptake of technology into teaching. 56% of the respondent teachers agree that their colleague use technology in their teaching, but the percentage of those agreeing to the statement "In my school, teachers often discuss computer-related topics and exchange ideas about computer hardware and software" drops to less than 50%, revealing exchange of ideas regarding ICT use in school does not take place despite some teachers using technology into their teaching methods.

Table 5.3: Social Influence

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In my school my colleague use technology in their teaching	13(2.8%)	58(12.4%)	134(28.8%)	198(42.5%)	63(13.5%)
In my school, teachers often discuss computer-related topics and exchange ideas about computer hardware and software.	14(3.0%)	62(13.3%)	163(35.0%)	173(37.1%)	54(11.6%)

According to Guoyuan et al. (2010), it had been proven that attitude towards computer influences computer adoption in the teaching. Many other studies have

also argued attitude to be an important factor leading to acceptance and finally integration. Only a slightly greater number of teacher in Bhutan seem to possess positive attitude towards ICT. However, the response to all the four items (Table 5.4) shows that teachers do possess positive attitude towards technology use in teaching.

Table 5.4: Attitude towards computer technology

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I will not feel anxious when I take any computer-related courses.	29(6.2%)	49(10.5%)	106(22.7%)	194(41.6%)	87(18.7%)
Learning software will NOT make me feel nervous and uncomfortable.	15(3.2%)	23(4.9%)	89(19.1%)	223(47.9%)	116(24.9%)
I feel technology will replace teachers in the future	36(7.7%)	43(9.2%)	137(29.4%)	171(36.7%)	79(17.0%)
While using technology I feel that student will lose their attention to the subject content and me.	56(12.0%)	107(23.0%)	157(33.7%)	103(22.1%)	43(9.2%)

72.8% agreed that learning software will not make them nervous or uncomfortable and 60.3% agreed that they will not feel anxious when they take any computer related courses displaying their willingness and strong interest to undergo any ICT training opportunities provided to them. This could probably be explained in terms of the demand to use of ICT in schools. The mounting pressure to employ technology in teaching may be changing the mind-set of teachers toward learning

technology. Teachers are now looking forward to trainings, to learn how to implement technology in teaching. Therefore, in order to open up their opportunities to training, they may be expressing that technology training will not be difficult for them. The other reason could be because teachers are getting familiar with basics of technology since they are constantly using it in their daily life.

The percentage of teachers who find learning to use computer easy is greater than those finding difficult to learn computer. Perceived ease of use is defined as the degree to which a person believes that using a particular system would be free of effort. Perceived ease of use has direct influence on behaviour intention to use(Teo, 2011). The responses in the Table 5.5 shows greater than 50% of the respondents agree that technology is easy to use.

Table 5.5: Perceived Ease of Use

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Learning to use technology is easy for me	7(1.5%)	41(8.8%)	156(33.5%)	203(43.6%)	59(12.7%)
I find it easy to use technology to do what I want to do	11(2.4%)	52(11.2%)	154(33.0%)	192(41.2%)	56(12.0%)

Regarding the views of usefulness of technology, teachers believe technology integration to be useful with most teachers strongly agreeing to all the seven items that measured perceived usefulness. They also believed technology would be the future trend in education (refer Table 5.6).

Table 5.6: Perceived Usefulness

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Technology-based instruction can improve learning achievement	2(0.4%)	1(0.2%)	32(6.9%)	207(44.4%)	224(48.1%)
Technology-based instruction is one of the future education trend	2(0.4%)	2(0.4%)	25(5.4%)	178(38.2%)	259(55.6%)
Technology-based instruction can make my teaching more lively and energetic.	3(0.6%)	0(0.0%)	34(7.3%)	159(34.1%)	270(57.9%)
Technology-based teaching can increase student's motivation	3(0.6%)	3(0.6%)	28(6.0%)	181(38.8%)	251(53.9%)
School policy on implementing technology-based instruction is most suitable	5(1.1%)	9(1.9%)	78(16.7%)	254(54.5%)	120(25.8%)
G Using technology will create good relationship between teacher and students.	2(0.4%)	17(3.6%)	135(29.0%)	211(45.3%)	101(21.7%)
Technology helps me create an innovative teaching technique	3(0.6%)	5(1.1%)	27(5.8%)	201(43.1%)	230(49.4%)

The seven items listed in Table 5.6 measures the degree to which teachers perceive technology to be useful in their teaching. Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her job performance. Teo (2011) found that perceived usefulness has direct influence on behaviour intention to use technology in a study where self-reported data were gathered from 592 teachers from schools in Singapore. The result shown in Table 5.6 reveals a very high percentage of Bhutanese teachers strongly agreeing to all the seven items measuring perceived usefulness. Greater than 92% of the teachers feel that technology will help improve learning achievement of the students. Greater than 93% feels that it can motivate students to learn. 93.8% of teachers agree that technology will be the main tool for instruction in the future of Bhutanese education system. As the electronic gadget becomes cheaper and affordable by the mass, it seems natural that eventually educational institutions will be immersed in technology based learning approaches since it may be the only tool that may be accessible to every learner. 92% feels or fantasize that if they use technology to teach, their teaching would be more lively and filled with energy probably because it would keep the learners engaged since technology based teaching has the tendency and capacity to deliver student centred lessons, where there will be active participation from the students making the teaching/learning process active and full of interaction. 80.3% of the teachers agree that school should frame and adopt policy to implement technology based instruction. 92.5% agree technology will help them to become innovative in their teaching. The most practiced teaching method in Bhutanese school is the old traditional method of teaching, where teacher usually talks and students listens. With technology use, teaching approaches can be different, filled with multimedia and interactions. Majority of the Bhutanese teachers either seem to be aware of the power of technology or at least fantasize the power of technology to transform the teaching approach thus believing that technology can make their teaching innovative.

Looking at the degree to which the teachers agree to all the seven items above, we can conclude that majority of the Bhutanese teachers view technology in teaching to be useful. Hence, provided other factors such as facilitating condition, technical assistant, training, etc. are provided, teachers of Bhutan looks happy to implement technology into their teaching.

They also like the idea of working with technology and look forward to it. Table 5.7 shows the respondents' attitude towards technology use. Clearly majority of the respondents displayed their preference to work with technology with 82.8% of them

agreeing to enjoy working with technology, 67.6% are looking forward to the aspects of their job that require use of technology. The reason why they enjoy working with technology could be because technology makes their work easy and also offers flexibility. Since use of technology is fairly new in schools, students' excitement in experiencing a new approach to teaching may be an encouraging factor that seems to make teachers enjoy working with technology.

Table 5.7: Attitude towards technology use

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Once I start using technology, I find it hard to stop.	31(6.7%)	72(15.5%)	176(37.8%)	148(31.8%)	39(8.4%)
I look forward to those aspects of my job that require the use of technology.	11(2.4%)	28(6.0%)	112(24.0%)	223(47.9%)	92(19.7%)
I like working with technology.	3(0.6%)	15(3.2%)	62(13.3%)	236(50.6%)	150(32.2%)

Majority of the teachers plan to use technology in their future. The two items displayed in Table 5.8 measures their behaviour intention to use. The responses from the previous table match with the responses of this table supporting Teo (2011) finding. This table displays 88% of the respondents agreeing to the statement "I plan to use technology in the future", stating their desire to use technology into their teaching.

Table 5.8: Behaviour intention to use

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I plan to use technology in the future.	4(0.9%)	6(1.3%)	46(9.9%)	234(50.2%)	176(37.8%)
I have no intention to use technology in my class	213(45.7%)	130(27.9%)	65(13.9%)	37(7.9%)	21(4.5%)

5.3 Result of Chi-Square test

5.3.1 Comparison between genders with regard to possessing computer at home

Different demographic characters of the response were compared with each item describing different factors. The following hypotheses were framed and Chi square was used to verify and validate them.

H_0: There is no significant difference in possessing computer at home between genders.

H_1: There is a significant difference in possessing computer at home between genders.

After analysis between the items, gender was found to be statistically significant in possessing computer at home, p-value = 0.000. More female is likely to possess computer at home than man. Table 5.9 shows 98.86% of female possess computer at home against 90.34% of male. The reason for this difference may be due to the fact that most male teachers already possess the skills for using technology, while female teachers had lacked the skills. With time, the demand for IT skills in their work environment may be forcing teachers to learn ICT skills, which encourages teachers to buy personal computers. Since majority of the female teachers lack IT skills, we may be seeing greater percentage of female teacher possessing computer at home than man.

Table 5.9: Comparison between male and female about possessing computer at home

Gender	Do you have access to computer at home?	
	Yes	No
Male	262 (90.34%)	28 (9.66%)
Female	174 (98.86%)	2 (1.14%)

However, there was no difference when it comes to accessing computer at school between male and female. Schools have limited computers, but careful planning and effective allocation of the resources are important to equally distribute opportunities to access these resources by every students and teachers.

5.3.2 Comparison between teachers with different teaching experience with regard to computer access at school

The following hypotheses were formulated to test the existence of significance between teachers of different experience regarding the access to computer at their school.

H_0:   There is no significant difference between teachers with different teaching experience regarding access to computer they get at school.

H_1:   There is a significant difference between teachers with different teaching experience regarding access to computer they get at school.

The analysis result showed younger teacher (with less teaching experience) as more likely to use computer at school than older teachers (greater than 10 years teaching experience), p–value = 0.025. Table 5.10 displays this difference. The descriptive statistic revealed that larger number of older teachers have computer access at home than younger teachers although inferential statistic did not reveal this difference. Younger teachers may not be financially sound to own a computer at home and therefore seek access at school. Tshering (2013) revealed that income plays a significant role in technology usage in Bhutan. Older teachers may not be using school computer preferring to use their own machine since they could afford machine and internet services.

Table 5.10: Crosstab between computer access at school and teacher with different teaching experience.

Teaching Experience	Computer access at school	
	Yes	No
1 - 5 years	137 (91%)	14 (9%)
6 - 10 years	184 (91%)	19 (9%)
11 years and above	91 (81%)	21 (19%)

5.3.3 Comparison between genders with regard to enhancing relationship between students and teachers due to technology use

The total number of teachers that responded strongly disagree was only 2 (refer Table 5.11), hence for chi-square test strongly disagree option was merged with disagree to and the result is displayed in Table 5.12.

Table 5.11: Cross Tab between gender and item enhancing good relationship between students and teachers due to technology

Gender	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Male	1	12	71	133	73
Female	1	5	64	78	28
Total	2	17	135	211	101

H_0:   There exists no significant difference between male and female regarding building good relationship between students and teachers due to technology use in classroom.

H_1:   There exists significant difference between male and female regarding building good relationship between students and teachers due to technology use in classroom.

Both male and female agree that using technology can create good relationship between student and teacher, however there is difference in the belief between gender group with 71% of male agreeing that using technology can create good relationship between student and teacher compared to their female counterpart (p-value = 0.018) shown in Table 5.12. Since many female teachers have till date avoided utilizing technology in teaching, they may not be aware of the benefits technology would provide for students and teachers.

Table 5.12: Crosstab between the item "using technology will create good relationship between teacher and students" and gender (Strongly disagree is merged with disagree).

Gender	Disagree	Neutral	Agree	Strongly Agree
Male	13 (4%)	71 (24%)	133 (46%)	73 (25%)
Female	6 (3%)	64 (36%)	78 (44%)	28 (16%)

5.3.4 Comparison between teachers with different teaching experience with regard to enhancing relationship between students and teachers due to technology use

Table 5.13: Cross-tab between teaching experience and relationship between student and teacher using technology in classroom

Teaching Experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1 - 5 years	0	6	49	72	24
6 - 10 years	2	9	63	85	44
11 - 15 years	0	1	13	29	15
16 or higher	0	1	10	25	18
Total	2	17	135	211	101

The number of teachers that responded for strongly disagree and disagree was less than 5, shown in Table 5.13, hence for chi-square test strongly disagree and disagree option was left out. The following hypotheses were tested.

H_0:   There is no significant difference between age groups regarding building good relationship between students and teachers due to technology usage in the classrooms.

H_1:   There is a significant difference between age groups regarding building good relationship between students and teachers due to technology usage in the classrooms.

There is no statistical significance with regard to the belief they have regarding the enhancement of relation between student and teacher due to technology adoption with p–value = 0.963. The p-value was 0.096. Therefore, null hypothesis H_0 was accepted.

Table 5.14: Crosstab between teaching experience and relationship between student and teacher using technology in classroom (Strongly disagree & disagree removed)

Teaching Experience	Neutral	Agree	Strongly Agree
1 - 5 years	49 (32%)	72 (48%)	24 (16%)
6 - 10 years	63 (31%)	85 (42%)	44 (22%)
11 - 15 years	13 (22%)	29 (50%)	15 (26%)
16 or higher	10 (19%)	25 (46%)	18 (33%)

The percentages reflect in Table 5.14 similar result for all categories of teaching experience with greater than 70% when agree and strongly agree are summed up. This could be because all teachers may be aware of the effect of technology since the teachers are now trained in ICT use through various kinds of workshops and trainings.

5.3.5 Comparison between genders with regard to learning software will not make teachers nervous and uncomfortable

Training has been found to be immensely influential in technology adoption in the classroom by teachers. Both male and female teachers are confident enough to take up technology training declaring that they will not feel nervous or uncomfortable while taking software training classes.

The total number of female teachers that responded strongly disagree was only 3 which is shown is Table 5.15, hence for chi-square test strongly disagree option was not included.

Table 5.15: Cross tab between genders and item "learning software will NOT make me feel nervous and uncomfortable."

Gender	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Male	12	13	60	125	80
Female	3	10	29	98	36
Total	15	23	89	223	116

The following hypotheses were then tested.

H_0: There is no significant difference between genders with regard to feeling nervous and uncomfortable while learning software.

H_1: There exists significant difference between genders with regard to feeling nervous and uncomfortable while learning software.

While making comparison between gender on their belief towards training difficulty, there was no significant difference at p–value = 0.069. Table 5.16 displays that 56% of the female respondents agreed that they are not nervous or uncomfortable while learning to use software. However, a slightly greater percentage of male compared to female, strongly agree that learning technology will not be uncomfortable for them because males are found to be more technology enthusiast compared to female. It is therefore true that males are more confidant and eager to learn about technology which explains their greater desire to learn and look forward to challenges due to technology.

Table 5.16: Cross tab between genders and item "learning software will NOT make me feel nervous and uncomfortable." (Strongly disagree merged with disagree)

Gender	Disagree	Neutral	Agree	Strongly Agree
Male	25 (9%)	60 (21%)	125 (43%)	80 (28%)
Female	13 (7%)	29 (16%)	98 (56%)	36 (20%)

5.3.6 Comparison between genders with regard to finding easy to accomplish desired task using technology

The frequency of female participants who choose strongly disagree is less than 5 as shown in Table 5.17. It therefore couldn't be used for chi-square analysis. Strongly disagree option was left out during chi-square analysis.

Table 5.17: Cross tab between gender and the item "I find it easy to use technology to do what I want to do."

Gender	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Male	8	32	85	117	47
Female	3	20	69	75	9
Total	11	52	154	192	56

Difference between genders regarding the ease of use to accomplish their task using technology is tested to verify the following hypothesis.

H_0: There is no significant difference between genders regarding the ease of use of technology for doing their task successfully

H_1: There is a significant difference between genders regarding the ease of use of technology for doing their task successfully.

The analysis showed greater percentage of male agreed to the item "I find it easy to use technology to do what I want to do" comparing to female showing the existence of difference between male and female computer skills, p–value = 0.004. 16% of the

male respondents strongly agree to the statement "I find it easy to use technology to do what I want to do", while only 5% of the female respondents strongly agree to the statement. For greater detail refer Table 5.18 below. Males may be able to achieve desired task with technology because males seem to be more confident in using and exploring technology and are more technically sound compared to female as mentioned in BECTA (2004).

Table 5.18: Cross tab between gender and the item "I find it easy to use technology to do what I want to do." (Strongly disagree is merged with disagree)

Gender	Disagree	Neutral	Agree	Strongly Agree
Male	40 (14%)	85 (29%)	117 (40%)	47 (16%)
Female	23 (13%)	69 (39%)	75 (43%)	9 (5%)

5.3.7 Comparison between genders with regard to their intention to use technology in their teaching

Because teachers in general belief technology in teaching will be beneficial, majority of teachers do plan to implement technology into their teaching. To verify the existence of difference between male and female, following two hypotheses were tested.

H_0:   There is no significant difference between genders regarding their intention to use technology in future.

H_1:   There is a significant difference between genders regarding their intention to use technology in future.

Table 5.19: Crosstab between gender and item "I plan to use technology in future"

Gender	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Male	3 (1%)	4 (1%)	27 (9%)	135 (47%)	121 (42%)
Female	1 (1%)	2 (1%)	19 (11%)	99 (56%)	55 (31%)

It is shown in Table 5.19 that the number of respondent for the options strongly disagree and disagree is less than 5 due to which these two were not used in chi-square analysis. However, the percentage of female planning to use technology is 87% compared to 89% for male. Very less percentage of male and female, 1% each disagreed which is highly encouraging. By looking at the strongly agree percentage (42% for male and 31% for female), it seem greater percentage of male will be using technology than female though it is not proven statistically by chi-square analysis. The reason for greater percentage of male emerging as wishing to utilize technology is because they have been using IT in the past as has been pointed out by several research papers. This dominance of male teachers is also reflected in teacher population in Bhutan thus their wish is reflected in the result shown in Table 5.19.

5.3.8 Comparison between teachers with different teaching experience with regard to their intention to use technology in their teaching

Since the number of teachers with teaching experience 11 – 15 years and 16 years or higher were less than 5 (Table 5.20) for strongly agree option, it is merged into agree while doing chi-square analysis.

Table 5.20: Crosstab between teachers with different teaching experience about intention to use technology in their teaching

Teaching Experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1 - 5 years	81	36	21	8	5
6 - 10 years	85	64	28	15	11
11 - 15 years	25	16	7	9	1
16 or higher	22	14	9	5	4
Total	213	130	65	37	21

The analysis revealed p–value = 0.426 showing that there was no significant difference. Thus rejecting the alternative hypothesis we accept the null hypothesis H_0.

H_0:   There is no significant difference between teachers with different teaching experience about intention to use technology in their teaching

H_1:   There is no significant difference between teachers with different teaching experience about intention to use technology in their teaching

There is no statistical significance probably because the benefit of technology is well understood by all teachers irrespective of their teaching experience or age. The other reason can be attributed to the requirement set by the education ministry to use technology in teaching.

5.3.9 Comparison between teachers with different teaching experience with regard to being able to do what they wish with technology

The number of teachers in all categories of teaching experience who selected strongly disagree is less than 5 making is unusable for chi-square analysis shown in Table 5.21. Strongly disagree was thus merged with disagree for chi-square analysis.

Table 5.21: Crosstab between teaching experience and the item "I find it easy to use technology to do what I want to do".

Teaching Experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1 - 5 years	4	17	53	61	16
6 - 10 years	4	16	63	90	29
11 - 15 years	1	5	20	28	4
16 or higher	2	14	18	13	7
Total	11	52	154	192	56

H_0: There is no significant difference between teachers with different teaching experience with regard to ICT training difficulty.

H_1: There exists significant difference between teachers with different teaching experience with regard to ICT training difficulty.

The analysis result showed existence of significant difference with p–value = 0.014. Alternative hypothesis was therefore accepted.

Table 5.22: Crosstab between teaching experience and the item "I find it easy to use technology to do what I want to do". (Strongly disagree is merged to disagree)

Teaching Experience	Disagree	Neutral	Agree	Strongly Agree
1 - 5 years	21 (14%)	53 (35%)	61 (40%)	16 (11%)
6 - 10 years	20 (10%)	63 (31%)	90 (45%)	29 (14%)
11 - 15 years	6 (10%)	20 (34%)	28 (48%)	4 (7%)
16 or higher	16 (30%)	18 (33%)	13 (24%)	7 (13%)

According to Table 5.22, 30% of the teachers with teaching experience 16 years or higher, disagree while less percentage of teachers with less teaching experience disagree. This shows teachers with higher teaching experience find ICT training difficult. Younger teachers are more tech savvy and exposed to technology earlier in their life and naturally find easier to learn. Older teachers, especially teachers with

teaching experience greater than 10 years are digital immigrants and thus have the tendency to understand technology much less. The finding is in line with the result of a study of the Internet access and usage behaviour in the Kingdom of Bhutan by Tshering (2013), where age was found to have a significant impact. His study showed that younger people use the Internet more than older people in the kingdom.

5.3.10 Comparison between genders with regard the teachers finding technology easy to learn.

Strongly disagree option was merged with disagree in the chi-square test as the frequency was less than 5 (Table 5.23)

Table 5.23: Crosstab between gender and item "learning to use technology is easy for me".

Gender	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Male	5	24	86	130	45
Female	2	17	70	73	14
Total	7	41	156	203	59

The hypotheses for the test were:

H_0: There is no significant difference between genders with regard to finding technology easy to learn.

H_1: There exists significant difference between genders with regard to finding technology easy to learn.

There was significance with p–value = 0.034, so we accepted the alternative hypothesis. 16% of male strongly agree compared to only 8% of female (refer Table 5.24). This tells us that males find easy to learn technology compared to female.

Table 5.24: Crosstab between gender and item "learning to use technology is easy for me" showing percentage. (Strongly disagree is merged to disagree)

Gender	Disagree	Neutral	Agree	Strongly Agree
Male	29 (10%)	86 (30%)	130 (45%)	45 (16%)
Female	19 (11%)	70 (40%)	73 (41%)	14 (8%)

It has been shown in studies that woman underperform in IT skills compared to man as published in an article by Ferenstein (2014). It reported vast gap between male and female in computer science, while the gap was not visible in other courses as shown in the Figure 5.7. This trend is also reflected amongst Bhutanese teachers according to the finding of this study.
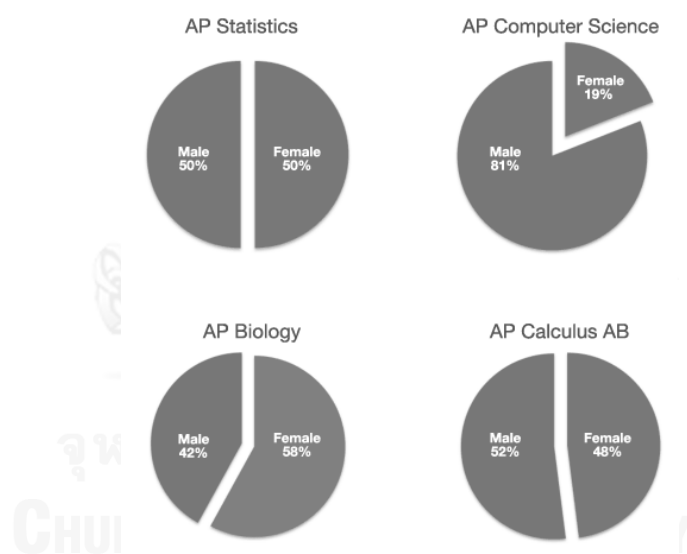

Figure 5.7: Male Vs. Female performance in various subjects (Ferenstein, 2014)

5.3.11 Comparison between genders regarding item "I like to work with technology".

The frequency for the option strongly disagrees was very less for both male and female and was therefore merged to disagree in chai-square analysis. Refer Table 5.25.

Table 5.25: Crosstab between gender and item "I like working with technology".

Gender	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Male	1	10	33	137	109
Female	2	5	29	99	41
Total	3	15	62	236	150

H_0: There is no significant difference between genders with regard to their wish to work with technology.

H_1: There is a significant difference between genders with regard to their wish to work with technology.

The wish to work with technology varies based on gender differences. Male like to work with technology more than female, p–value = 0.013. The reason could be because more male teachers seem to be confident about computer knowledge. 38% of the male strongly agree to the statement while only 23% of the female strongly agree as depicted in the Table 5.26.

Table 5.26: Result of chi-square and crosstab between gender and item "I like working with technology". (Strongly disagree is merged to disagree)

Gender	Disagree	Neutral	Agree	Strongly Agree
Male	11 (4%)	33 (11%)	137 (47%)	109 (38%)
Female	7 (4%)	29 (16%)	99 (56%)	41 (23%)

5.3.12 Comparison between different teaching experiences regarding item "I look forward to those aspect of job that require use of technology".

Table 5.27: Cross tab between teaching experience with item "I look forward to those aspects of job that require technology use"

Teaching Experience	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1 - 5 years	5 (3%)	11 (7%)	34 (23%)	78 (52%)	23 (15%)
6 - 10 years	5 (2%)	10 (5%)	49 (24%)	96 (47%)	43 (21%)
11 - 15 years	1 (2%)	3 (5%)	16 (28%)	26 (45%)	12 (21%)
16 or higher	0 (0%)	4 (7%)	13 (24%)	23 (43%)	14 (26%)

All the teachers irrespective of teaching experience look forward to those aspects of job that require use of technology with greater than 60% agreeing to the statement (refer Table 5.27). Majority of Bhutanese people like any other people around the world are fascinated with technology. Technology has the potential to simplify and speed up the work besides making it enjoyable. Moreover there is pressure in their work environment to make use of technology. The enthusiasm therefore is expected and is seen in this study as well.

5.4 Result of Regression Analysis

5.4.1 Reliability Test:

Reliability Test to test the internal consistency of the items generated the results shown in Table 5.28. No question/item was required to be eliminated since **α** value for all the constructs were greater than the accepted standard reliability coefficient value of 0.70.

Table 5.28 : Result of the reliability test

Constructs	Items Code	Cronbach's alpha (α)
Perceived Usefulness (PU)	PU1 PU2 PU3 PU4 PU5 PU6 PU7	0.839
Social Influence (SI)	SI1 SI2	0.78
Facilitating Conditions (FC)	FC1 FC2 FC3 FC4	0.846
Perceived Ease of Use (PEOU)	PEOU1 PEOU2	0.845
Attitude (ATT)	ATT1 ATT2 ATT3 ATT4 ATT5	0.716

5.4.2 Factor Analysis

For factor analysis, we used principle component analysis. Factor analysis generated groups of questions that were related to each other. These related questions were grouped under four different factors. Five items were loaded into perceived usefulness, four items were loaded into facilitating conditions, and two items each were loaded into social influence and perceived ease of use, shown in Table 5.29.

Table 5.29: Rotated Component Matrix[a]

Item Code	Component			
	1	2	3	4
PU3	0.832			
PU4	0.816			
PU1	0.779			
PU2	0.721			
PU5	0.66			
FC2		0.85		
FC1		0.84		
FC4		0.816		
FC3		0.71		
PEOU2			0.914	
PEOU1			0.896	
SI1				0.837
SI2				0.814

5.4.3 Regression Analysis

Regression analysis is applied to the factors loaded after the factor analysis. Regression analysis is used to identify factors that influence the attitude of teachers toward ICT adoption it teaching. R-Square and beta coefficients are reported in regression analysis to show the performance of the model. Table 5.30 shows the result of the regression analysis.

Four variables are used to explain the users' attitude towards technology. R-Square value gives the percentage to determine the degree to which the four variables explain attitude of Bhutanese teachers towards technology in classroom teaching. It shows that the model using the four predictor variable explain about 39.3% (R^2=0.393, coefficient of determination) of variance in teachers attitude towards technology use in Bhutan.

Table 5.30: Result of the regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.001	.036		-.021	.983
	PU	.353	.036	.353	9.702	.000
	FC	.173	.036	.173	4.757	.000
	PEOU	.458	.036	.458	12.581	.000
	SI	.170	.036	.170	4.657	.000

The beta level can be used to compare the contributions the variables made in predicting the outcome. The result of the regression analysis shows that all the predictor variables significantly affect teachers' attitude towards ICT adoption in teaching.

Of these four factors, perceived ease of use (β = 0.458, p < 0.001) and perceived usefulness (β = 0.353, p < 0.001) are the most significant factors that affect teachers attitude towards ICT adoption in teaching. These findings are consistent with findings in many studies such as Fuad and Sharifah (2013), Teo (2011), Davis (1989), etc. which

found PU and PEOU to have positive significance on attitude and behaviour intention to use technology. Therefore, it can be conclude that Bhutanese teachers will use technology if they perceive that technology use can enhance their productivity and also when they find technology easy to use. Facilitating condition (β = 0.173, p < 0.001) and Social Influence (β = 0.170, p < 0.001) are also significant factors in influencing attitude of teachers for adopting ICT in teaching. Figure 5.7 shows the model displaying the result of the regression analysis. Bhutan has remained in isolation until the 1960s. Though Bhutan is modernizing at a very fast pace, the social dependence is very strong and effect of urbanization has at the moment not affected the traditional social structure and interdependence of Bhutanese people to each other. In fact "community vitality" has been recognized as one of the nine domains of Gross National Happiness, the development philosophy of Bhutan (Droji, 2013). Hence this justifies, why social influence emerged to have positive significance on the attitude of teachers in adopting ICT in classroom teaching.
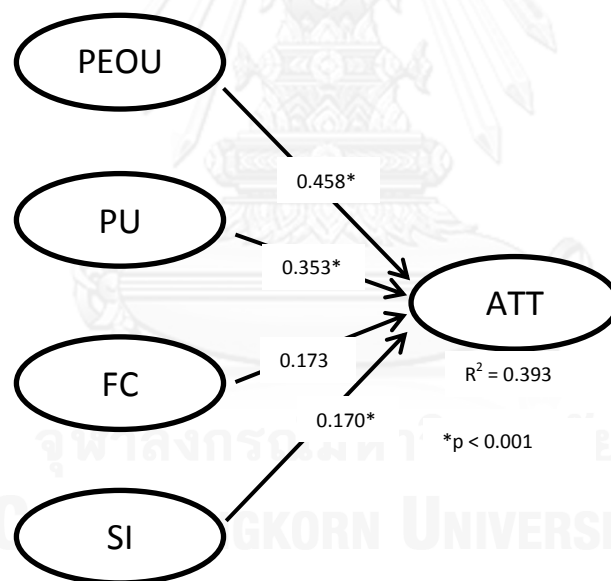

Figure 5.8: Regression analysis results

CHAPTER 6

CONCLUSIONS

This study exhibited that Bhutanese academic staffs have positive attitude towards technology and are willing to study and integrate ICT into their teaching methodology. The government should harness this positive aspect of teachers by providing adequate training and necessary resources which seem to be missing in the schools.

Although a high percentage of teachers are ICT literate, the trainings provided may not be appropriate. Teachers find learning computer difficult and they have expressed difficulty in accomplishing desired task using technology. While designing ICT training for teachers, it is shown by the study that age based training should be designed. Younger teacher are already familiar with basics of technology while older teachers are not. Basic skills should be included if the trainings are meant for older group, while it should be skipped if the training is designed for younger group. An ICT course designed with focus to develop basic IT skills would bore the younger participants while an advance course would confuse the old, digital immigrant teachers. Hence these two groups of teachers should be separated for training and provided appropriately designed training for the respective group. Further study requires to be carried out to decide if further subdivision would be more effective while undergoing ICT training.

The finding has shown that more female teachers wish to attend ICT training. Their negative views regarding ease of use of technology could be the reason that prevents female teachers from involving in technology teaching. They may not feel confident with their present ICT skills to implement ICT in their classroom. This group of female also intends to use ICT in their future work hence their greater desire for additional training. Therefore in future technology trainings, more number of female participation should be considered.

In the past technology integration in class room was dominated by male teacher. However the study has revealed that the trend is gearing for a change. Females are equally willing to take up training and have expressed their desire to adopt technology in their future teaching. The finding matches with Tshering (2013) conclusion that found greater number of female than male using internet in Bhutan.

Result of the regression supported perceived usefulness and perceived ease of use to have greater significance than facilitating condition and social influence on attitude

of teachers towards ICT usage in teaching. This indicates that to create positive attitude towards technology, teachers must be aware of the benefits of adopting technology in their class room teaching. Training of teachers to use technology seems to be necessary because if teachers perceives using technology to be difficult, it would affect their attitude towards technology negatively.

In conclusion we can confidently say that the number of Bhutanese teachers adopting technology in their teaching will increase with time. ICT Facilities in schools are developed at a faster pace than it has ever happened before. More importantly, the younger, newer generations of teachers joining the teaching profession are confident technology users thus eliminating the need for vigorous training that was deemed highly necessary in the past.

The future of technology use in Bhutanese education system shines bright at distant and that distance is gradually getting eliminated.

REFERENCES

Abdulkafi, A. (2004). Teachers' Attitudes Toward Information and Communication Technologies: The case of Syrian EFL Teachers. *Computer & Education*, 373 - 398.

Afshari, M., Bakar, K. A., & Luan, W. S. (2009). Factors Affecting Teachers' use of Information and Communication Technology. *International Journal of Instruction, 2*(1), 77-104.

Al-Senaidi, S., Lin, L., & Poirot, J. (2009). Barriers to Adopting Technology for Teaching and Learning in Oman. *Computer & Education*, 575-590.

Almalk, G., & Williams, N. (2012). A Strategy to Improve The Usage of ICT in The Kingdom of Saudi Arabia Primary School. *International Journal of Advanced Compute Science and Application, 3*(10), 42 -49.

Bauer, J., & Kenton, J. (2005). Towards Technology Integration in the Schools: Why It Isn't Happening. *Journal of Technology and Teacher Education, 13*(4), 519 - 546.

Baylor, A. L., & Ritchie, D. (2002). What Factors Facilitate Teachers Skill, Teachers Morale, and Perceived Student Learning in Technology - Using Classrooms? *Computer & Education*, 395 - 414.

BECTA. (2004). A review of the research literature on barriers to the uptake of ICT: Becta.

BICMA. (July 2004). Bhutan Information and Communication Technology Policy and Strategies.

Buabeng-Andoh, C. (2012). Factors Influencing Teachers' Adoption and Integration of Information and Communication Technology into Teaching: A review of the literature. *International Journal of Education and Development using Information and Communication Technology, VIII*(1), 136-155.

Damodharan, V. S., & Rengarajan, V. Innovative Method of Teaching.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3).

Drent, M., & Martina, M. (2007, May 5). Which Factors Obstruct or Stimulate Teacher Educators? *Computers & Education,* 13.

Droji, L. (2013). *Bhutan's Case: Social Capital, Household Welfare and Happiness*. Thimphu Bhutan: National Statistics Bureau.

Education, M. o. (2012). Annual Education Statistics. Bhutan: Policy and Planing Division.

Ferenstein, G. (2014, 22/02/2014). Women Outnumber Men For The First Time In Berkeley's Intro To Computer Science Course.   Retrieved 22, 2014, from http://techcrunch.com/2014/02/21/women-outnumber-men-for-the-first-time-in-berkeleys-intro-to-computer-science-course/?utm_campaign=fb&ncid=fb

Fethi, A. I., & Deborah, L. L. (2010). Factors Affecting Technology Integration in K-12 classrooms: A Path Model. *Education Tech Research Development*, 137-154.

Frank, W. K. A., Mary, N. L., & Dzomeku, M. (2011). The Use of Computers and Internet as Supplementary Source of Educational Material: A Case Study of the Senior High Schools in the Tema Metropolis in Ghana. *Contemporary Educational Technology, 2*(2), 151 - 162.

Fuad, A. A. T., & Sharifah, S. s. h. (2013). Attitude towards the use of Learning Management System among university students: A Case Study. *Turkish Online Journal of Distance Education (TOJDE), 14*.

Gable, G. G. (1994). Integrating Case Study and Survey Research Methods: An Example in Information Systems. *European Journal of Information System, 3*(2), 112-126.

Grainger, R., & Tolhurst, D. (2005). Organisational Factors Affecting Teachers' Use and Perception of Information & Communication Technology. *South East Asian Regional Computer Confederation (SEARCC), 46*.

Guoyuan, S., Martin, V., Johan van, B., Jo, T., & Chang, Z. (2010). Predicting ICT Integration into Classroom Teaching in Chinese Primary Schools: Exploring the Complex Interplay of Teacher-related Variables. *Journal of Computer Assisted Learning*, 160 - 172.

Gyeltshen, K. (2013). Status Update on School IT (pp. 1 - 26). Phuntsholing: Ministry of Education.

Higgins, S. Does ICT Imporve Learning and Teaching in Schools. Newcastle: British Educational Reserach Association.

Hsu, Y.-S., Hwang, F.-K., & Wu, H.-K. (2007). Factors Influencing Junior High School Teachers' Computer-Based Instructional Practices Regarding Their Instructional Evolution Stages. *Educational Technology & Society*, 118-130.

Hsu, Y.-S., Wu, H.-K., & Hwang, F.-K. (2007). Factors Influencing Junior High School Teachers' Computer-Based Instructional Practices Regarding Their Instructional Evolution Stages. *Educational Technology & Society, 10*(4), 118-130.

Khan, M. S. H., & Hasan, M. (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The example of Bangladesh. *International Journal of Instruction, V*(2), 61-80.

Kinley, K., Zander, P.-O., Georseen, M., & Choeda, n.-f. (2013). *The usage of ICT for teaching at a Bhutanese college.* Paper presented at the International Association of Technology, Education and Development (IATED), Valencia.

Nair, I., & Das, V. M. (March 2012). Using Technology Acceptance Model to assess teachers' attitude towards use of technology as a teaching tool : A SEM Approach. *International Journal of Computer Applications (0975 – 8887), 42*(2), 1-6.

Reid, S. (2002). The Integration of Information and Communication Technology into Classroom Teaching. *Alberta Journal of Educational Research, XLVIII*(1), 30-46.

Reporter, S. (2013). An ICTised primary school *Kuensel*. Retrieved from http://www.kuenselonline.com/an-ictised-primary-school/

Sarah, P. (2011). The beliefs behind the teacher that influences their ICT practices. *Computer & Education*, 449 - 458.

Serge, L., Yves, K., Robert, A. P. R., Carole, D., Claude, W., & Christoph, M. (2009). Teaching with Information and Communication Technologies: Preliminary Results of a Large Scale Survey. *ACM SIGUCCS*, 157 -162.

Teo, T. (2011). Factors Influencing Teachers' Intention to Use Technology: Model Development and Test. *Computer & Education, 57*(4), 2432–2440.

Tshering, K. (2013). To Study the Internet Access and Usage Behavior in the Kingdom of Bhutan. *International Journal of Computer Science and Electronics Engineering (IJCSEE), I*(2), 288-297.

Ward, L. (2003). Teacher Practice and the Integration of ICT: Why aren't our secondary school. 1-13.

APPENDIX

APPENDIX A

Letter of approval to carry out survey from Ministry of Education

དཔལ་ལྡན་འབྲུག་གཞུང་། ཤེས་རིག་ལྷན་ཁག །

Royal Government of Bhutan
Ministry of Education
Department of School Education

:ducating
for GNH

Ref: MoE/DSE/01/2013 /2360

14 May 2013

To Whom It May Concern

Mr. Sherab Tenzin, Teacher Drukgyel HSS is undertaking a research on the topic "**Use of ICT by Bhutanese teachers in class room**". This research is conducted as a partial fulfilment of his master program in Chulalongkorn University, Thailand, funded by TICA and it requires the involvement of Principals and teachers from different schools in Bhutan.

Therefore, all the concerned school heads and teachers are requested to facilitate Mr. Sherab's work as deemed appropriate.

(Chencho Dorji)
Offtg. Director

Director
Department of School Education
Ministry of Education

APPENDIX B
SURVEY QUESTIONNAIRE

Demographic

1. Gender

   - Male

   - Female

2. Teaching Subject (Choose all that applies)

   - English
   - Math
   - Dzongkha
   - Physics
   - Chemistry
   - Biology
   - Geography

   - History
   - Commerce
   - Accounts
   - Economics
   - Computer
   - Other: ....

3. Teaching Experience1 - 5 years

   - 6 – 10 years
   - 11 – 15 years
   - 16 – 20 years
   - 21 years and above

4. Do you have computer/laptop at home?

   - Yes
   - No

5. Do teachers have computer in your school?   (either in group or individually)

- Yes

- No

6. Have you attended any of the following IT training? (Please tick all that

applies to you.)

- Chiphen Rigphel Training

- PGCTIS (Post Graduate

  Certificate in Teaching

  Information System)

- FIT (Functional IT at PCE or

  SCE)

- WIREd (Singapore Project)

- ClassMate PC orientation

- Education Portal orientation - SAMS

  (school administration and

  Management System)

- Training on EMIS (Education

  Management Information System)

- Other (please specify): ....

- None

For each of the statement below, please indicate the extend of your agreement or disagreement by *CIRCLING* the ratings of 1-5

1: Strongly Disagree,   2: Disagree,   3: Neutral,   4: Agree,   5: Strongly Agree

Technology-based instruction can improve learning achievement.(Yin-Shao Hsu, Hwang, & Wu, 2007)	1 2 3 4 5
Technology-based instruction is one of the future trends in education. (Yin-Shao Hsu et al., 2007; Ying-Shao Hsu et al., 2007)	1 2 3 4 5
Technology-based instruction can make my teaching more lively and energetic. (Yin-Shao Hsu et al., 2007)	1 2 3 4 5
Technology-based teaching can increase students' motivation. (Yin-Shao Hsu et al., 2007)	1 2 3 4 5
School policy on implementing technology-based instruction is most suitable.	1 2 3 4 5
Using technology will create good relationship between teacher and students.	1 2 3 4 5
Technology helps me create an innovative teaching technique.	1 2 3 4 5
I have designed activities that allow students to learn through the Internet.(Yin-Shao Hsu et al., 2007)	1 2 3 4 5
I have used pictures, audios, videos, animations and educational software to promote learning. (Yin-Shao Hsu et al., 2007)	1 2 3 4 5
I have used document management software, such as Word and PowerPoint, in classrooms.(Yin-Shao Hsu et al., 2007)	1 2 3 4 5
I have used email or Face book to interact with my students	1 2 3 4 5
In my school my colleague use technology in their teaching	1 2 3 4 5
In my school, teachers often discuss computer-related topics and exchange ideas about computer hardware and software. (Yin-Shao Hsu et al., 2007)	1 2 3 4 5
In my school, administrators provide hardware for supporting technology-based instruction. (Yin-Shao Hsu et al., 2007)	1 2 3 4 5
In my school, administrators provide software for supporting technology-based instruction.(Yin-Shao Hsu et al., 2007)	1 2 3 4 5

When I encounter difficulties in using technology, a specific person is available to provide timely assistance.(Teo, 2011)	1 2 3 4 5
In my school there is enough financial support to create and use technology in learning.	1 2 3 4 5
I will not feel anxious when I take any computer-related courses.(Yin-Shao Hsu et al., 2007)	1 2 3 4 5
Learning software will NOT make me feel nervous and uncomfortable.(Yin-Shao Hsu et al., 2007)	1 2 3 4 5
I feel technology will replace teachers in the future	1 2 3 4 5
While using technology I feel that student will lose their attention to the subject content and me.	1 2 3 4 5
Once I start using technology, I find it hard to stop.(Teo, 2011)	1 2 3 4 5
I look forward to those aspects of my job that require the use of technology.(Teo, 2011)	1 2 3 4 5
I like working with technology.(Teo, 2011)	1 2 3 4 5
Learning to use technology is easy for me.(Teo, 2011)	1 2 3 4 5
My interaction with technology does not require much effort.(Teo, 2011)	1 2 3 4 5
I plan to use technology in the future.(Teo, 2011)	1 2 3 4 5
I have no intention to use technology in my class.	1 2 3 4 5

VITA

Mr. Sherab Tenzin has served as a teacher in a higher secondary school for 8 years, teaching Physics and Computer Application.

He holds a Bachelors degree in Secondary Education (Math and Physics), Postgraduate Certificate in Teaching Information System, International Pedagogical ICT Certificate, and Certificate of Proficiency in Graphic Designing.

He is a recipient of the V.K. Khandaswami Prize for mathematics from Samtse College of Education in 2004.