THE IMPACT OF ICT ON QUALITY EDUCATION AT THE UNIVERSITIES OF BANGLADESH: AN EMPIRICAL STUDY

(In fulfillment of the requirement of Doctor of Philosophy, Faculty of Business Studies. University of Dhaka)

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Ph.D Program

Reg. No: 16/2014-2015

Re-registration No: 92/2018-2019

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University of Dhaka

DEPARTMENT OF MANAGEMENT INFORMATION SYSTEMS

FACULTY OF BUSINESS STUDIES

UNIVERSITY OF DHAKA

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A THESIS SUBMITTED TO THE DEPARTMENT OF MANAGEMENT INFORMATION SYSTEMS OF THE UNIVERSITY OF DHAKA, BANGLADESH FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN MANAGEMENT INFORMATION SYSTEMS.

Certificate from Supervisor

This is to certify that the thesis titled "The Impact of ICT on Quality Education at the Universities of Bangladesh: An Empirical Study" submitted by Md. Zillur Rahman for the award of the degree of Doctor of Philosophy (Ph.D) has been completed under my supervision and guidance. I certify that the work is original and has not been submitted for the award of any degree or diploma in education institution. The thesis represents entirely an independent work on the part of the candidate, no portion of thesis is a reproduction from any other sources, published or unpublished without proper acknowledgement.

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Declaration

I do hereby declare that the thesis titled “The Impact of ICT On Quality Education at the Universities of Bangladesh: An Empirical Study” submitted to the university of Dhaka for the award of the degree of Doctor of Philosophy (PhD) is my original work, accomplished under the guidance and supervision of Dr. Md. Abdul Hannan Mia, Professor of the Department of Management Information Systems, University of Dhaka. This work has not been submitted earlier by me in any other university or institutions for the award of any degree, diploma, or award.

MD. ZILLUR RAHMAN

DEDICATED TO MY PARENTS

My father LATE MD. HAMIJUDDIN RARI

&

My mother CHAHERUN NESA

ABSTRACT OF THE STUDY

Over the past few decades, Information and Communications Technology (ICT) has become gradually more important to the educational institutions, particularly at the tertiary level in Bangladesh. There are wide ranges of research exist to explore and study the use of ICT to improve quality of education in the process of learning and teaching in universities. This research examines how ICT is applied in the classroom, examination process, result processing, skill developments and the impact of using ICT in improving quality of education at universities of Bangladesh.

This thesis argues that quality of education may be determined by the performances of ICT within organization (University), and the performance of ICT in the external environment (Business Organization) that depend on practices of ICT in the university education. It attempts to uncover the factors and how these factors of internal organizational environment (universities) interactions are important for better performance of ICT to enhance quality education. This interfacing theme is missing in previous researches. This study argues that when there is an association among practices of ICT, performance of ICT within organization (University), and the performances of ICT in the external environment (Business Organization), there is a likelihood that the quality of education at the university level would be improved. Proposed ICT framework or model consists of three different components, each has had a direct relationship with improvement of quality education. The broad proposition of the proposed ICT model is discussed and analyzed under three components.

The phenomena has been investigated using a mixed methods approach. The qualitative data are collected from important stakeholders: FGD with alumnus and in-depth interview with employers. The survey has been conducted with teachers and students of the universities. In this study, mixed methods are applied to investigate the complex phenomena from various stakeholders' points of view. Validation support has been made by combining different perspectives in order to give a complete picture of the phenomena. A research model has been developed and multiple techniques have been deployed to collect data from several sources. All the collected data are organized and analyzed systematically using SPSS 24.0 with AMOS for quantitative data and qualitative data analysis techniques used for qualitative data.

Current practices of ICT in the university level are partial and relatively weak but the impact of ICT on quality education is relatively strong. Literature of ICT adoption is examined to enhance theoretical foundation of this research. One of the gaps in existing literatures is that practices of ICT have not been improved according to the expectations. Objectives can act as a criterion to evaluate the outcome of the study. All the relevant theories are applied to explain the findings.

It has been concluded that ICT's contribute directly to enhance quality in teaching and learning at the university level. It also reveals that the teaching qualities and teacher's motivation also depend on the intensity of ICT use. Finally, the study has found that ICT directly supports to access in broad range of study materials which ultimately improve the quality of education through ICT application in different disciplines of the university. The implications of the study on the relevant theories and practices are also considered. Furthermore, directions for future research are identified.

[Key words: ICT, Quality Education, Teaching and Learning, ICT Adoption, Mixed Method]

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CHAPTER ONE
INTRODUCTION

CHAPTER ONE
INTRODUCTION

1.0 Overview

In the first chapter, it provides the setting of main figures of the research, problem statement and research questions. Furthermore, it has inferred the research objectives, research methodology andrationale of the study. This chapter documents an understanding of research at the higher educational institution context, its theoretical underpinnings and contributions to knowledge. The chapter explains the thesis structure, with a brief description of each chapter. It also includes the meanings of key terms of capture the main components of this study.

At the dawn of new millennium, a dominant and ubiquitous revolution has been taking place around the globe, which is regarded as Information Technology (IT) revolution. The term information technology (IT) has been replaced by information and communication technology (ICT) which facilitates by electronic means of creation, storage, management and dissemination of information. A report published through the (UN) United Nation in (1999), ICTs includes internet facilities, telephone equipment and utilities, IT kit, transformation in media coverage, libraries and data centers, business and professional information providers, web information, IT systems associated with facts.

Moursund (2003) also explained, ICTcomprises the full collection of presentation and projection devices used to show computer output. In addition to that it contains the local area networks and wide area networks that permit computer systems and people to communicate with each other. The digital cameras, computer games, CDs, DVDs, cell phones, telephones, telecommunication satellites, and fiber optics capture the concept of ICT comprising computerized machinery, and computerized robots. Such innovations have been described as an important tool for the realization of a modern learner centered

education model that better meets the needs of learners through differentiated and customized training (Watson and Watson, 2011).

ICTs are both a vehicle for communication and a means of processing information. Most people recognize ICTs as catalysts to bring about improvements in working conditions, knowledge processing and sharing, lesson plans, learning techniques, scientific research access to information.

Pioneering teaching methods developed based on active and experiential learning. It may be enhanced with ICT and can increase student commitment and improve their performance. The role of ICTs in enhancing access and educating the relevance and eminence of education in developing countries and ICTs significantly facilitates the attainment and engagement of knowledge, creating unpatrolled opportunities for poor countries to strengthen their education systems, advance policy formulation and implementation to expand the range of business and poor opportunities (Tinio 2002). Information and communication technologies (ICTs) are influencing every aspect of human life. They have become an integral part of stimulating education of a country. Effective use of ICT in education sector has had a substantial positive impact in progressing towards the development path of a country like Bangladesh. The effective utilization of ICT in the developed nations has already shown a remarkable contribution in their economic and social progress. The economic progress of a country depends on the extent to which the country is adopting the information technologies in different sectors while education sector is one of the important sectors. So acquiring knowledge on ICTs in different level of education is an important issue for unique developments of the country.

In Bangladesh, maximum of the educational institutions is not well furnishedwith ICT infrastructure (hardware, software, database, networks and telecommunications) to promote quality of education in each level mainly in tertiary level. The importance of ICTs

no way to deny in the educational organizations. This seek to convert its facilities to improve the condition of social, professional and educational purpose with modern technology so that it can enhance the quality of education and fulfill the knowledge gap. This rearrangementnecessitates effective adoption of technologies into prevailing learning environment in order to enhance improving professional productivity and efficiency. ICT has accelerated the pace of globalization. Countries having access to and control over information can lead the world economically and politically.

In the last two decades, many countries have invested comprehensively in ICT development. Nonetheless, the practice of ICT in education sector has been a main priority over the last decade in many other EU and OECD countries, though progress has been inconsistent (Aristovnik, 2012). Yet, ICT expenditures are different within and among the countries, side by side between institutions within countries. In many countries, universities have entrenched ICT into the curriculum, and demonstrate high levels of effective and appropriate ICT application to support teaching and learning across a wide range of subject areas. In other countries, however, some innovations in e-learning are in the initialstage of implementing ICTs, characterized by significant improvements in the learning process. Although there is limited profound change in learning and teaching in this sector (Balanskat et al., 2006). Like other developing countries, Bangladesh is also passing early stages of adopting ICT for enhancing quality education but the issue is debatable.

Hence, one puzzling question concerns the role of these technologies on educational consequences or performance of quality education. Quality education means education that support to innovation, development, and fulfills the requirements of the stakeholders. Given the increasing use of ICTs in education, there is a rising need for metrics to track

and demonstrate transparency to fund several sources and public. Metrics are required to show the relations between use of technology and success in education.

2.0 Statement of the Problem

Though the developed nation proved their efficiency in education sector by using ICT in different levels education but application of ICT in this sector is still at an early stage for ensuring quality education. Again the association between ICT and educational performance is inconclusive the literature provides contradictory results (Youssef and Dahmani, 2008). Application of ICT has credible role on educational development, and mainly at the university level but role is yet to be causally established in education sector.

3.0 Research Questions

The central research question of the study: What is the impact of ICT on quality education at the university level of Bangladesh?

Additional questions related with research are given below:

i. What is ICT's contribution to improve the education quality and learning outcome?
ii. Why and how the action of using ICT are connected with developingthe quality education at university level in Bangladesh?
iii. What is the gap between expected ICT application and current application of ICT?

4.0 Objectives of the Study

General Objective

The main objective of the study is to assess the impact of ICT on quality education in the university level of Bangladesh.

Specific Objectives

This study followed some specific objectives to encounter the primary objectives which are as follows:

1. To focus on ICT's contribution to enhanced quality in teaching and learning and a broad access to learning materials.
2. To examine the existing relationship between teaching quality and teacher's motivation, intensity of ICT use and performance of student.
3. To identify whether ICT helps to access in broad range of study materials.
4. To draw out a guideline to improve quality of education through ICT application in different disciplines of the university.

5.0 Methodology

In order to achieve objectives, mixed research methods (qualitative as well as quantitative) have been used in collecting necessary data. This study has considered stakeholders of all public and private universities such as Teachers, students, employers and alumni. Eight universities were selected (3 from public universities and5 from private universities). Among these universities, 100 teachers, 400 students were selected conveniently by using stratified sampling method, while 5 employers (3 from multinational corporations and 2 from local enterprise), and 20 alumni were selected based on access priority. As a suitable technique, data were collected by triangulation research approach by the researcher through FGD, personal in-depth interview and structured questionnaire. All the interviews were recorded and after completing the interviews data were transcribed. Subsequently, data classified and addressed to specific research issues. Finally, interview data have been presented in the form of findings and discussion based on issues identify through literature review relating to the Impact of ICT on Quality Education at the University of Bangladesh.

Table 1: Relationship among Research Questions, Objectives and Methods

S.N.	Research questions	Objectives	Methods
01	What is the impact of ICT on quality education at the university level of Bangladesh?	To assess the impact of ICT on quality education in the university level of Bangladesh	Main: -Primary sources -Secondary Sources Support: -In-depth Interview -FGD -StructuredQuestionnaire
02	What is the contribution of using ICT in improving teaching quality and learning outcome?	To focus on ICT's contribution to an increased quality in teaching and learning.	Main: -Primary sources -Secondary Sources Support: -In-depth Interview -FGD -Questionnaire Survey
03	Why and how use of ICT would improve quality education at university level in Bangladesh?	To examine the existing relationship between teaching quality and teacher's motivation, intensity of ICT use and performance of student.	Main: -Reviewing Literature -In-depth Interview - FGD Support: - Structured Questionnaire
04	What is the gap between expected ICT application and current application of ICT?	To draw out guidelines to improve quality of education through ICT application in different disciplines of the university followed by possible limitations.	Main: -Primary Sources Support: -In-depth Interview - FGD
		To identify future research issues those	Main: -Primary sources

		have been raised in this study.	-Secondary Sources Support: -In-depth Interview -FGD -Reviewing Literature

Source: The Researcher

6.0 Rationale of the Study

According to Wong and Li (2008), ICT played very crucial role in reengineering educational delivery and student learning, but occasionally these systems are applied in isolation. ICT systems have moved outside a perfect teaching and learning support to a movement of transforming education in the material society (Repiso&Tejedor, 2012). Rosas and Nussbaum (2005) explained that there is a possiblesolution for improving student learning environment using collaborative system atmospheres and vigilant planning. Though, it is of very important for successful implementation of the system, but the existing researches do not identify a process or model for implementing these systems. The sporadic and specialized nature of collaborative system and its implementation in education environments is further supported by the varying educational levels of targeted students in different studies (Zurita and Nussbaum, 2004; Valdivia and Nussbaum, 2007). Collaborative system implementations are far accomplishment in implementation from elementary applications through higher education and have been found to have a statistically significant improvement in student learning performance.

7.0 Contribution of the study

7.1 Contribution to theory and knowledge

Although there is ample scope to study the impact of ICT on quality education at the Universities in Bangladesh. The previous study has failed to address this issue substantially. Therefore, it is hoped that the impact of ICT on quality education at the University of Bangladesh in the present study in measuring impact of ICT on quality

education at the Universities of Bangladesh could be a successful extension of the theory. Moreover, previous studies cannot explain (i) conceptual framework of ICT and quality education (ii) relationship among use of ICT, quality education, teacher motivation and student performance at university level (iii) clear cut guidelines to improve quality of education through ICT application in context of developing countries like Bangladesh. This research is expected to fill these gaps. Therefore, the researcher believes that it will contribute to existing stock of knowledge.

7.2 Contribution to practitioners

The existing researches do not provide an adequate guideline that how factors related in using the ICT process and performance level of higher schooling. The thirst of this research is to find out the answer of these questions and an attempt to develop different frameworks as the emerging findings of the study. These could be guideline to the practitioners such as UGC, authority of the university, and the ministry of educationto find appropriate methods of ICT application in education sector. The researcher also believes that the findings will contribute to the policy makers to understand way of improving ICT application at the tertiary level of education.

8.0 Structure of the Dissertations

The study is organized into nine chapters. The first chapter discusses introduction, problem in perspective, objectives, research issues & research questions, research objectives, methodological orientation, and contribution of the study.

Chapter Two points out the context for this analysis by reviewing literature from research related fields, including ICT, university education. This chapter classifies the factors associated with using ICT in higher education for quality education. It also explains the different ICT applications and their teaching and learning aspects. This chapter also

explain the relevant theories of technology in relation to higher education and also the theoretical focus for measuring the different phenomenon.

The chapter three describes the methodology of the study. In order to apply the appropriate research technique, general research paradigm in education and other social science disciplines are reviewed. In doing so, mixed research method is proposed as an appropriate research method to resolve the research issues. Methods of data collection and techniques of data analysis are discussed. The chapter elucidates data collecting methodsused in this study. The main data collection mainly performed with questionnaire survey, interviews, and focus group discussions. The chapter explains the techniques to ensure the superiority of mixed research with respect to this study. The chapter also explains ethical aspects, confidentiality and anonymity in addition with the triangulation research approach used in this research study.

Chapter four explains the current scenario of public and private universities of Bangladesh in relation to the use of ICT for improving quality education.

Chapter Five highlights the data presentation of the collected data. Based on the research questions and proposition drawn in the review of literature, data presented sequentially to give an insight to the researcher and collected data are analyzed using quantitative data analysis techniques.

Chapter six presents analysis of collected data through structured questionnaire from the selected respondents and organization considering different sections with emphasizing on objectives of the study in relation to theory.

Chapter seven presents the qualitative data and qualitative findings from the personal in-depth interview, FGD.

Chapter Eight presents findings of the study based on the analysis in the last three chapter (Chapter five, six, and seven).Chapter nine presents conclusion of the study, theoretical and practical implications, limitations and directions of future research.

CHAPTER TWO
REVIEW OF LITERATURE

CHAPTER TWO
REVIEW OF LITERATURE

2.0 Introduction

This chapter examines a representative range of literature on ICT on quality education through teachingand learning. In recent times many educators have become more circumspect in relation to the contribution of ICT to ensure quality education in teaching and learning for e.g. (Cuban, 2001) reports a number of case studies that demonstrate some of the challenges uncertainty for teachers and schools involved in incorporating the use of ICT into their programs. Within a very short time ICTs have become a key role player which is regarded as building blocks of modern society, (Adu and Olatundun, 2013). Again, ICT is considered as a core part of education, along with reading, writing and numeracy. People are more concern about understanding ICT as well as learning the basic skills and concepts of ICT education. The term ‘computers’ was substituted by ‘IT’ (information technology) after the end of 1980s, which is signifying a shift of focus from computing technology to the capacity to store and retrieve information from the IT (Adu and Olatundun, 2013). Information and communication technology (ICT) are beyond to store and retrieve only, it is the combination of ‘Informatics technology’ with other related technology, specifically communication technology (UNESCO, 2002). There are numerous products of ICT have been used in education for different purposes among them- teleconferencing, email, audio conferencing, television lessons, radio broadcasts, interactive radio counseling, interactive voice response system, audiocassettes and CD ROMs etc. are more relevance to education purpose (Sharma, 2003).

It has been derived from literature review that one of the most important aspects of use of ICT has an immense role on the change of organizational performance. ICT has direct impact on the performance of quality education. Punie et al., (2006) argues that few

attempts have been made to present a systematic application of ICT in the education sector especially on university education in Bangladesh. A diverse range of studies have been conducted by various scholars, which present different perspectives with regard to the role of ICT for teacher performance, student performance, organizational performance. Through an overview of selected studies in the above areas an attempt has been made to bring out the essential parameters of impact of ICT application in educational sector, as considered relevant to the present study in university education in Bangladesh. Therefore, this chapter is an attempt to present general scenario of ICT application to improve quality education in the university level of Bangladesh.

To this end in achieving the objectives of the study, the chapter examines ICT's contribution to an increased quality in teaching and learning and a broad access to learning materials, the existing relationship between teaching quality and teacher's motivation, intensity of ICT use and performance of student.

2.1 Formal understanding of ICT

ICTs includes innovations along with devices, the web, radio and TV transmission and video conferencing (Khan et al. 2012). In this study ICT with IT (Information Technology) has been used synonymously.

***ICT for teaching**:*

ICT for teaching can be define in that way *"the technological equipment which support the teacher for preparing their notes or other related things for teaching the students. The supportive things are comprising a teacher's computer (laptop, desktop or other device) that can be connected to a data projector and sound system in visual way which can also provide rich media to the entire class"* (Douglas, 2011, p.128).

***ICT for learning**:*

ICT for learning "*is characterized as being student-centric.*

The main focus point of information technology is to support the needs pf the students. Its not about to understand about the learner perspective but also it facilitates the availability of a learner when they need.(Douglas, 2011, page.129).

2.1.1 Concept of Information and Communication Technologies (ICT):

There are many definitions for ICT and the most elaborate version by Blurton (1999, p.1) defined ICT as the: "*diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information.*

Other innovations includes computers, the internet, radio station and tv transmission system and video conferencing. ICTs are interconnected network which includes data analysis, storing and information dissemination (Herselman& Britton, 2002).

For both developed and developing countries, it is an essential need and also truth that the use of ICT is already an indispensable part of everyday life for a large number of people (Kirkwood & Price, 2006). ICT has become the center of training teachers ans students to engage in a learning environment, Kozma (2002). (Punie et al, 2006) argued that "*it is difficult and maybe even impossible to imagine future learning environments that are not supported, in one way or another, by ICT*" (p.5).

Though technologies are obligatory tools for Information and Communications, it is not a cure for all educational problems (Guri-Rosenblit, 2006; Jung, 2005). ICT while successfully integrated into learning makes sure communication between learners and instructors, thereby promoting the development of cognitive capabilities (Jones and Cress, 2001, Punie et al., 2006).

ICT has provided sufficient resources for investing in education to remote geographical areas (Guttman, 2003). The integration of ICT is extensive, when looking at its existing widespread diffusion, especially among the young generation (Punie et al., 2006). Many researchers believed that ICT creates three important milestones: a) access to teaching and learning opportunities; b) improving the quality of learning and teaching; and c) delivering lifelong learning for adults (Bates, 2000b; Hefzallah, 2004; Oh, 2003; Tinio, 2000).

Information and Communications Technology in higher education is significant and includes satellite communications and the Internet, which are a revolution in distance learning, offering flexible learning opportunities (Guttman, 2003. The definition of virtual learning as societies under which the training communities are based on common purposes Blurton (1999). In this sense, ICT will also have a significant positive impact through education all over the world (Herselman& Britton, 2002).

Higher Education:

A number of independent human rights treaties protect the fundamental right of access to higher education. The 1966 United nations International Covenant on economic, social and cultural rights stated that "Tertiary education having been made equally available to all by offering free access to education and all necessary ways to allow them to comprehensive education"(OHCHR, 2007).

The word "higher" in the context of higher education means attaining specific quality with substantial knowledge (Teichler, 2006). Hence, higher education means attaining quality education generally in university level. Tertiary universities fail to overcome the immense challenges and opportunities that ICT raises (Breen, Lindsay, Jenkins & Smith, 2001). As stressed by Microsoft Scholar Mr. Edward Barboni: "*Integration of information technology into learning in higher education is an urgent priority. The higher education community must continue to find innovative ways to empower educators to use technology*

to enhance learning and prepare students for careers and a lifetime of learning" (Microsoft, 1997).

Professional and tertiary education are terms used interchangeably withina the system of education (Teichler, 2006). The revolution of learning and teaching necessitates reorganization of the ways universities and higher education institutes are planned, managed and organized (Sife et al., 2007). The higher education sector has been undergoing a revolutionary change in the past decade, driven by the Internet and e-learning technologies (Guttman, 2003).

Sife et al. (2007) expressed concern that many institutions fail to incorporate ICT into teaching and learning because they are using ICT to duplicate their traditional practices, content and control. The higher education sector exists within an environment marked by significant transformation, not only in education but also in the wider society (Kirkwood & Price, 2006). The rate of new technological change must keep pace with the higher education system in terms of enhancements in knowledge and skills to meet the demands (Hong &Songan, 2011).

The transformation in higher education is boosted with the use of ICT, which thus enhances the quality of education (Kozma, 2005; Sangrà& González-Sanmamed, 2010; Tinio, 2000). In the same manner ICTs can enhance the quality of education (Tinio, 2000; Sangrà& González-Sanmamed, 2010) by enlarging the motivation of learner, engagement and acquisition of basic skills. There is increasing pressure in developing countries where higher education is held back by serious challenges to ensure that technological possibilities are viewed in the context of educational needs (Jaffer et al., 2007).

2.1.2 ICT in Higher Education:

Using technology is an important milestone towards the university education. Although education is unlocking the door to growth, information technology is progressively

opening doors to development, Wims& Lawler (2007), (p.7). Technology has developed rapidly and has influenced the society and everyday life. The importance of education was emphasized by Guttman (2003) as: "*education is first and foremost a fundamental human right, spelt out in Article 26 of the Universal Declaration of Human Rights (1948), which declares that "elementary" education shall be free and compulsory, and that higher levels of education will be equally available on the basis of merit"* (p.13).

The developed and developing countries in the world are investing a great deal of funds in higher education through the use of ICT. Information and Communication Technology investment thus represents an opportunity for developing countries to significantly improve their higher education sectors. *By offering developing countries extraordinary opportunities to enhance educational systems as well as improve policy formulation and execution, ICTs greatly facilitate the acquisition and absorption of knowledge. In addition, it can widen the range of opportunities for business and the poor people. The greatest adversities for poor who live in the poorest countries, is their sense of isolation. For this reason, the new communications technologies aptitude to reduce that sense of isolation and to open access to knowledge in unbelievable ways* (Tinio, 2000).

Current trends indicate higher education will change in response to the plethora of possibilities by the use of ICT. Technology can replace certain learning and teaching elements and can enhance or communicate effectively between teachers and students.

The World Declaration on Higher Education 1998 for the Twenty-First Century stated that: "*Higher education institutions should lead in drawing on the advantages and potential of new information and communication technologies. In the same time, ensuring quality and maintaining high standards for education practices and outcomes in a spirit of openness, equity and international co-operation"* (Guttman, 2003).

Information and Communications Technology has the potential to change the social structure and operation procedures, and force educational institutions to react and change as well (Kozma, 2002; Oh, 2003). Stensaker, Maasen, Borgan, Oftebro and Karseth (2007) pointed out that global use of ICT in higher education has made a remarkable "big leap forward" from the early 1990s (also see Oh, 2003). Due to the diverse nature of student requirements and their circumstances, educational institutions need to be constantly reflecting on the changing higher education environment (Kirkwood & Price, 2006).

2.1.3 ICT and Quality:

The survival of organizations is depending on the quality mostly in this global economy. It is the key word for any organization. Day by day the approach of organizations is changing from the production-led philosophy to a customer-focused approach for developing the current status. The important strategy for any organization is competitiveness, which is determined by the way it delivers customer service. This is the technique used in post-liberalized era. However, Firms with high service quality pose a challenge to other firms (Lenka&Suar, 2008). Furthermore, Organizations can achieve business excellence through ensuring quality control in service segment. Among the various quality management practices are leadership (Flynn, *et al.,* 1994; and Powell, 1995), strategic planning (Black and Porter, 1996; and Dow *et al.,* 1999), information and analysis (Anderson and Sohal, 1999; and Samson and Terziovski, 1999), customer focus (Powell, 1995; and Ahire*et al.,* 1996), supplier management (Saraph*et al.,* 1989; and Powell, 1995) are mostly important for ensuring quality in the service organization. There is sparse literature available on developing a holistic model of TQM in service sector (Sureshchandran*et al.,* 2002). TQM is recognized as a source of competitive advantage in manufacturing (Dean and Bowen, 1994). TQM benefits organizations that implement it properly. This concept has been established by case studies and empirical studies (Adam

et al., 1997; and Samson and Terziovski, 1999). With successful application of quality control in manufacturing sector, academics have begun to apply quality control principles and practices to service organizations, while ICT can play a pivotal role to control quality in such service organizations.

Service is delivered by both employees as well as with technology deployed by the firm. Operation of service industries consists of integration of both—back office and front office. While back office operations are technology-driven, front office operations are people-driven (Lenka&Suar, 2008). Now the many service organizations try to ensure quality service in the front office with involvement of IT knowledgeable people with the IT based back office. There is an extensive body of literature using information systems as the unit of measure and investigating its impact on service organization (Banerjee &Sriram, 1995; Lancioni et al., 2000; Lim &Palvia, 2001; Sriram et al., 1997). Investment in information technology (IT), committed to improving a company's efficiency and productivity, such as transection in IT and investment opportunities. This will lead to business performance which will also strongly linked to financial performance, Weill (1992).

2.1.4 ICT and quality Education:

ICT would not generate education and learning qualities automatically. The use ICT is not always be used in positive way. It is not being surprising that the use information and communication technologies also happens for unimportant purposes, which waste students' time or even worse. Again, one can also be able to use information and communications technology for destructive or immoral purposes. We can certainly use ICT to further entrench inequalities and to favor particular groups. No far the examples are placed, it is evidence from USA, that is African American and Hispanic students are given more repetitive drill and practice tasks on computers and fewer sophisticated simulation

applications than their white peers which is gone in negative way (Weglinsky 1998; Kreuger 2000).

Although there is considerable evidence that ICT implementation can stimulate and enhance learning on a multiple fronts and practical skills(Mann 1999, BECTA 2000). Critical thinking, (Oliver & Omari 1999, Williams 1999), System integration (Peabody 1996), interpersonal skills (Adnanes 1998), encouragement (US Congress 1995, Allen 2000, Combs 2000, Diggs, 1997, Sherry, 2001), establishing life-long learning habits (Schollie 2001) and concepts development (Yelland 1998), still there been some problems exists. In addition, information and communication technologies are being applied not only in learning management but also to the business models of educational delivery. This is evidenced from one recent report which explain that this trend is mainly from USA based, Year Four CEO Forum School Technology and Readiness Report (CEO Forum 2001). Professors therefore have a choice. They can impulse the boundaries of information and communications technology in education sector, by seeking to exploit its capacities to improve our outcomes; by extending us beyond the limits and standards we currently experience. Again, we can limit it to the boundaries that we currently know, by challenging only our technical skills. So, it can be said that if the teaching profession and mainstream educational institutions follow this path we will be overtaken by newer, more commercial models of ICT enabled education in every aspect. Ignoring it is not an option at all.

2.1.5 Education as a Special Case Environment:

The education environment has a unique set of characteristics that separate the user population and environment from that of business and industry. Studies in ICT implementation are much fewer in the education environment compared to business and industry (Huai, 2008). The drivers within education that lead toward ICT use and how

they affect intention to use the technology (Meyer and Xu, 2009). System use may vary in education longitudinally and that faculty users were the primary driver of system success (Roschelle et al., 2010). Several studies showed that how technology acceptance models differ with educational users (Sang et al., 2010; Wang, Wu and Wong (2009), and Huang et al. (2011). ICT systems play an important role in educational delivery methods, but the implementation of those systems used in business and industry has had less than optimal implementation strategies. The literature review in Huai (2008) showed that there have been many studies that examine user acceptance and adoption of technology in many fields, but there are minimal studies that adequately identify behavioral intention of teachers to use technology. Because of the varying results of technology acceptance studies, Huai chose to study teacher acceptance of technology in Taiwanese universities.

Huai created a causal model of factors that lead to behavioral intention to use technology by faculty. The causal model studied in Huai reflected the modifications to TAM in Venkatesh and Davis (2000), using that model to study teacher intention to use technology. Perceived usefulness had a positive impact on intention to use, perceived ease of use did not impact behavioral intention, but it did positively affect perceived usefulness, Computer self-efficacy also strongly impacted ease of use and was the single largest factor in behavioral intention to use technology by faculty. Additionally, subjective norm was not a significant predictor of use, which shows that colleague input did not significantly impact teacher perception.

Meyer and Xu (2009) stated that, in the minds of educational leadership, technology has become a silver bullet that could solve the problems in higher education in terms of performance and productivity. Higher education institutions have grown interested in seeing technology incorporated into the classroom, but without faculty acceptance and use of the technology the systems have no impact. Meyer and Xu used data from the 1999 and

2004 National Study of Postsecondary Faculty to create a causal model of factors that lead to faculty use of technology.

2.1.6 Quality concepts in higher education (Universities):

Quality concepts varies in field to field and situation to situation. Again, it differs from product to service. Johnson &Golomskiis (1999), explain main four issues for quality concepts in higher education are:

(i) Incorporation of quality concepts in the curriculum. An extensive International Academy for Quality (IAQ) multinational study was chaired by Jean-Marie Gogue, which is still useful (Gogue, 1988).

(ii) Using quality concepts to improve educational administration. Education as a category was included during the first time this year, when the Malcolm Baldrige Annual quality Award. Just once case published in the journal at the previous year(ASQ, 1999a, 1999b).

(iii) Quality concepts used to improve the teaching of any subject. There have been several authors who have set up specific objectives for course, and daily learning objectives and measures for taking class.

(iv) Quality concepts also included in doing research. Researchers do research for fulfilling the purposes of research, which is depending on the various event. If it has been done to fulfill a Ph.D requirement, it will be to help individuals learn how to use that research when conducting research on a meaningful subject.

Again, when the research is ongoing by professors and research associates, it is to add to knowledge. There are two separate issues. The first has to do with whether anything can be measured that can be used for performance measurement and process improvement. On the contrary, the second has to do with whether or not someone is

breaking new ground in theory, or is more concerned with new applications of research issue. In the second part of the second issue, each step-in research is based on prior steps, which considerably thinking when doing research.

Furthermore, Johnson &Golomskiis (1999) explained six quality concepts for education based on the quality management principles.

i. Leadership: Leaders establish unity of purpose and direction of education. They should create and maintain the internal environment in which people can become fully involved in achieving the university's objectives. When the higher authority of a University loses interest in quality, quality efforts have little chance of survival. Many activities do not require sustained attention and support of the superior. Quality systems are management style neutral. In many universities, the leadership is delegated to principles, teacher, and staff. Senior leaders in a university system need to set directions and within an accepted value system. They need to ensure that strategies, systems, and methods are used to build knowledge, skills, and attitudes consistent with educational goals and objectives.

ii. Understanding stakeholders: Public universities depend on public confidence and therefore should understand current and future community needs, meet student learning requirements, and exceed the community's expectations.

iii. Factual approach to decision making:Effective decisions and actions are based on the analysis of data and information. The selection of appropriate data in universities needs to be guided by considerations of the breadth and depth of the data collected. Quality related data should include student and stakeholder needs, process control limits, performance measures, and changed values.Good data is trustworthy, unswerving, structured, descriptive, precise, timely and accessible. How reliable,

consistent, etc., the data are determined by the quality requirements found in the university's quality manual.

iv. Involvement of people:People at all levels are the essence of learning and their complete participation makes it possible to use their talents for the good of the organization. Employees are critical to success in universities. Teachers, staff, and administrators are the assets that produce and maintain the intellectual capital from which a high level of quality education is produced. The quality system assures stakeholders' confidence in continued high quality education.

v. Process approach: Learning is achieved more efficiently when related resources and activities are managed as a process. A process changes the value of whatever enters a university.

vi. Continual improvement: Continual improvement in processes and results should be a permanent objective of universities. University improvement is a continuing goal of universities. Improvement, when carried out in a quality system, is subjected to two criteria. First, the results continue to rise and the costs continue to fall. Second, systems have to be stable from Edwards Deming before they can be changed. from Edwards Deming, processes must be stable before they are improved. Taken together, these criteria require data on results, cost, process stability and process capability.

In Addition seven management concepts needed to provide the linkages necessary to improve education (Johnson &Golomskiis, 1999) be:

a. Top management's obligation to improve organizational effectiveness.
b. Identification of critical processes for improvement.
c. Selection of saleable processes.
d. Measuring processes before beginning the improvement.
e. Proportioning time appropriately among design, development, and implementation.

f. Periodic measures taken during the improvement cycle and reporting results.

g. Reporting improvements in terms meaningful to process stakeholders.

2.2 Indicators for measuring quality of education

With the goal of improving quality in the last twenty-five years, worldwide, higher schooling programs and institutions have experienced significant change and transformation. From these significant changes, an extensivenose has been driven to yield methodicalproof of efficiency as well as effectiveness in higher education system. (Guthrie & Neumann, 2007, Doyle, 2006,Hayford, 2003).

To achieve the greater efficiency and accountability within their organization, itprovides higher schooling systems, which have graduallyimplemented, more sophisticated, logical, formal process, (Burke and Minassians, 2001). The development of education systems took place in narrative form at university level with standardized government model.

Across the national and state boundaries, organizations need to improve the way of auditing and checking the output. There are some indicators considered as a vital component in flyingquality higher schooling, for example routine work, performance features, organizational and state level standard models. Organizations, by the same token (WTO) World Trade Organization supportthe developing countries to indicate the performance featuresand standard form at different levels as explained earlier. Thereupon the state and institutional level. (Marginson& van der Wende, 2007).

Furthermore, jointly OECD and UNESCO have gradually developed objectives performance features at worldwide to make a standard collation of higher schooling programs, (OECD, 2007).

Similarly, a strong group of skilled workforce will support the external and macro factors like improving the economic growth, performance prototypes and other variables. Consciously, higher schooling is the way of helping and assessing the student’s skill level.

Again, it is ensuring that how the education system is making the students for employment. Several authors focused on various aspect such as social, political, education and economic measurement. To put it in another way higher education affects the development and performance models. (Ward, 2007, Trowler et al. 2005, Reindl and Brower, 2001).Ordinarily, it is found that country governments and organizations related with higher schooling use performance models and propositions for various reasons that is very significant between the two cases.

Explaining performance indicators:

According to Cave, Hanney&Kogan (1997) the major three types of performance indicators explained.

- *Simple indicators:*The simple indicators described with the form of complete figures.For measuring the quality education, it provides an unbiased explanation of a situation.
- *Performance indicators:*Performance indicators are quite different from the simple indicators. Point of reference is necessary for instance, a quality level, assessment, comparator and objective focus. Hence, in character they are relative rather than absolute form. For the most part, simple indicators stay neutral than performance indicators. However, it may become a performance indicator where the judgement values are involved.
- *General indicators:*These indicators drove externally and recognized as indicators, whichis not harsh in logic. Chiefly, frequently opinions or sayings, survey outcomes or general statistical tools are general indicators.

Often the confusion between simple indicators and performance indicator is to make a clear judgement provided through performance indicators. In short distinction relies on the judgement of the two indicators.

Nowadays, no general definition of performance indicators is provided yet. Theperformance indicators might not considered as circumstance. It is taken into consideration as goal, concept ladder, value creation and utilization at different procedures. This is dependent on performance model for measuring standard of education. The following sayings synthesized from the following authors: (Burke et al. 2002, Burke and Minassians, 2002, DEST, 2002, Rowe and Lievesley, 2002, Bruwer, 1998, Romainville, 1999). The stated definition used for the project of quality teaching indicators.

> *A measurement process is classified as information and statistics context. This permits to compare between fields, extra time with generally accepted standards. The main purpose of performance indicators are to provide information about the homogeneity that helps to meet the objectives of learning outcome at different levels of higher education institutions.*

The developed countries similar to Australia, the country institutions use performance indicators. The reason behind lays to monitor country higher education performance level to compare with other countries. In short, comparative purpose, to smooth the assessment operations, to ensure the evidence for external parties. For ensuring quality assurance audits of organizational education and learning quality, (Chalmers, Lee & Walker, 2008; Burke &Minassians, 2002; Rowe &Lievesley, 2002; Burke et al, 2002; DEST, 2002; Romainville, 1999; Bruwer, 1998).

2.2.1 Different types of performance indicators:

As collected from several authors' performance indicators are divided into four major types. These are Input, Process, Output, and Outcome available in theory (Borden and Bottrill, 1994, Richardson, 1994, Carter et al. 1992, Cave, Hanney andKogan, 1991). Subsequently, these are classified as quantitative and qualitative indicators.

Quantitative Indicators:

Indicators those are measured or classified related with quantity or quantity measurement. The quantitative indicators articulated with special characters like numerical values. If it is in descriptive form the meaning considered through a numbering process. A specific number assigned to understand the meaning. The input and output performance indicators are concerned with the quantitative indicators for further measurement.

Input indicators

Indicators related with human imitation, financial resources and physical as well. This will support the institutional programs, actions and services. One of the limitations of that indicator is the inability to determine the quality of education and learning. Without rigorous analysis and interpretation, it cannot possible to determine. Notably, resource allocation an indicator should be understood with enrolment data, resource standard, and conceptual variety to determine education and learning outcome.

Output indicators

Similar limitations apply to output indicators. In this scenario, the output data represents the sum of outcomes produced, by calculating immediate outcomes and by directing the consequences of the activities carried out to produce these outcomes (Burke, 1998). The defining features of performance indicators or metrics is numerical values and the accuracy of those quantity numbers is almost completely overlooked. The input and output measures are fundamentally limited by their quantitative nature, which is driven by data. Those two indicators prevents things particularly investigating educational, interactive and learning programs that are vital to an organizations efficiency, educational courses and graduates. While quantitative performance indicators do not demonstrate quality of equation, it shows relatively large amounts of results (Burke et al, 2002).

It is observed by the research study, there is insufficient empirical support for quantitative factors as enhancers of quality of teaching and learning. Nonetheless, empirical approaches have received substantial support because they concentrate on the quality dimensions and allow for the assessment of complex and subtle issues.

There are some of the aspects the structure of university education is typically constructed. Using empirical as opposed to quantitative metrics contains information. This will promote a broader understanding of the component assessed for the purpose of quality.

Qualitative indicators

In addition, qualitative metrics are synonymous with definitions based on observations, rather than an absolute numerical calculation or quantitative measurement value. Such metrics refer to or include distinctions based on attributes or non-numerical details such as policies and systems for evaluating learning outcomes, learning community experience, or the contents of a mission statement that are all in qualitative form.

There seem to be two indicators that define the indicators of the qualitative outcome and process. Usually, these kind of performance indicators do not require producing the quantity of results in the form of numerical data or any other numerical value, but rather assess complex process and outcomes in terms of the quality and effect or argument.

Outcome indicators

It success metric tests overall consistency of curriculum, operation and service benefits for all stakeholders in the school. Such key stakeholders include students, parents, the government, employers and industry, as well as others involved (Burke, 1998).

Furthermore, it is not involved in developing the quantity of outcomes in the form of numerical value (as do production performance indicators), but rather in evaluating complex systems and outcomes in terms of their quality and effect. This is the widely known difference between output and outcome measures indicated above. While both

measures the effects of higher education from their own viewpoint, indicators of output efficiency determine this quantitatively. It will have ensured qualitatively by measurements of impact.

In addition, this measure sets up a system known as the result based evaluation method and stresses the value provided to students by their experience in university education. The satisfaction with the quality of experience and the quality of skills that they have built in their own way is also appreciated.

Moreover, the approach is associated with the students as customer, culture that is widespread in university education, where they described identifiable skills and products for students as learning quality values, satisfaction and learning outcomes are the general character of outcome indicators.

This constituted by means that outcomes are harder to measure than numerical outputs. Consequently, they are not used as often their empirical counterparts in the calculation of the tests, (Romainville, 1999; Bruwer, 1998; Bormans, Brouwer, Int'Veld&Mertens, 1987). However, to measure the approaches and quality of education and learning in relation to the higher education objectives, outcome indicators are considered more perceptive, constructive and reliable indicators of performance.

These are also more effective in the collection of information for improving teaching and learning. Getting information on overall satisfaction and skills, this case, is more informative to the school, teacher and future students than data on retention rate.

Although a metric such as graduation rate is useful from a social and economic point of view, it facilitates the ambiguity of the perception of university education. For the reason, qualitative indicators are supposed to take better account of the uncertainty related with to higher education than that of the quantitative measures when assessing efficiency.

Process indicators

Finally, process indicators include the means used to supply training programs, activities and services for performance measurement within the organizational environment, (Burke, 1998).

Furthermore, process metrics look at the system that operates within its specific context. It also address the field of organizational diversity accounting which is a popular confusing factor inter and intra institutional comparison for performance assessment of those issues.

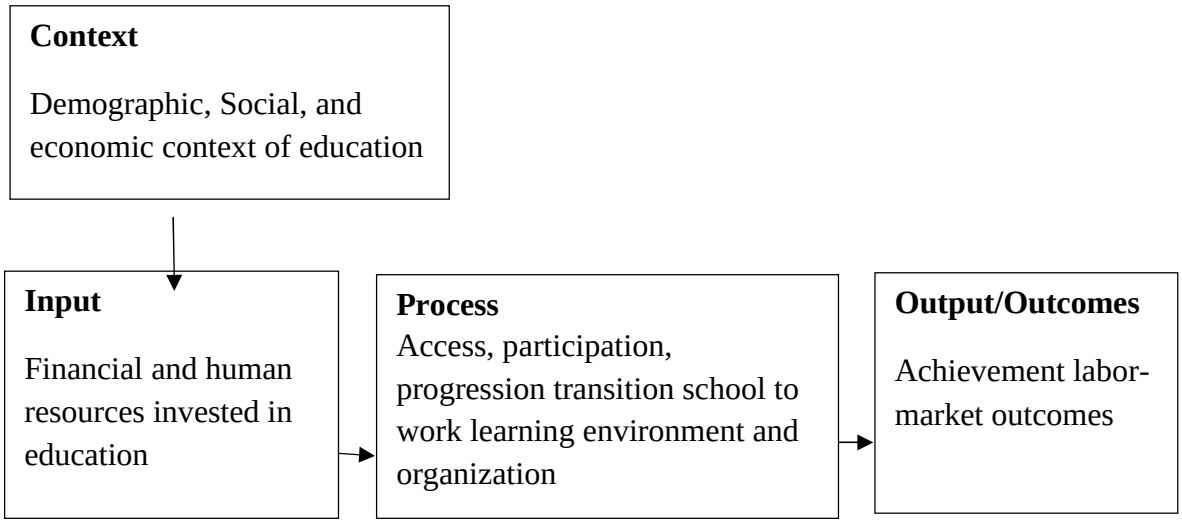


Figure: 2.1 – Ordering indicators for measuring education performance

2.3 Theories of ICT adoption in the Organization

Existing theories and frameworks developed by researchers have been used to explain the adoption and diffusion of technology.

Table - 2.1: Common used technology adoption theories

Diffusion Theories	**User Acceptance Theories**	**Decision Making Th. (incl. Problem Solving Theories)**	**Personality Theories**	**Organization Structure Theories**
Innovation	Theory of	Rational Choice	Technology	Disruptive

Diffusion Theory IDT also called Diffusion of Innovation Theory DOI (Rogers 1962) Technology Lifecycle Theory (Rogers 1962; Moore1995) **Focus on technology, Focus on the environment and on the using (ICT practicing organization)**	Reasoned Action TRA (Ajzen and Fishbein 1973, 1975) Theory of Planned Behavior TPB (Ajzen 1991) Technology Acceptance Model TAM 1; TAM 2 (Davis 1989) Motivational Model (Vallerand 1997) User Acceptance of Information Technology UTAUT (Vankatesh et al. 2003) **Focus on the rational employee interest**	Theory/ Game Theory Decision Making under Uncertainty Risk Management Change Management Media Richness Theory (Daft and Lengel 1984) **Focus on the rational organizational/ management interest**	Lifecycle Theory (Rogers 1962; Moore 1995) Non-technology related approaches are : Social Cognitive Theories SCT (Compeau and Higgins 1995) **Focus on the individual cognitive interest**	Technology Theory (Bower and Christensen 1995) Creative Destruction Theory (Schumpeter 1912, 1942) **Focus on the strategic organizational interest**

Source: Hillmer U. (2009)

One of the most commonly employed models is the Technology Acceptance Model (TAM) developed by Davis (1989), which explains and predicts the acceptance of particular technologies across a range of populations (Lippert&Govindarajulu, 2006).

In 1990 Tornatzky and Fleischer developed the Technology-Organization-Environment (TOE) framework to explain the decision to adopt a technological innovation and its acceptance. As ICT-enabled higher education is an innovation, the TOE framework allows its adoption factors to be categorized. A conceptual tripod to illustrate how a society spreads innovation this was described Rogers in 2003, Diffusion of Innovation (DOI),

2.3.1 Technology Acceptance Model (TAM)

Davis (1989) introduced the Technology Acceptance Model (TAM). The most widely applied system of user acceptance and use is the Technology Acceptance Model (Davis 1989, Davis et al., 1989), shown in Figure 3. Researchers used TAM to study the adoption of various technologies and TAM has become the most influential theory in the Information Systems field (Benbasat&Barki, 2007; Chen, Li & Li, 2010; Godoe& Johansen, 2012). Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are explained in the Technology Acceptance Model, which also provides strong views about a new technology that impact aperson'sassertivenessheaded for and use of that technology (Davis et al., 1989,Godoe& Johansen, 2012).

Adoption of an IT artefact depends on two main constructs: Perceived usefulness and the other one is perceived easy of use (Iqbal & Qureshi, 2012; Chen et al., 2010; Venkatesh&Bala, 2008). PU and PEOU determine the intention to use the system, which in turn has an effect on the actual system use. Perceived Usefulness and Perceived Ease of Use are assumed to be related to the acceptance of a computer or technology system (Chang, Yan & Tseng, 2012; Godoe& Johansen, 2012).

Davis (1993) explained that PEOU has a causal effect on PU since it has an indirect effect on attitudes towards and actual usage behavior. Technology Acceptance Model suggests that perceived usefulness will be influenced by perceived ease of use because the easier a technology is to use, the more useful it will be (Venkatesh and Davis (2000).

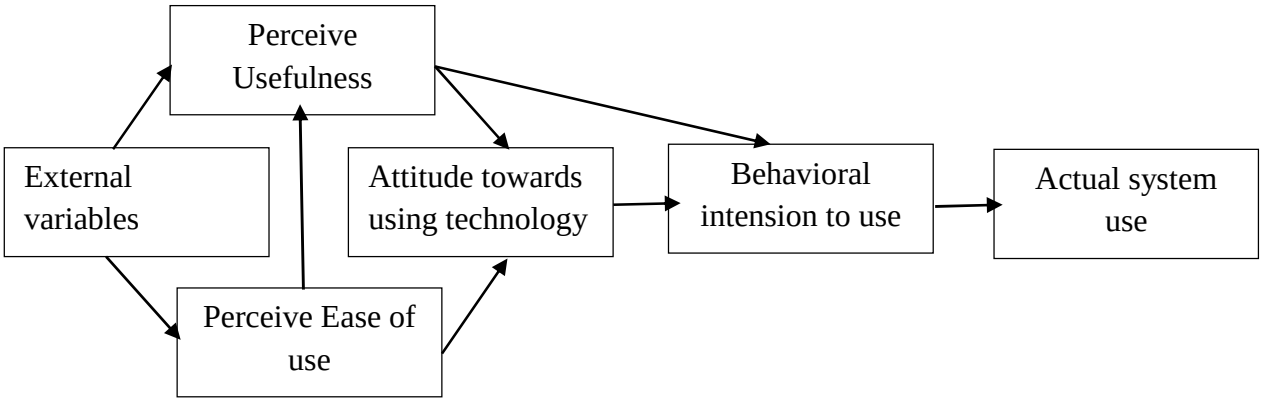


Figure: 2.2 – Original Technology acceptance model (Davis et al. 1989, p985)

The Technology Acceptance Model is designed to predict information technology acceptance and usage on the job (Ventakesh, Morris, Davis & Davis, 2003). The goal of TAM as explained by Davis, Bagozzi and Warshaw (1989, p.985) is: *" ... to provide an explanation of the determinants of computer acceptance that is general, Capable of describing customer behavior across such a diverse range of end user computing technologies and user communities, while also being both logically and parsimoniously justified.*

The Technology Acceptance Model has predictive power to enable it to apply to different situations but the model also has key limitations (Venkatesh and Davis (2000). TAM is the most influential theory as per the Benbasat and Barki (2007, p.212). But it is increased focus on suitable number of unstable outcomes: *a) the diversion of researchers' attention away from important phenomena. b) TAM-based research has led to the creation of an illusion of progress in knowledge accumulation, and c) TAM's failure to provide a structures means of extending and modifying its core concept as a theory has restricted its utility in the ever-evolving context of IT adoption.*

The study observers have used the TAM on various ICT technologies.The Technology Acceptance Model has become the most influential theory in the Information Systems field (Benbasat&Barki, 2007; Chen, Li & Li, 2010; Godoe& Johansen, 2012).

The Technology Acceptance Model assumes that, there would be many variables, like PU and PEOU affecting decisions about where and how consumers will be introduced to new technology.

As Venkatesh and Bala (2008) also noted, TAM was developed to predict individual adoption and use of new information technologies. The Technology Acceptance Model suggests that PU and PEOU are beliefs about a new technology that influence an individual's attitude toward and use of that technology (Davis et al., 1989). The researcher used TAM for this specific research since it is an Information Systems theory that models how users come to accept and use a technology. This theory has not provided the dimension to measure the impact of using systems.

2.3.2 Theory of Reasoned Actions (TRA)

The second theory most cited was TRA (Theory Reasoned Options). The theory comes from social science, and it is an unique case of the planned behavior theory, (Ajzen 1991. produced TRA to explain the connection between peoples beliefs, attitudes, norms, perceptions and behaviors. The theory assumes that a person’s behavior is determined by the person’s behavioral intention to perform it, and the intention itself is determined by the person’s attitudes and his or her subjective norms towards the behavior.

The subjective standard relates to “the interpretation of the individual that most people who are essential to him consider that the action involved should or should not be done. (Ajzen, 1991) book focuses on human estimation and understanding to help solve applied problems by making political decisions. The authors state that TRA is applicable, for example, when studying consumer behavior, women’s occupational orientations, or family

planning behaviors. In these studies, TRA was used to compare it with TAM (Davis et al., 1989), or in combination with DOI. Examined users' pre-adoption and post-adoption views and outlooks by joining aspects of TRA and DOI, for example, Karahanna et al. (1999)

2.3.3Diffusion of Innovations (DOI)

The third principle that was most cited was Diffusion of Innovations. In addition, the book DOI, which was established by Rogers (1983), has been the single most cited person work, earning 286 citation on that. DOI is a conceptual model of how new ideas are transmitted and accepted within a community and it tries to clarify how channels of communication and leaders of opinion influences adoption. Rogers 1983 formulated the first method model, a five-stage model of companies introducing and embracing innovation. Moore and Benbasat (1991) used DOI to cultivate an instrument designed to determine the different perceptions an individual may have adopting innovation in information technology. The tool was intended to be a tool for studying the initial adoption and subsequent dissemination of IT innovations with organizations.

2.3.4Theory of Planned Behavior (TPB)

The fourth concept most cited was the Planed Behavior Theory. The fourth most cited theory was the TPB. Ajzen(1991) presented a theoretical model, TPB, which focuses on cognitive self-regulation. It is very comparable to the TRA model, but the difference is that it takes into account another aspect, namely presumed regulation of behavior. Presumed behavior control refers to the feeling of regulation over the output of a particular behavior. In TRA, objective factors influence individual choices and actions, and conduct is determined by individual expectations. Intentions and motives of the persons to perform a particular act. Intensions often represent individual perceptions and to what degree individuals view a particular act as beneficial or advantages. The theory assumes those

personal behaviors, but also social pressure and a sense of control social phenomena. Ajzen(1991) reviews that the theory was implemented, for example, in experiments investigating problem drinking or relaxation behavior, in which the theory provided valuable information to understand such behaviors, or to incorporate successful strategies to alter them.

In their studies Taylor and Todd (1995) and Mathieson (1991) compared the ability ofTPB and TAM to explain behavior and predict an individual's intention to use ICT, respectively.

2.3.5Unified Theory of Acceptance and Use of Technology (UTAUT)

The fifth concept frequently cited was the UTAUT (United Theory Acceptance and Use of Technology). Venkatesh et al. (2003) developed the unified model by reviewing eight models that explain the use of ICT, namely TRA, TAM, and TPB model that combines TAM and TPB. PC utilization model, DOI and social behavior theory. UTAUT is intended to explain the expectations of a user to use ICT and the resulting user behavior. The model treats as four concepts as direct predictors of users acceptance and use behavior, namely expectation of efficiency, expectation of commitment social influence and situation encouraging. There are four main variables of moderation: gender, age, experience and use will. The authors claimed that UTAUT provides managers with a method to determine the probability of technology adoption progressand to consider acceptance factors for implementing strategies, which include for example training or marketing. UTAUT focuses on users who might be less willing to adopt new systems and use them.

2.3.6Information Systems Success Model

The last theory most reported was the model of success in information system. Delone and Mclean 1992 analyzed earlier research and developed a systematic taxonomy of factors that contribute to IT performance. The authors analyzed the IT performance literature and grouped success metrics into six major categories: system quality, knowledge quality, use,

user engagement, human impact and organizational effect. Both categories are interrelated and interdependent, giving an overall view of IS performance. The models goal is to direct potential investigative efforts. In addition, the most cited theories of preceding publications indicated that the research field hypothesis centered on technology acceptance adoption. The hypothesis most frequently cited were TRA,TAM, TPB and DOI. Almost all the concepts focuses on the individual level, (TAM, TRA,UTA and UT) may also focus on either the institutional level the IT implementation process model or the level of a social system (DOI focuses on a group or organizational level)

In the Information Systems Success Model, the focus of the analysis is oncritical success factors in ICT implementation in organizations.The research focuses on critical success factors. In the application of ICT in organizations within the information systemsuccess model depends on the several factors. These findingsare mostly consistent with earlier research into the most common hypotheses used in studies of ICT implementation and adoption. Galivan 2001, separates from the core conceptual frameworks a certain four concepts most cited, namely TAM,TRA,DOI and TPB, others that also include Jeyaraj et al., 2006.TAM has also been recognized as the most influential model by previous literature, Chutur 2009, Jeyaraj et al. 2006, Lee et al.2003. Studies have one exception compared to the previous literature, namely that of Galivan 2001 and Jeyaraj et al., 2006, 2**.**

2.3.7 Stages of teaching and learning through ICT

UNESCO has publishes a four learning of ICT resources and Process of ICT methods for learning

Stage A: ICT resources to learn; students and teachers to explore ICT technologies in general use. This is the first step where students and teachers continue their academic life using the ICT resources.

Stage B: Thatis the teaching and learning phase of how to use ICT resources. This is the second phase where students and teachers can discussin their teaching and learning cycle how to use the ICT resources and tools.

Stage C: This is the stage of understanding how and when to use ICT tools to achieve particular purposes, and includes the ability to recognize and apply ICT to tasks to solve real problems.

Stage D: This is the last stage where students and teachers specialize in the use of ICT tools and eventually become ICT specialists.

2.3.8 Technology-Organization-Environment (TOE) framework:

The Technology-Organization-Environment (TOE) framework (Figure 2.3) developed by Tornatzky and Fleischer (1990) has been a useful theoretical lens for understanding the technology adoption within organizationsGovindarajulu, 2006; Oliveira , Pudjianto and Hangjung, 2009, Martins, 2011, Arpacı et al., 2012. According to Pudjianto and Hangjung (2009), TOE provides a framework that explains the decision to adopt a technological innovation based on technological considerations, but also on the organizational and environmental contexts.

The TOE structure addresses the context in which innovation takes place, both inside, and outside the organization. The TOE framework has a concrete theoretical basis, consistent empirical support and the potential to be applied to Information Systems innovation domains (Oliveira & Martins, 2011).

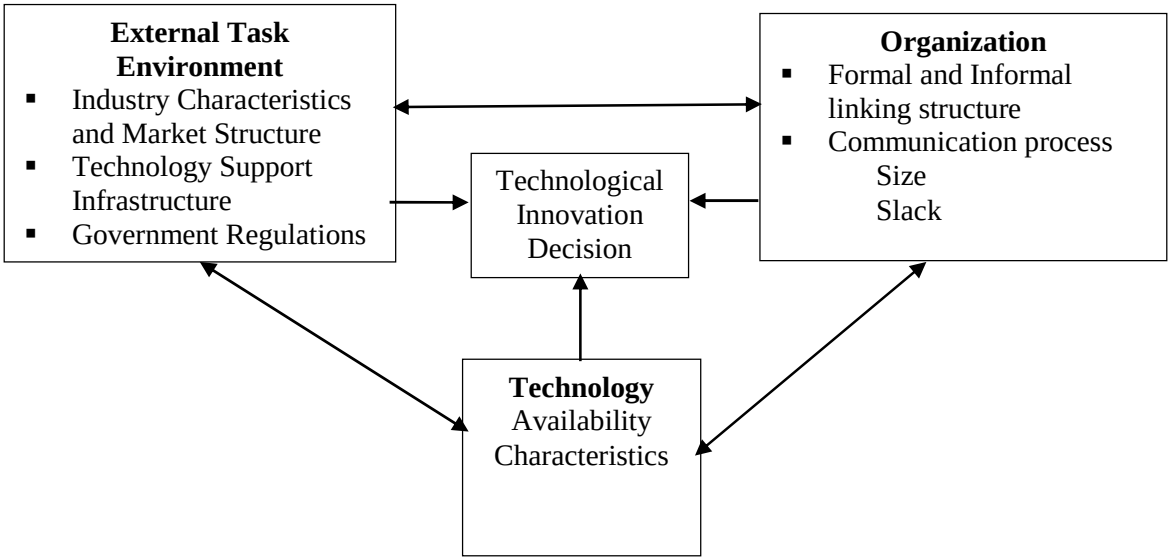


Figure- 2.3: TOE framework (Source: Tornatzky& Fleischer, 1990, p.154)

Several studies used the TOE framework as a theoretical lens to understand different IT adoptions, such as e-Government assimilation (Pudjianto&Hangjung, 2009); e-Learning Implementation (Raouf, Naser&Jassim, 2012), IT implementation at Firm Level (Oliveira & Martins, 2011), mobile communications (Arpacı et al., 2012) and e-business (Hsu, Kraemer &Dunkle, 2006) e-Commerce (Awa &Ukoha, 2012), Open-Systems (Awa &Ukoha, 2012), Web Service Adoption (Lippert&Govindarajulu, 2006).

2.3.8.1 *Elements of TOE framework:*

The TOE framework identifies three aspects that influence how an organization adopts and implements technological innovations: Technology, Organization, and Environment (Arpacı et al., 2012; Awa &Ukoha, 2012; Chau& Tam, 1997; Lippert&Govindarajulu, 2006; Oliveira & Martins, 2011; Pudjianto&Hangjung, 2009; Raouf, Naser&Jassim, 2012).

i. Technology

Tornatzky and Fleischer (1990) suggested that technology adoption is influenced by what technology is available and how the technology fits with the current internal technology infrastructure.

The sense of technology as, essential technologies available to the client, both internal and external, that could be useful in enhancing organizational efficiency, Lippert and Govindarajulu (2006, p.148). The technical background is related to the technologies available to an organization and how the features of technology itself can affect the adoption process (Arpacı et al., 2012).

The technology context includes the internal and external technologies that are relevant to the organization. The technology involves good ICT like fast Internet connections, sufficient up-to-date computers, and good computer networks (Raouf et al., 2012).

Furthermore, technology may include both equipment and process. Therefore, the technology context describes the existing technologies that are currently used and new technologies, which will be used in organizations. The technology is an important component for the introduction of ICT into higher education.

ii. Organization

According to Tornatzky and Fleischer (1990) the organization context refers to a set of features of an organization that describes the structures and processes that either limit or facilitate the adoption of a technological innovation.

Organizing meaning described through (Resources available to support innovation acceptance) Lippert and Govindarajulu (2006, p.148). The organization context is vital for any IT innovation adoption in this research context. Pudjianto and Hangjung (2009) explained that researchers have utilized the TOE framework for explaining the organizational context by using various organizational factors.

iii. Environment

The environment context is described as the platform where the organization operates, the industry, suppliers, customers, and government (Tornatzky and Fleischer, 1990), where all these factors influence innovation adoption. The environment context describes the environment conditions in which the organization conducts the services (Arpacı et al., 2012). Lippert and Govindarajulu (2006, p.148) defined the environmental context as the *"... setting in which the firm conducts business, and [is] influenced by the industry itself, its competitors, the firm's ability to access resources supplied by others, and interactions with the government"*.

Therefore, the environment includes the size and structure of the organization competitors, macroeconomic context and regulatory environment (Tornatzky& Fleischer, 1990).

2.4 Conceptual Model of this research

After the revolution regarding internet there has been a change in the works or researchers that emphasizes more on the influence of online doings: use of internet, digital campaigns, use of blogs, use of educative online platforms and wikis, etc. (Youssef and Dahmani, 2008). Regarding the literature on the effect of ICT on pupils has exposed miscellaneous results. On one side, some research reveals that there is no indication of a key role for ICT in higher education (Angrist and Lavy, 2002; Goolsbee and Guryan, 2002; Banerjeeet al., 2004). On the other side, some studies display an actual impact of ICT on students' success (Sosin et al., 2004; Fuchs and Woessmann, 2004; Coates et al., 2004). Though above theories explaining about IT adoption but not focused to measure the impact of using technology for improving quality in service sector like educational sector. By considering the different dimensions and application of different theories of ICT adoption, this research mainly focused on the TOE framework of Tornatzky& Fleischer, 1990 for measuring impact of ICT on quality education at university level of Bangladesh. But, this model not fully perfect for this study to measure the impact of ICT on quality education, thus the research conceptualize a new model based on TOE framework.

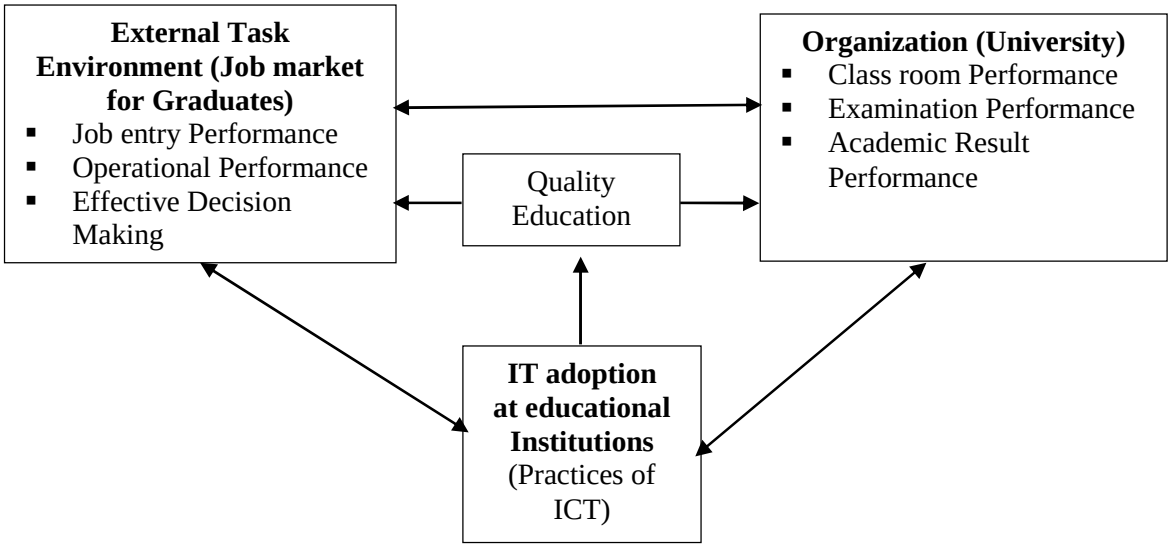


Figure – 2.4: Conceptual Framework for measuring impact of ICT adoption for quality education at university level based on TOE model

Source: The Researcher

i. Practices of ICT:

This proposed model considered practices of ICT is one of the important component for ICT adoption for quality education at university level. Practices of ICT means how much ICT practices in the organization in relation to ICT infrastructure in classroom, examination processing, result processing, access to internet, e resources, e-library, which will improve the quality of education. It actually means what is the level of practicing ICT at educational institution.

ii. Organization (University)

Organization is another component of the proposed model. This study consider university as an organization as the Technology will practices in the educational institution (university).So practices of ICT would impact on the organization that can be measured by the changing performance of the organization (universities). The proposed model consider this issue by taking the opinion of the stakeholders of the universities.

iii. External Task (Job market for Graduates)

Final component of the proposed model is the external environment. This study considered external environment is the job market (employers in the job market) as the employers employ the output of the universities. Thus performance of the output or graduates finally evaluated by the employers or external environment where the quality education can be proved. Thus external environment can be an influential factor whether the organization

will be practices ICT or not, or what will be the level of practices of ICT in the educational institutions.

2.4.1 ICT adoption and classroom performance

ICTs (Information and technologies) must be combined with more conventional technologies including books and radios, and more widely applied to development becauseteaching technology is more helpful especially in a developing country like Bangladesh(UNESCO (2005). But technology alone is not sufficient to engage learners in deep learning it should be used purposefully and grounded within a theoretical framework (Wankel and Blessinger, 2012). Smart and greater learning outcomes for students are made by collaboration with the physical and virtual space of a classroom (Block et al., 2015).

ICTs give students the opportunity to explore, discover, develop, interact with teachers effectively and openly, complete and receive online assignments and input, initiate and engage in online discussions (Wright et al. (2007).These are referred to as students' impact among which are higher literacy, better jobs, higher income, higher life satisfaction, connection to global economy and socio-economic change (Wagner et al. (2005). Students now have a global perspective and collaboration on their learning develops critical thinking skills and construct knowledge in culturally diverse learning environment with the aid of ICTs which gives them competitive advantage (Rajasingham, 2007; Hanna, 2002; and Lao and Gonzales, 2005). Different google tools to enhance collaborative efforts between students and professors are used by Google education and classroom (Zhang et al., 2016).However, it is a crucial issue to be concerned that students' absenteeism in class due to availability of online resources and class notes (Roosenburg, 2002). But it is also found that availability of lecture notes online as one of the factors that

influence students' class attendance (McGill and Bax, 2007). Apart from the use of computerized attendance systems, which had led to increased attendance, most teachers did not feel that using ICT in lessons had impacted on attendance (Don et al., 2003).Many professors lack the substantial technological skills necessary to teach using smart classrooms, or refuse to learn for other reasons (Bandilla Quintana et al., 2017). Classroom curriculum need to be adapted new revolution, new math courses with initial digital-age skills, such as data analytics implementation (WEF, 2015). Use of different apps, books and videos present online – which are based on the cloud – according to the needs of students are needed to be ensured in order for them to learn more effectively (Block et al., 2015).In a traditional classroom, there are some students who cannot keep up with the speed of learning and therefore have insufficient knowledge as compared to those who are above average (Stošić, 2015). The situation in developing countries that the lack of tools and methodologies for the assessment of ICT impact on teaching and learning hinders research in this regard (Trucano, 2012).

Therefore, this study reproduces the proposition that ICT adoption is positively related with classroom performance.

2.4.2 ICT adoption and examination performance

ICT adoption has diverse impact on examination performance of students. Teachers are convenient and confident in using ICTs as factors for ICT usage in teaching (King et al., 2007; Madden et al., 2007) which must influence the examination performance of students. However, it was found that students better appreciate the opportunities afforded by ICT than their teachers (Madden et al., 2007) which also does not negate the influence of ICT on examination. Some Authors found a significant relationship between ICT adoption and academic performance in a conservative environment which consists of examination result.

If there is a question like “what are the biggest challenge for institutions in adopting new technologies?”. Then one of the most common answer will be as training personnel to use new technologies (66% of respondents) (King et al., 2007); Use of ICT to do tasks, such as preparing assignments and sequencing classroom activities is very helpful to perform well in examination which is proved by an absolute majority of students in Gomal University. By virtue of university administration and training seminars organized in this regard, ICT tools stimulate students and their examination performance along with efficiency in their lesson-plan.

There seem to be two major reasons for growing ICT use across the UK education. Initially, ICT can improve the pace of the classes, and subsequently, there are causes for concern among university researches in the UK. This will help to improve the way of technical technologies, which can enhance the quality of teaching and learning in schools. Thus helping learners to produce better results, suggesting that ICT affects the output of the test.

A study conducted by Mishra *et al*. (2005) to know internet usage pattern of the undergraduate students of G B Pant University of Agriculture and Technology, Pantnagar. The findings of the study indicated that 85.7% of the students used the internet and also presented that 61.5% of the males and 51.6% of the females used internet for making assignments. A majority of said that they confronted the problem of sluggish functioning of network connection. Another study revealed that a large majority have been using internet and communication, research and publication is the main purpose of them. It has facilitated them to save time, find up to date material and collaborate with their mates. Slow speed and lack of entree from home are the main difficulties and m that is why most of them are concerned in enlightening the internet use skills through formal training (Al-Ansari, 2006). Some authors stated that exam scores, after taking into account variations

in student characteristics, were about 6% advanced for the on-campus arrangement than for the online arrangement. They found relatively better performance in the on-campus classes to the benefit of teacher-student communications in person, and a comparatively inferior performance of the students in the online class to the lack of discipline necessary for successful self-governing education in the online setting (Brown and Liedholm, 2002). Some stated that there is no indication for a association between augmented educational use of ICT and students' performance even they found a constantly negative and slightly significant relationship between ICT use and some students' success measures (Terry *et al*., 2003). Leuven et al. (2004) also determined that there is no evidence for a association between enlarged educational use of ICT and students' performance. Besides, in contemporary times Mbaeze et al. (2010) showed that there was no statistically momentous association between ICTs and students' academic performance.*So this study can reproduce that ICT adoption is positively related withexamination performance.*

2.4.3 ICT Adoption and academic result performance

Academic success or performance "is the consequence of education – the extent to which a student, teacher or institution has achieved their educational goals." (Ward et al., 1996). A very study presented that the students and faculty are conscious of electronic sources and also the internet and even though most of the academic people use electronic information resources for their academy associated work, most of them choose print rather than electronic information sources (Cuban 2001).

Many efforts have been made to adopt information and communication technology (ICT) to promote learning excellence in various educational settings which is expected to help the improvement of academic result of students (Cuban, 2001; Hakkarainen et al., 2000; Valentine et al., 2005). "Students learn more with up-to-date learning materials in their own language" is noted by International Institute for Communication and Development

(2005) on its "ICT Policy for Education Tanzania" which clearly indicates that academic result performance can be improved by using ICT.). Moreover, ICT has great contribution in the way of teaching and the teachers need to be more skillful to use ICT in teaching which will in turn contribute to the academic performance of students (Salehi&Salehi, 2012).

ICT helps students to involve in lively group discussions at any time anywhere which is very pivotal to improve academic result and this provide a better result regarding to their study (Fedena Blog, 2016). Students are finding internet learning especially YouTube learning very beneficial to them and they finding it as informal learning which includes more independence and broad range providing a bunch of opportunities and thus the teacher are moreable to exercise the ICT implementation to influence the improvement of academic result (Lee, 2013).

A research conducted on internet use by students of the University of Dares Salaam exposed that the students are not using internet efficiently although they had access to the internet. They accessed it mainly for messaging with friends and families more than for academic drives (Luambano and Nawe, 2004). Another research conducted in the universities of Ghana display that in spite of the paybacks of the internet, its use among faculty is still very little and the main reasons for this are training and lack of access to the internet. Obviously, it is essential for university authorities to take instant steps to deliver wide-ranging access points for faculty through computer workshops or laboratories (Adika, 2003). In developing nations with such a shortage of or restricted need for ICT due to numerous challenges. Such as power issues, lack of ICT infrastructure and the reluctance to use them, paper and pencil became the only option for most rural students, (Braimoh&Osiki, 2008). Therefore, this study can reproduce that ICTadoption is positively related with academic result performance

2.4.4 ICT and Job market performance:

2.4.4.1 ICT and job entry performance

Along with other benefits ICT has different impacts on empowering university students to get satisfactory jobs. It is the introduction of the system of education of innovative ideas.Includes the expertise and activities that required as societies shift and becoming more productive, (Visvizi et al., 2018a). However, the application of new ideas, knowledge and practices are not possible without the help of ICT. 13,000 youths have taken professional outsourcing training and employment services, graphics design, web design and digital marketing which will contribute huge to the job market (ProthomAlo, 2017b).

ICT enables youths to gain knowledge over different online activities such as web design, photo editing, assignments etc. can have a positive impact on job opportunity (ProthomAlo, 2014). Software, data skills and other ICT related courses in the educational system which will make student eligible for getting a job and will be necessary for the demands of the new digital work place. Machines will replace low-skilled jobs and create a greater demand for high-skilled jobs, apart from this, medical robot designers and grid optimization engineers are the occupations of the new digital age (WEF, 2015).A pivotal role in job creation as well as growth is played by Information and Communication Technologies (ICTs) which indicates that the organizations need ICT experienced person (Reding, 2007). ICT helps students to gain job by giving access into information centers, participation in multimedia based information programs, concern about different social issues and centers cooperate with the students (Sparrowe et al. 2001).

2.4.4.2 ICT and Job performance

Performance expectancy is defined as the degree to which an individual believes that using ICT will help him or her to attain gains in job performance (Venkatesh and Davis, 2000). Employees with ICT knowledge will do better in job sectors because organizations continue to make huge investments to build information and communication technology (ICT) platforms to facilitate employee communication and, consequently, enhance employees' job performance (Gartner 2008). Timely access to important knowledge which is done by ICT facilitation or advice plays a critical role in affecting knowledge seeking and subsequent job performance (Sparrowe et al. 2001).

Individuals intend to use ICT and they believe it will improve their job performance besides it is easy to use and people want (and expect) them to use. Moreover, appropriate hardware, software, training and support should be in place, since facilitating conditions positively impact use of ICT (Gupta et al., 2008).

Some emphasized that the use of IT systems does not directly influence the knowledge transfer process. Instead, it has an indirect effect through influencing organizational commitment and helps in dismantling communication constraints (Van den Hooff and de Ridder, 2004). Though different ICT related researches have been conducted, research related to the broader employee job outcomes, especially job performance, of technologies has been limited (De Lone and McLean 1992, 2003; Rai et al. 2002; Seddon 1997).

2.4.5 ICT and Quality Education

We can define "Educational technology" as 'a systematic and organized process of applying modern technology to improve the quality of education' (Stošić, 2015, p. 111). the imperative of better and quality education can be contributed by Technology-enhanced learning (TEL) (Visvizi et al., 2018b). The need for quality professional development programs for pre-service and serving teachers, for proper technology integration to take

place in teaching and learning are also stressed by some authors (Yusuf, 2010). A driving force for reforming educational system is ICT and which will help to ensure the quality of education (Achimugu et al., 2010). A great contribution toward the competency based learning rather than teacher-based learning is done by ICT(Komail et al., 2015). If the huge number of youths in Bangladesh are provided with a quality education and ICT skill, Bangladesh will turn into an economically advance country (ProthomAlo, 2017a). The largest investor, the United States, expanded from 30.61 percent in 2009 to 32.14 percent in 2010, as even the smallest investor, Ireland, improved from 11.3 percent in 2010 to 12.41 percent. A proportional figure in terms of overall cumulative fixed capital investment in quasi-residential areas (OECD, 2007).

This data show that technology has an unavoidable presence in our everyday lives. We must use this to enhance the quality education.

However, some disadvantages that accrue from the use of ICT in teaching and learning were identified as plagiarism, absenteeism and over-reliance on ICT. Some authors have identified plagiarism as a problem in the use of internet resources which affect the examination performance. They have tagged “plagiarism” with different terminologies among which were students’ slang to alleviate the effect of plagiarism such as “patchwriting,” “mosaic plagiarism,” “paraphragiarism.” (Evans and Merhout, 2004 and Adedokun-Shittu, 2012). This types of strategy spurs the destruction of quality education. To avoid plagiarism, students must be taught proper citation of references and they should be required to use and cite library resources (Etter and Merhout, 2007).Besides, evidence exists that literacy levels and mathematical skills of students who have computers and other ICT equipment/devices in their classrooms decreased. This indicates a challenge that the education systems worldwide have to address today, that is, how to use ICT in a classroom in a way that boosts the skills’ acquisition process rather than undermining it

(Tsinonis, 2018). Thus this study can reproduce the statement that *ICT is positively related with the improvement quality education through class room performance, academic result performance, examination performance.*

The above figure (2.4) provides a conceptual model of this research study's use of information system theories and frameworks. This conceptual model helps to clearly show the relationship among the entities for implementing ICT in university level and its impact on quality education. The researcher used one information system framework (i.e. TOE framework) and one information systems theory (TAM). The conceptual model is primarily based on the literature reviewed in this study. The literature helped the researcher to frame the problem, synthesis the knowledge base, and identify a need for this study. An integrated conceptual model of this kind helps to illustrate the components involved in this research. Such a structured conceptual model perfectly illustrates the sections engaged in this study.

2.5 Gaps in Literature

There is evidence from the reviewed literature that there is lack of ICT adoption considering improving quality of education in higher education generally university level. In this study three literature gaps are noted:

Firstly, there is a lack of literature identifying the factors that affect the adoption of ICT in higher education in the context of developing country like Bangladesh. Due to this, there is a need to undertake research about adoption of ICT in higher education in Bangladesh.

Secondly, there is a lack of research in the developing country when it comes to ICT use in the higher education sector. Researchers like Walsham and Sahay in their research paper emphasized the importance of academic research in developing countries, by identifying gaps in the literature in this context (Walsham & Sahay, 2006; Walsham et al., 2007).

Finally, a major gap is the need for analyzing impact of ICT on quality of education in university level. The lack of available models and frameworks is a major problem faced by the higher education sector in developing country like Bangladesh.

This research fills this gap in the literature and addresses the need to analyze impact of ICT adoption in higher education framework suitable for developing country like Bangladesh. This research addresses three major points: a) identification of the factors relevant to the adoption of ICT in higher education; b) ways to utilize ICT within the higher education sector; and c) measuring impact of ICT on quality education in Bangladesh. Social science research aims to solve important gaps in order to gain a deeper understanding of directions to come.

2.6 Hypothesis development

From the reviewing literature and considering the research objectives this study proposed the following hypothesis:

H1: ICT adoption is positively related with classroom performance

H2: ICT adoption is positively related withexamination performance

H3: ICT adoption is positively related with academic result performance

2.7 Summary

This chapter has reviewed the literature relevant to this research study. The chapter started by highlighting the three main elements of the research. The elements are ICT, higher education, and Quality of education. This chapter also highlighted the theoretical frameworks, which are appropriate to this research. The theories and framework selected for this study are Technology-Organization-Environment (TOE) framework, Technology Acceptance Model (TAM).

The TOE structure was selected as a valuable theoretical tool for understanding implementation of ICTs. The main elements of TOE framework are applied in the contexts

of technology, organization and environment. Technology Acceptance Model is used in the acceptance and usage of information technology.

UNESCO's continuum model of ICT development is selected as a practical framework for ICT adoption in the university education field.Finally, factors will use to measure the performance quality of education. The literature review above lays the groundwork for this research and concludes with an identification of the research gaps this study is intended.

CHAPTER THREE

RESEARCH METHODOLOGY

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction:

From the review of methodological literature, many of the previous research suggests that there is no unique method to conduct ICT research, especially in the field of education in Bangladesh. Therefore, this chapter is designed to identify the gaps in the previous research methods on the ICT in particular and general educational sectors in a developing country like Bangladesh. This chapter is designed by considering following aspects:General concepts of research method and application of different methods in ICT research. It conjointly explained a technique for this study with a justification of choosing this method considering the gap in previous research methods

Finally, the data collection method and data analysis techniques for this study weredefined in this section. Data were collected using mixed research methods (Qualitative as well as quantitative) through in personal interview, focus group discussion and in-depth interview technique. It ends with a discussion of issues related to the validity, reliability and generalization of the results.

3.1 A General view of Methodology

The word method refers to a special form of procedure adopted in any division of mental movement for which an investigation or discussion were continued. Actually it's a systematic arrangement and a procedure to accomplish an object what states to a branch of logic that teaches how to arrange thoughts and topics for investigation, exposition or knowledge composition. According to (Anol, 2012), Methodologyindicates an orderly arrangement of ideas and topics. In a general term, method means a way of doing anything, especially on the basis of the overall plan. On the other hand, methodology means the science of the method. Science is systematized knowledge (Ghe, 1950). To

solve the problem systematically research methodology is one of the finest way.Kothari (1997) explain research methodology can be defined as a science of studying how research is done systematically. Etymologically, the word “science” is derived from the Latin word sciatica meaning knowledge. Science refers to a systematic and organized body of knowledge in any area of inquiry that is acquired using “the scientific method” (Anol, 2012). In general, methodology is the study of how research is done, how any things will find out, and how knowledge is gained. Methodology is about the principles that guide research practices and definitely explains why using certain methods or tools are used in a particular research.

As stated by MC Gregor and Murname (2010), *“Methodology word contains two nouns: one is method another is ology, which implies a subdivision of knowledge, as many authors call it as a branch of knowledge. It deals with the general principles and coherent of the new knowledge. It comprises the assumptions of rational and philosophical study of natural, social or human science weather it is expressed or not. Conjointly, methodology refers to the logic, reality, values and counts data as knowledge to inform research.”*

According to philosophical arguments regarding research methodology in the field of ICT have gone through a numerous academic ‘terminology’ surrounding quantitative and qualitative methods. Both qualitative and quantitative methods can be considered as a broad classification of research methodology currently used by different kinds of researchers. The following section distinguish research methods and research methodology.

Table 3.1: Difference between Research Methods and Research Methodology

Research Methods	Research Methodology
Research methods are the methods by which any one will conduct research into a subject or a topic.	Research methodology explains the methods by which researcher may proceed with his/her research.
Research methods involve conduct of experiments, tests, surveys and the like.	Research methodology involves the learning of the various techniques that can be used in the conduct of research and in the conduct of tests, experiments, surveys and critical studies search.
Research methods aim at outcome solutions to research problems.	Research methodology aims at the employment of the correct procedures to find out solutions.
The scope of research method is narrow than that of research methodology.	The scope of research methodology is broader than that of research methods.
Research Methods do constitute a part of the research methodology.	Research Methodology has many dimensions.

Source: The Author based on Mark. Lewis & Adriam, (2003, p.02)

3.1.1 Qualitative, Quantitative and Mixed Methods:

The methodology used in the research study have to relate with the specific phenomenon of concern for conducting research (Krauss, 2005). Different phenomena may necessitate the use of various methodologies. Every researcher has the independence to select the research methods, techniques and procedures of research that need to perfectly match with their needs and demands (Creswell, 2003). Generally, there are three major types of research methods applied by the researcher which are: qualitative methods, quantitative methods and mixed methods.

Generally qualitative research methodemphasizes on observations and words to present reality and motivated to explain by a person in their universal situations (Amaratunga et al., 2002). Qualitative researchers naturally employ inductive reasoning (Teddlie and Tashakkori, 2009). Inductive method usually comprises discovering patterns, themes and categorizes in one's data. The key strengths of the qualitative research isthe ability to examine a condition where slight is known about what is there and to discover complexities that are beyond the opportunity of a more controlled approach (Gillham, 2000). Moreover, this method can be used a consolidation of techniques to provide a broad understanding of a social science (Ticehurst & Veal, 2000).

Qualitative approach is focused on the inductive approach to producing theory, frequently using an interpretivist idealapproving the existence of numerous subjective perspectives and building knowledge rather than sought to seeking it practically.

On the contrary, quantitative approach is generally focused on the deductive approach to examining theory, often using number or fact and therefore a positivist or natural science model, and an objects model.

In case of quantitative research method, numerical value or numbers are used to present opinions or concepts (Amaratunga et al., 2002). The main approach of quantitative inquiry is testing theory or deducting theory. Generally, deductive model consists of the a priori deduction of hypotheses from a theory or a conceptual framework and the testing of selected hypotheses based on numerical data and statistical analysis (Teddlie & Tashakkori, 2009). The major strength of quantitative analysis is thequadrangular measure that the topic depth is examined through techniques and additionally the irresponsibleness and validity may be observed more objectively than with qualitative research techniques (Amaratunga et al., 2002).

In according to Sue (2008), Most of the presentresearch using a mix of both quantitative and qualitative strategies. In qualitative standard interpretivism, (Secker et al., 1995, Altheide and Johnson, 1994; and Kuzel and Like, 1991) another paradigm constructivism developed by (Guba and Lincoln, 1994), side by side for quantitative model, it is based on positivism. The most common features in quantitative method are: i) the sample investigation or tentative design ii) respondent are selected on statistically demonstrative basis, iii) the use mailing survey or standardizing interviewing tools most commonly controlled questionnaire, iv) with a large sample size (Leather, 1987). Moreover, it suggests the application of measurement or numerical dimension to the nature of the issue under inspection (Bullock et al., 1992). Qualitative methods, in contrast, most commonly are: i) focus group interviews or in-depth individual interviews ii) participant observation iii) open-ended, non-directive or the use of unstructured questionnaire iv) and small number of sample size. It is frequently viewed as rigorous or a micro viewpoint which relies on case studies or evidence from individuals or particular condition (Bullock et al., 1992).

Johnson & Christensen (2008) compared Quantitative and Qualitative research on the basis different criteria as depicted in following table:

Table 3.2: Differences between Qualitative and Quantitative Research

Criteria	Qualitative Research	Quantitative Research
Purpose	FOR understanding & interpreting social interactions.	For testing hypotheses, a cause and effect look with a prediction is necessary.
Group Studied	It is Small& not selected randomly.	It is large &selected randomly..

Variables	An aggregate study, not confined to variables.	The variable studied which is more specific and concise.
Type of Data Collected	Data type in respect with word, image or objects.	Quantitative means numbers and statistical means.
Form of Data Collected	Field study such as respondent interviews, observation, note system and reflection of image considered through qualitative data Typically, open-ended response is determined.	Considered detailed measurements using structured &authorized data-collection instruments quantitative data are collected. Structural means close ended questionnaire..
Type of Data Analysis	Shape and pattern of data, features, and thoughts are mandatory.	Statistical relationships looked thoroughly.
Objectivity and Subjectivity	Subjectivity is a matter of question	Objectivity is literally critical .
Role of Researcher	Participants in the study may know researcher & their biases, & participant characteristics known to the researcher.	The participants in the study do not know researcher & their biases, & participant characteristics deliberately hidden from the researcher (double blind studies).
Results	Particular or specialized findings that do not take a broad view.	Generalized findings that can be practical to other populations.

Scientific Method	The researcher generates a new hypothesis and theory from the data collected. It is Exploratory another called bottom up.	The researcher tests the hypothesis and theory with the data. It is called Confirmatory or top-down.
View of Human Behavior	Human behavior viewed as dynamic, situational, communal, & personal.	Regular &probable.
Most Common Research Objectives	Explore dramatically, & construct.	Describe the facts, explain, &foresee.
Focus	Lens are focused by wide angle and examines the breadth and deepness at a universal characteristics..	Lens are focused by narrow-angle and examines with specific criteria.
Nature of Observation	Study behavior conduct in a natural environment.	Study behavior under controlled conditions; separate causal effects.
Nature of Reality	Multiple realities and subjective.	Single reality, objective.
Final Report	Contextual description & direct quotations are gathered from participants , more narrative report.	Report with correlations, comparisons of means, & statistical significance of strong findings.

Source: Johnson & Christensen (2008)

Mixed method has been considered as asubstitute to the dichotomy of the qualitative and quantitative approaches throughout the last twenty years (Teddlie & Tashakkaori, 2009).

Qualitative and quantitative approaches both have strengths and weaknesses, and therefore, a combination of methodologies can appeal on their pertinent strengths and the research findings would be more inclusive.

3.1.2 Research Methods for this Study:

Research design is the overall plan of the research. It is considered as a process in which idea is transformed into a research task or plan that can be performed in practice by a researcher (Sage, 2008). Hence, Creswell and Clark (2011), explained research designs is the procedures for collecting, analyzing, interpreting and reporting data in research studies. According to Zikmund (2003), a research design requirement to demonstrate the overall arrangement of the research involving decision about what kind of evidence needs to be assembled, from where the data will be collected and in which way data will be analyzed. Research design is indispensable in guiding decisions about methodology and setting the judgement by which the researchers make clarification at the end of their research project (Creswell & Clark, 2011).

Methodology of research can be seen as universal, but different field of research especially Information and Communication Technology studies have made their own methodological emphases and bodies of knowledge. The field of ICT industry is large which comprises a wide range of individual and human activity as well as service industries that entitled with public sector, non-profit and commercial organization. (A. J. Veal, 2001). The presentation of qualitative and quantitative research method has gained momentum with in last two decades throughout several academic disciplines and different research field which tend to develop separate research approaches, models and research applications (Chen & hirschheim, 2004).

Using both qualitative and quantitative techniques can be outlinedbynumerous factors. The most noticeable is perhaps the fact that, as the reliance of destinations on ICThas grown and the industry prolongedworldwide; Abundant resources have been applied to the collection of quantitative data and the preservationof ICT data sets. This may have encouraged researchers interested in quantitative data analysis to give higher priority to the ICT on educationalsector in their research agenda. At the same time stakeholders of the industry, including employers, teachers, students and alumnus to make more informed decisions, by devising better policies and evaluating existing are paying more devotion to the results from quantitative research (Larry dwyer, 2002).Again, qualitative research is a well-established approach to researching phenomena in the social sciences arena. But for enhancing the reliability and validity of data adopt both form of qualitative and quantitative method as a process of methodological triangulation. Moreover, collecting different types of data by different methods have result in a broaderattention of the problem space. The next section discusses about appropriate research methods and approaches for the present study and the following section discussed about the justification of the selection of this method. The methodological dimensions of this study are given below:

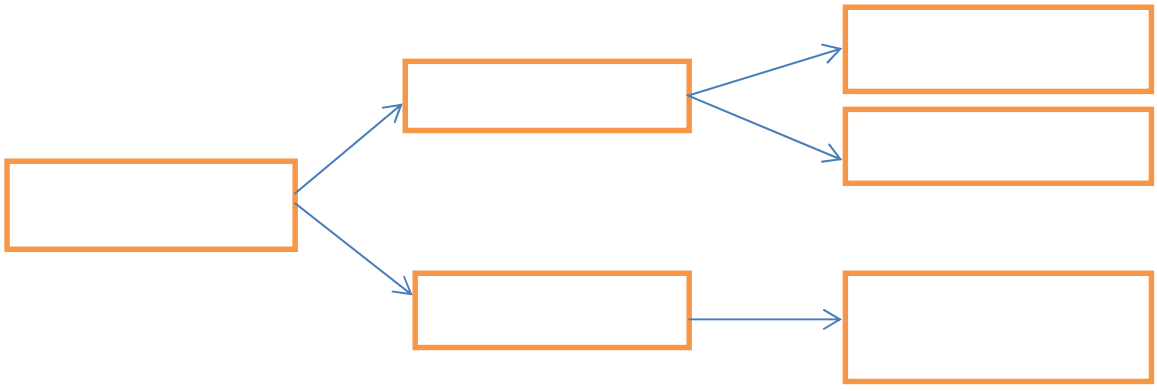


Fig 3.1-Methodology of the study
Source: The Author

Using mixed method approach, researcher gathers analyses and mixes both qualitative and empirical data in a single study or in multiple studies in a constant program of inquiry (Creswell, 2003). The researcher considers it will offer the best focus of a research problem. Often mixed research method can easily answer the research questions that no other can (Teddlie and Tashakkori, 2003). This researcherargued that mixed methods supportto the researcher to simultaneously answer exploratory and confirmatory inquiries and to generate and verify the theory at the same time.

Mixed method has several strengths this are given structured by Johnson & Christensen (2008) is given below:

- It can answer a comprehensive and more complete range of questions because the researcher is not limited to a solitary method or approach.
- To add accuracy of words, pictures and narratives numbers can be used.
- A researcher can practice the strengths of an additional method to stunned the weakness in alternative method by using both in a research study.
- Narrative explanations, words and picturescan add meaning context to numbers.
- A strongevidence for conclusion can be given by convergence and justification of the findings.
- Can be applied to upsurge generalizability of thefindings.
- An insight and understanding viewpoint can add without missing when only a single method isused.
- Qualitative and quantitative research method used together to yield more informationabout theory and practice.

3.1.3 Justification of the Choice of Research Methodology

The prime and foremostobjective of the study is to assess the impact of ICT on quality education in the university level of Bangladesh which has been discussed in detailed in the

chapter two. (Detail in chapter -two). Other objectives are to focus on ICT's contribution to an increased quality in teaching and learning and a broad access to learning materials, to examine the existing relationship between teaching quality and teacher's motivation, intensity of ICT use and performance of student and to draw out a guideline to improve quality of education through ICT application in different disciplines of the university followed by possible limitations. It appears too relevant numerous types of questions related with the study. To gather data for completing the study, it appears that a mixed method is more appropriate than a single method i.e. quantitative or qualitative. Moreover, the main target of this study is concerned not only to 'test' or 'verify' the theories but also to generate the multiple theories as their potentiality observed the chapter of literature review. Triangulations, complementary, development, initiation and expansion are the few justifications for merging quantitative and qualitative research (Bryman, 2006). The justificationfor integrating and combining of quantitative and qualitative research contains of completeness, context, explanation and also discovery and confirmation. Triangulation research technique applied in this research in matters of data sources and data collection methods to confirm data reliability and validity. Literature review helps to obtain adequate knowledge for pre-understanding (Gummesson, 1991) of the literature issues.After studying the numerous works, it is clear that for gaining such objective a mixed method is scientifically appropriate and only viable way of making and examining the theories.

Thus, mixed methods are particularly helpful for any of the following:

i) When both quantitative and qualitative datajointly, provide a better understanding of a research problem than any one type by itself.
ii) When single type of research method (qualitative or quantitative) is not sufficient to address the research problem or answer the research questions.
iii) When practicality is important i.e. multiple viewpoints.

iv) To include a qualitative component into quantitative study

v) To shape from one to another i) Explore qualitatively then develop an instrument ii) Follow-up a quantitative study qualitatively to obtain information that is more detailed.As a result, researcher has obtained acceptable understanding of the research issue but in the situation of Bangladeshi context the theory generation can be more appropriate and testing the theory. For that reason, mixed research approach has been selected to pursue the present study.

Indeed, all the above arguments from Steckler et al. (1992), Fielding & Fielding (1986), Ragin et al. (2004), Morse (1991), Tashakkori & Teddlie (1998) serve as the justification for choosing and using mixed research method for this research.

3.2 Sampling design:

A sample is the representative part of the population. It states to a subcategory of the components of the total population that are selected for participation in a study (Malhotra, 1999). The First work of sampling design is to define target population.

3.2.1 Population: The population of any research study contained mainly the whole group under study as specified by the objectives of the research (Farman & Prebtice, 2000). Target population of this study must be precisely defined. Description of target population generally involves translating a research problem into a detailed statement of whom or which should be comprised in and which or who should be excepted from the sample. People who related with higher educational section of Bangladesh are considered as a population in this research. At higher education in Bangladesh there are 34 (thirty-four) public universities and around95(Ninety-Five) private universities providing education to the bulk of higher studies students. (UGC report, 2017) Generally, public universities are funded by the government while managed as self-governed organizations. On the other hand, private universities are managed and funded by the private hand. This study has

considered stakeholders of all public and private universities such as teachers, students, employers and alumnus.The main objective of the study is to assess the impact of ICT on quality education in the university level of Bangladesh. So, all the stakeholders who are involved in higher educational sector of Bangladesh were considered as the target population of the study.

Table – 3.3: Distribution of the population of the Study:

Particulars	**Private University**	**Public University**	**Total**	**Ratio**
Total number of Universities	95	34	129	**74:26**
Total number Students	337157	264084	601241	**56:44**
Total number Teachers	14958	12913	27871	**54:46**

* Excluding national university and Open University

Source: UGC Annual Report, 2017

3.2.2 Sample and Sample Size: Considering the above population, the relevant sample size is to be determined as n = $(\frac{ZS}{E})^2$, where ZS is standardized value of the variable of interest and E is the standard error and assuming 5% level of significance, minimum sample size will be 306 but here sample size estimated to be 100 teachers, 400 students selected based on stratified sampling method while 20alumnus, 5 employers (3 from multinational corporation and 2 from local enterprise) has been selected based on access priority. The calculation of sample size is important for extracting good result of the study. To determine sample size, a stratified convenience sampling has been followed.

Table – 3.4: Sampling Distribution of the Study:

Particulars	**Private University**	**Public University**	**Total**

Total number of Universities	5	3	8
Total number Students	232	168	400
Total number Teachers	54	46	100
Grand Total			500

* Excluding national university and Open University

Source: The Author (Proportionate Sampling)

3.2.3 Sampling Technique: Sample refers to a group of population whom are able to clearly represent the total population of the study and createuniversal inferences about the characteristics of the target population based on the response of the sample (Sekaran, 2003). For selecting representative sample, the researcher could be chosen unit of samples from probability and non-probability sampling technique. As stated Kothari (1997) probability sampling and non-probability sampling are main two categories of sampling techniques.

A sampling techniques that do not have chance in selection procedures rather, they depend on personal judgment of the researcher and this type of sampling comprise a convenient to justify the sampling , proportion sampling and finally snowball sampling referred to as Non-probability sampling techniques. On another side, probability sampling is the sampling technique in which every element of the population has an equal chance to be selected for the sample and probability sampling categories into simple random sampling, systematic sampling, stratified sampling and cluster sampling (Malhotra, 1999). Since collection of primary data depends on availability of respondents and also on time and money constraints, the present study followedat first probabilistic stratified sampling for grouping the whole respondents then conducting convenience sampling for collecting data from identified sample (Mandhachitara, Shannon & Hadjicharalambous, 2007; Tifferet and Herstein, 2012). Using simple random sampling technique was almost

impossible in this study because of abundant of population (University students and teachers) (Etikan, Musa & Alkassim, 2016).

Therefore, as a result of limited resources, time and workforce constraint, non-probability sampling technique considered for this research. It is totally impossible for the researcher to survey every respondent for this study who is involved in higher education. Especially this reason was more responsible for using convenience sampling technique. Selected sample in a manner that ensure an acceptable level of confidence. Study areas have also been selected based on the convenience sampling technique.

Table -3.5: List of Sampled Universities

Private University	Public University
East West University, Dhaka	Dhaka University. Dhaka
Daffodil International University, Dhaka	Shahjalal University of Science and Technology, Sylhet – 3114.
Leading university, Sylhet	Sylhet Agricultural University, Sylhet
Metropolitan University, Sylhet	
Northeast University Bangladesh, Sylhet	

3.3 Data Collection

The maximum research studies are statistical in nature (Azim, 2008). This study is also statistical in nature as it attempts to assess the impact of ICT on quality education in the university level of Bangladesh. Essential information has been gathered from both primary and secondary sources. Based on literature review and justifying available data sources, following data sources and methods of data collection have been used.

3.3.1 Primary Data: The primary data were collected through personal interview with structured questionnaireand in-depth interview with guideline questionnaire (See Appendix -1).

Duration and time of primary data collection: After pretesting the questionnaire the primary data were collected from the respondents (100 teachers, 400 students, 20 alumni, 5 employers) on aone-year time duration that started on 1st september, 2017 to end on 31st October, 2018.

Geographic spot for primary data collection:The primary research data were collected from the university students, teachers, employers and alumnus who were directly affected with using Information and Communication Technology in higher study. There were numerous public and private universities in Bangladesh. Eight universities were selected using convenience sampling from Dhaka and Sylhet. As the study purpose was to assess the level of ICT at higher education in Bangladesh the data were collected from the stakeholders who were related with higher educational level in Bangladesh. Analyzing the information from collected this people will be helpful to assess the present scenario of ICT at higher education in Bangladesh.

Response rate of the survey:For testing a SEM model a total of 400 students, 100 teachers were approached to fill-in the questionnaire.

Along these all respondents, data also collected from employers and alumnusthrough using a guideline questionnaire. Researcher used in-depth interview from collecting information from employers and FGD from alumnus.Survey method has been conducted to collect information from students and teachers. Among these 620 questionnaires by excluding problematic, incomplete and unanswered questionnaires, 500 questionnaires were usable into the analysis. This result in the overall response rate was 80.64% for the study.

3.3.2 Secondary Data: Secondary data mainly collected from organized sources. Itincludes information made available by universities, ICT ministry, It firms and

computerized databases (Malhotra, 1999). The secondary data that has been needed for gathering knowledge has been collected from books, reports, magazines, newspapers, journal articles etc. The literature review portion of this study is based on secondary data. Related documents of the ICT education and progress of ICT in higher educational sector in Bangladesh will be reviewed. Various research studies relating to assess ICT in higher education have been studied. Based on this study, a proposed model has been developed and tested.

3.4 Research Instrumentation

3.4.1 Data Collection Instrument

This study used data triangulation method for collecting data, so different instrumentswere needed to collect data from different sources.

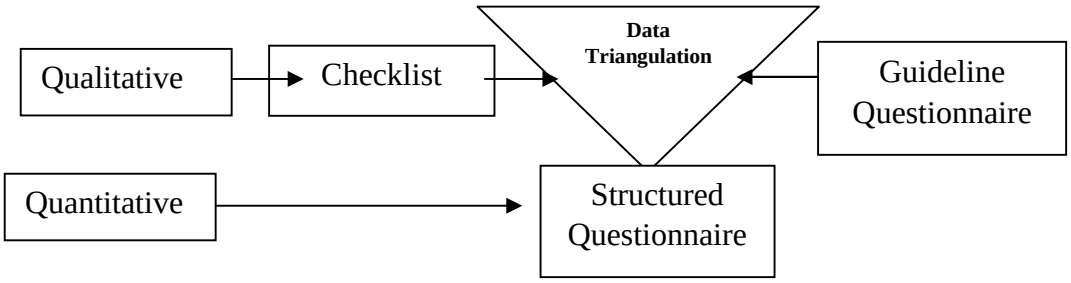


Fig3.2: Data collection Instrument

This research study has collected quantitative data through structured questionnaire from the respondents and from the published documents of the organization and recognized database. Again, qualitative data were collected with in-depth interview and FGD. These instrumentswere used for taking expected information about the contribution of ICT in higher educational level of the country.

3.4.2Quantitative Method

Since general purpose of the present study isto assess the impact of ICT on quality education in the university level of Bangladesh, consequently, efforts were made to select a quantitative research instrument that would cover as many stakeholders of the universities as possible in the study area. The general background and living standard of the stakeholders of the universities in Bangladesh are the same as what contains everywhere in Bangladesh; the result from the survey study on employees in the study area can be generalized to the broader understanding about the assessment of ICT on quality education in the university level of Bangladesh.

The structured questionnaire was employed in the study to collect data because it was well matched to the descriptive and correlative nature of the study (Bryman 2004; Creswell 2003; Kumar 2005; Leedy and Ormrod 2005). Again survey questionnaire is employed to collect data because it enabled a systematic collection of principally quantitative data.

The data collected would be useful in measuring many variables and testing the specified hypotheses of the study, which contributed to the understanding of ICT's contribution in higher study in developing country like Bangladesh (Leedy and Ormrod 2005; Neuman 2006).

3.4.3Qualitative Method

As stated earlier in the research problem of the study that the limited knowledge about ICT and its contribution, problems or challenges in the previous literature. A qualitative method was chosen to better discover and understand the global view and the assessment of ICT in higher educational level and stakeholders those have faced problem from their own perspectives.

According to Putnam (1990), a qualitative methodology documents the researcher to leave the workshop and to get closer to the data. The decisive aim of the researcher is to learn situations from the participants' point of view. hence, a qualitative methodology produces

descriptive data, the actual words of the people studied. The selection of 5 employers and 40 alumni for interview were enabled to take the present scenario of ICT in higher educational level and also from both students and teachers.By interviewing an appreciate number of respondents from various background in Bangladesh have been revealed. Research methodologies (Yin 2003, Ormrod 2005; Kumar 2005; Leedy and Neuman2006; Bryman 2004;) describe the interview as a superior data gathering device as respondent converted as participant and people's inclinationto talk more than write. They also agreed that qualitative interviews allow the interviewer access to the respondent's gestures, tone of voice, and the emotional impression of the response (Kumar, 2005). Again, the words and tone of voice can be preserved within the voice recorder of the interviewers.

The qualitative interview technique employed in the research study for taking exclusive advantages as it can be most effective in revealing the reasons for actions, feelings and attitudes. It delivered an opportunity to penetrate in-depth the responses of the participants, something unlikely to be achieved through other forms of investigation (Leedy and Ormrod 2005).

3.4.4 Pilot Study

Whatever the research techniques applied in the research study cab be piloted to ensure their reliability, validity and appropriateness for the study. Generally, piloting helps in ensuring that the survey questions operate well and the research instrument as a whole function well (Bryman 2004; Neuman 2006). In this study, the survey questionnaire and the interview schedule were pilot-tested. On the other hand, the pilot test was conducted to ensure the academic, business, social and cultural relevance of the survey questionnaire and the interview schedule for personal interview. Importantly, comprehensibility and confidence in the research questions and instruments were also assured in advance.

3.5 Data Collection Procedure (Triangulation Procedure)

A triangulation researchis an important research approach, which applied multiple research techniques of qualitative and quantitative research methods, which were used to collect data for the present study.

3.5.1 Survey Method:

In this study, survey method was applied to collect primary data. During the survey, each respondent reads and answers the same set of questions in a prearranged order and interviewer being present at that time. This method is helpful to collect more original data in a short time and also creating a radical shift in the 21st century (Smith et al. (2008). A Structured questionnaire was the key instrument to collect primary data through using different techniques in this method. To complete this study, researcher used personal interview, telephone interview and also email interview technique to collect data.

Personal Interview:

To complete survey method, researcher used personal interview technique in which major numbers of respondents were conducted personally by the researcher. Researcher collected information from actual respondents directly through using interview method.The key purpose of this conversation is to encourage the production of a speech on a topic defined by a research framework (Blanchet al., 1985). For confirming hypotheses or describingsocial science in a scientific way, personal interview can be a technique for obtaining, through questions and answers, verbal information from individuals and human groups. (Curelaru M., 2003).

3.5.2 In-depth Interview:

In-depth interview is the main tool to collect data in the qualitative method of research process. In this study, researchers used in-depth interview method for collecting

qualitative information with a guideline questionnaire. All the employers (5) were conducted by the researcher himself. The researcher first ensures confirmation from the interviewee about the time schedule of the interview and it also reconfirm with interviewee before the day of the interview. At the interview session researcher/interviewer used a voice recorder to record the complete interview which will ensure that the data is not lost. There are 5 in-depth interviews were conducted. All of them were the employers of the graduates of the universitieswhich were selected from the study area. Each interview was taken for a minimum of 30 minutes to one hour. All interviews were conducted at the working places where they used information and communication technologies. According to Saunders et al. (2007), Location should be convenient to the respondents where and when they feel comfortable and where the interview can be participated without any disturbances. Researchers selected respondents for in-depth interview through using convenience sampling method.

3.6 Techniques of data analysis

For analyzing primary data, a statistical package for social sciences (SPSS) was used. The collected data were first edited, coded, and checked to identify any missing data. For analyzing quantitative data, SPSS is a widely used technique all over the world for managing the data effectively and analysis appropriately. Several statistical techniques were used to analyses various data to address several questions and gain research objectives. Details on data coding and editing procedures with several techniques were followed to analyze survey data, as explained in the next.

In research, data analysis is considered as a significant phase because of potentiality of prejudice a well-designed investigation (Kumar et al., 1999). Literature evidenced that the rationale of the procedures which are statistical is to support in establishing the reliability

of the theoretical model for estimate the extent to which the independent variables used seem to be influencing the dependent variable (Coorley, 1978).

Preliminary Data Analysis:

The quality of data analysis depends on how soundly arranged the statistic and transformed into a suitable structure for investigation (Aaker et al., 2005). Thus, for testing the hypotheses before conducting statistical analysis, the raw data collected ought to an initial analysis. Therefore, to screen the data of this study in terms of editing, coding, cleaning and treating missing data were conducted followed by, testing for normality, (i.e., using skewness and kurtosis). Outliers, (i.e., using Box and Whisker, normal probability plot), and multicollinierity (SEM assumptions) and non-response bias were performed. At last, descriptive analyses on the factors were presented. In this process, mostly used and accepted data analysis technique (Statistical Package for Social Sciences (SPSS) version 20 has been executed by the researcher (Zikmund, 2003).

Descriptive Statistics:

Data which were collected from the respondents (students and teachers) were analyzed through SPSS for analyzing frequencies, standard deviation and mean. For instance, demographic profile with behavioral characteristics of the respondents was analyzing through only percentage. For gaining initial information about the respondents, these analyses were conducted for each of the variable.

Model Specification:

The model used in this research is conceptualized as a structural equation model which comprised of some key construct with their interrelationship. Early on 1980s the most popular (SEM) Structural Equation Model was first developed.

Structural equation model (SEM)first developed in the marketing literature early on 1980s (Bagozzi & Yi 1988, Bagozzi 1994; Fornell & Larcker 1981a, 1981b). In the present

research world, SEM has been considered as an important instrument for data analysis and widely used. (Heise, 1975; Anderson and Gerbing, 1982; Bentler, 1980; Breckler, 1990; Byrne, 2001; Jöreskog and Sörbom, 1996; Schumacker and Lomax, 1996; Kline, 2005; Smith et al., 2006; Hair et al., 1995). Remarkably, this statistical instrument has been employed by many researchers in diverse fields such as biologists, economists, educationalists, marketing, medical and a diversity of other social and behavioral scientists (Anderson & Gerbing, 1982). According to literature, SEM is the ideal analysis for the researcher, when the statistical investigation required a simultaneous series of interrelated relationships among the measured variables and latent constructs, as well as between different latent constructs (Hair et al., 2006b; Schumacker & Lomax, 2004). Therefore, structural equation modeling (SEM) is the gathering of statistical techniques that permit a set of relations between one or more independent variables (IVs), either continuous or discrete, and one or more dependent variables (DVs), either continuous or discrete, to be observed (Ullman, 2006). SEM is a significantly complex statistical method for assessing relationsbetween constructs, including latent and observed variables.

Table 3.6Summary of the variables used in SEM

Name of the Variable	Definition of the Variable	Actual Variable
Exogenous variables (Independent variables)	Variables that are not influenced by another variables in the model.	PRAC_1, PRAC_2, PRAC_3
Endogenous variables (Dependent variables)	Variables that are influenced by another variables in the model.	ARP, EP, CRP
latent variable	A variable that is not directly measured. It refers to the conceptual	IT adoption

	terms that are employed to show the theoretical concepts. These variables in the model are graphically symbolized by a circle.	

* Detail in chapter six

Source: The Author

Multivariate analysis of a theory, such as uni-dimentionality, reliability and validity of a construct has been examined through structured equation modeling (Hair et al., 2006b; Kline, 2005). For evaluating and modifying a theoretical model, SEM is an inclusive method (Anderson and Gerbing, 1982). It is also considered as a second generation multivariate method that used to assess the reliability and validity of the model measures. To investigate confirmatory method (i.e., hypothesis-testing) Byrne (2013a) stated SEM as a statistical procedure through examination of a structural theory on a given phenomenon. Generally, SEM can be observed as a speculation that reveals "causal" techniques that present observations on multiple variables (Gefen, Straub, & Boudreau, 2000; Hair, Ringle, & Sarstedt, 2011). Generally, SEM technique presents two major concepts. First of all, constructing a group of structural (i.e., regression) equations, by allowing the measurement error, endow with the studied causal processes. Secondly, converting the structural relations into research model for generalization to assist a clearer conceptualization of the theory and studied hypotheses (Roldán & Sánchez- Franco, 2012; Wong, 2013). SEM estimates a series of separate, but interdependent,

Multiple regression equations concurrently by stating the structural model used by the statistical program. Statistically SEM "represents a second generation analytical technique which: a) includes an econometric perspective focusing on prediction, and b) a psychometric perspective modeling latent (unobserved) variables inferred from observed-

measured variables". SEM has the skill to provide greater flexibility in modeling theory with data compared to first generation techniques. Alternatively, SEM encompasses "three primary mechanisms; first of all the pointers (also known as visible variables or observed variables), secondlydormant variable (hypothesis, thought and factor) finally the relationships between or among the variables. (correlation, one or two way paths" Chin (1998). The application of SEM necessarily provides both practical and theoretical justification by improving statistical estimation by better representing theoretical concepts (Hair et al., 1998).

3.6.1 Justification of the choice of SEM Technique

Structural equation modeling approach has been followed to examine the hypothesized model and to test the hypotheses of the relationships between the constructs as proposed in the conceptual model. SEM offers lots of advantages over other multivariate techniques.

Firstly, the model is allowing reciprocal relationships, highly flexible, allowing errors to be correlated or uncorrelated, and allowing the modeling of different types of interaction relationships or experimental effects.

Secondly, it has the skill to assign relationships between latent variables (unobserved constructs) from observable variables into the analysis.

Thirdly, first generation regression models such as linear regression, ANOVA, MANOVA and LOGIT, which can analyze only one layer of linkages between independent and dependent variables at a time while SEM (Chin,1998) enables researcher to illustrate the relationships among multiple independent and dependent constructs simultaneously (Gerbing and Anderson, 1982) of all variables in the model in place of separately. Whereas, the first generation regression models required two unrelated analyses,

nonetheless, SEM permits complicated variable relationships to be expressed through hierarchical or non-hierarchical, recursive or non-recursive structural equations, to present a more complete picture of the entire model (Bullock et al., 1994, Hanushek and Jackson, 2013).

Fourthly, an overall method to connote, approximation and testing a hypotheticalsystem of several linear relations between variables. Those variables may only be measured imperfectly, either directly observable or unobservable, (Rigdon, 1998).

Fifthly, SEM permits the researchers to unambiguously recognize the imperfect nature of their measures by establishing a flexible factor analytic measurement model between the measures and the traits being measured.

Sixthly, it is a powerful statistical method to successfully deal with the difficult problems of multicollinearity.

Last of all, it presents a suggestive graphical path to provide a convenient and powerful way for presenting complex relationships (Rigdon, 1998) which has make it a standard tool in many scientific disciplines to examine the hypothetical models for clarifying the interrelations among a set of variables (Chi, 2005).

Reliability and Validity for SEM:

Structured equation model should be evaluated with the reliability and validity in order to achieve their consistency (Hair et al., 2011). This study has discussed the SEM by measuring the individual item reliability, internal consistency and discriminant validity (Hulland, 1999; Eta, 2010).

In this research, two structured questionnaire has been used for understanding impact of ICT. One for teachers and another for students of selected universities who used ICT for studying purpose. One checklist and one guideline questionnaire has been used for conducting focus group discussion and in-depth interview respectively.

Item Reliability:

Reliability of each item explains how well each item related to their respective construct, which is occasionally referred to as simple correlations. The reliability of individual item for SEM can be evaluated by examining the loadings of the items of reflective constructs. The loadings score can be obtained from the value of factor analysis. Usually at least 50% used as a inactive concept also explained as an essential part of individual index difference, Henseler et al. (2009). Literature suggested that item reliability can be assessed differently. Barclay et al. (1995) specify that the items with loadings less than 0.700 should be discarded. Even so, Hulland's (1999) recommended items with factor loadings less than 0.50 should not be maintained for structure analysis. According to Sirdeshmukh et al. 2002, priority has been found in the literature allowing for 0.30 factor loading level as acceptable. As the current study has been conducted on a third world country like Bangladesh, so, the researcher determined a minimum cut off value of 0.6 as the fitting measure to strengthen the reliability of individual items of reflective constructs so that the maximum number of items can be maintained for the final data analysis (Hossain et al.2010b, 2011d).

Internal consistency:

Internal consistency for analysis has been developed by Fornell and Larcker (1981). Consistency here means inter-connection among the objects of the test and whether the items are consistent between themselves to a sufficient degree for them to be combined with one another (Serbetar and Sedlar, 2016). Researchers of Social science used Cronbach's alpha to measure internal consistency reliability (Wong, 2013) but SEM researches used Composite Reliability as a replacement (Bagozzi and Yi, 1988; Hair et al., 2012) Cronbach's alpha. In this work, internal consistency is measured by not only composite reliability but also Cronbach's alpha which are discussed below:

Composite Reliability: Composite reliability, divergent from the Cronbach alpha, doesnot presume that all metrics are not equally reliable. The values ranging from 0.60 to 0.70 is consider as composit reliability which is observed through exploratory research. Whatever the values ranging from 0.70 to 0.90 in more proficient stage of research, a satisfactory stage of reliability (Nunnally and Bernstein, 1994), whereas, below 0.60 provides confidence unavailability. In factor loading, each indicators or factors have absolute standardized loading which need to be higher than 0.70, Henseler, Ringle, and Sinkovics (2009). According to Bagozzi et al. (1998) suggested 0.60 cut-off point value for internal consistency. Typically, loading factors between 0.40 and 0.70 should be measured for exclusion from the scale only if removal of this criterion leads to increase reliability of the composite. Hensele, Ringle, and Sinkovics (2009) stated those factors displaying very small loads ranging from 0.40, should always be omitted from the scales.

Cronbach's Alpha: For assessing the reliability of a multiple-item variable, Cronbach's alpha has been mostly used as reliability coefficient, which is known as also coefficient alpha (Nunnally, 1978). Coefficient alpha is an estimate of reliability, or more precisely, an estimate of internal consistency (Serbetar and Sedlar, 2016). Value of alpha below 0.60 is undesirable (Churchill and Peter, 1984). However for scaling items which are used for the first time in a fresh environment, Nunnally (1978;1988) indicated the cut-off value for the Cronbach's alpha should remain at 0.60 (Churchill and Peter, 1984, Nunnally, 1978;1988) otherwise, 0.70 should be the threshold. So, 0.60 value is considered adequate in this study (Churchill and Peter, 1984, Nunnally, 1978;1988).

Convergent Validity: Validity means measurement of the accuracy of an instrument used in a study. According to Fornell and Larcker, 1981 average variance extracted (AVE) should be examined for convergent validity (Hair, Ringle & Sarstedt, 2011). When Average Variance Extracts (AVE) values are higher than the critical threshold value of

0.50, it defines that a dormant concept is helpful in providing the explanation more than twice of the variance of its factors on average, (Hensler et al. 2009). In statistical term, Hair, Ringle & Sarstedt (2011) has mentioned that the AVE of each dormant structure would surpass the highest squared correlation with any other inactive structure (Fornell & Larcker, 1981). When the cross loading of indicators is tested, the loading of an indicatorwith its corresponding inactive structure should be greater than its loads with all the existing structures.

Discriminant Validity: In measuring model, the next step is to evaluate discriminant validity of the variables that measured the degree to which the constructs differ from each other. Barclay, Higgins and Thompson (1995) suggested two analytical procedures to conduct discriminant validity. These are:

I. A Square root of AVE analysis at the construct level and
II. Cross loading matrix evaluation at the item level.

Square root of AVE: The researcher first estimates the AVE of each latent variable for conducting discriminant validity. After this the square root of AVE need to be calculated. In this regard Fornell-Larker (1981) suggested that the off-diagonal elements (correlation of latent variable) must be less than or equal to the blooded, diagonal elements (the average variation or variance and its square root explained) within the corresponding rows and columns (Barclay, Higgins and Thompson, 1995; Gefen Straub & Boudreau 2000). This value is then compared with the inter-construct correlation. Barclay, Higginsand Thompson (1994) mentioned that the discriminant validity tests whether the variables are not related with the actual one. This will reached when a concept's square root derived from average variance (AVE) is greater than its correlation with other variables.

Cross loading: The second discriminant validity measure can be completed when loading of an item within a construct is greater than its loading in any other constructs (Chin,

1998). However, the condition tests discriminating validity at the level of the construction and the cross-loads make this measurement at the level of indicator, (Henseler et al, 2009).

CHAPTER FOUR

ICT ON QUALITY EDUCATION: BANGLADESH PERSPECTIVE

CHAPTER -FOUR

ICT ON QUALITY EDUCATION: BANGLADESH PERSPECTIVE

4.1 ICT in Bangladesh

In the last few years Bangladesh has facedenormous growth in the information and communications technology (ICT) sector. It is a market where consumer spending is around USD 130 billion plus and growing at 6 percent annually in this market of 160 million plus people. After launching 3G services in 2013, internet inclusion in Bangladesh grew by 22 percent by the end of 2014. Nearly 96 percent are mobile users and 10 million smartphone users from the 66.8 million active Internet subscribers (Annual Report, 2016). We have seen an increasing emergence of digital perceptive consumers with growing Internet connectivity, availability of cheaper smartphones, and rapid rise in social networking.

The followings are the proof of improvement (Khan et al., 2017)

- 8.5 million Multimedia learners produced by 1,00,000 teachers.
- 105 online textbooks for students of visually impaired speaks.
- 103 innovations incubated by technology services Fund
- Earning of US $28.15 million for digital center entrepreneurs.
- Seven years tax holiday for registered IT firms.
- Structure for private equity and venture capital policies implemented as of July 2015.
- VAT for e-commerce reduced to nil

The statistics of the increment of 3g subscribers in last July 2016 to June 2017 is given in table 4.1 below-

Table 4.1:3G subscribers in last July 2016 to June 2017

3G Subscriber		
Month	**Subscriber (Million)**	**Growth Rate (%)**
July, 2016	29.118	-
August, 2016	28.279	-2.9%
September, 2016	29.430	4.1%
October, 2016	27.811	-5.5%
November, 2016	31.093	11.8%
December, 2016	32.312	3.9%
January, 2017	32.941	1.9%
February, 2017	33.790	2.6%
March, 2017	34.557	2.3%
April, 2017	35.565	2.9%
May, 2017	36.102	1.5%
June, 2017	49.661	37.6%

Source: Annual Report, 2017 (BTRC)

4.2 ICT in Quality Education:

For enhancing the qualityeducation for transformation of individual which in turn help, to boast national economy ICT works as a tool. Therefore, ICT must be implemented fully in the educational system (Tinuoye&Adogbeji, 2013).ICT is a transitional that includes the use of computers, internet and other telecommunication technologies in all aspect of human enterprise (Bandele, 2006).

ICTscomprisesCD-ROMS, Internet access, telephone, electronic mail, library services, on line databasesand fax machines.(Nwosu and Ugbomo, 2012).ICTs includesthe provision of internet services, commercial software providers, telecommunications equipment and supplies, IT equipment and services, libraries and datacenters, media and broadcasting, network based information services, and other associated information and communication practices. (United Nations report, 1999).

4.3 ICT and Quality Education in Bangladesh:

It is very relevantto vouch here that Bangladesh has been gone ahead after being connected to the global information super highway with inauguration of the submarine cable on through the Prime Minister of Bangladesh.The Southeast Asia- Middle East-West Europe-4 initiative links Bangladesh with deep sea fiber cable transiting from Singapore via Malaysia, Thailand, Bangladesh, India, Sri Lanka, Pakistan and sometimes a majority of Middle-Eastern countries to eventually arrive in France.

Then the county supposed to have a 10-gigabyte data-transfer capacity per second, 68 times higher than that current speed. (The Daily Star, 2006). It was thought that this would be a landmark development, in general, for the country's Internet access scenario.

4.4 ICT in Higher Education in Bangladesh:

Bangladesh should identify the barriers in the area of higher education and should take some policy measures to face those challenges. Vision and goal setting, curriculum and continuing professional training (CPD) plans for teachers to enhance their teaching and learning skills, develop strong quality improvement systems, incorporate ICT in pedagogy, etc(Islam, 2016).

Moreover, there is growing interest in social dimensions of learning which is shown by a study on the effective use of social software in higher education in theUK to support student learning and engagement (Minocha, 2009).Virtual learning environments (VLEs), which incorporate collaboration andcommunication tools such as wikis, blogs, forums and chat are led by growing interest in social dimensions of learning.In teaching and learning, some web-based social networking tools such as Delicious, GoogleDocs, Facebookand Flickr have been adopted recently. The pioneers in adopting and using Information and Communication Technologies (ICTs) are the higher academic institutions of a country. At present, there are 39publics and 93government approved private universities in

Bangladesh, and many of them have Internet access (Info.amardesh.com, 2019). Bangladesh Agricultural University, Bangabandhu Sheikh Mujibur Rahman Agricultural University, and Sher-e-Bangla Agricultural University have been connected to the Sustainable Development Networking Programme (SDNP) since several years. At first, only two universities have their own VSATs and they areRajshahi University, and Shahjalal University of Science and Technology, Sylhet. Besides, Chittagong University, Khulna University, Dhaka University, Jahangirnagar University, National University, Bangladesh Open University, Bangladesh University of Engineering and Technology (BUET), Islamic University, etc. have leased lines. Table 4.2 below shows the budget of Information and Technology Department for 2017-18 financial year, which indicates the growth in ICT plans and implementations. This different disbursement also affects the ICT implementation in higher education in Bangladesh.

Table 4.2: Budget of Information and Technology Department for 2017-18 financial year:

in taka (,000)

Serial No.	**Details**	**2017-18 Financial Year**		**Expense**	**Expense Rate**
		Budget	**Amended**		
1.	Revenue	189, 22, 92	208, 93, 63	132,18,92	63.27%
2.	Development	3784, 45, 08	3260, 46, 00	2935,51,86	90.03%
Total		39,736,800	34,693,963	30,677,078	88.42%

Source: Annual Report, 2018 (ICT Division)

A study conducted in all the 47 departments of 7 faculties, 5 institutes, computer centre, central library and administrative building of Rajshahi university, Bangladesh. the study exposed that nearly half of the accountable authorities of the numerous sectors are not gratified with the currentamenities owing to several constrictions. This demonstrated future instructions for batter internet access in the mutual interest of the

university community, based on the powerful or dominant situation, (Roknuzzaman, 2006).

Table 4.3: Status of users' access to computers and Internet

Units (58)	Access Status					
	Teachers		Students		Administrative Staff	
	Computer	Internet	Computer	Internet	Computer	Internet
Departments (47)	47	40	17	08	29	10
Institutes (05)	05	05	03	03	03	03
Faculty Laboratory (03)	03	03	02	02	03	03
Computer Centre (01)	01	01	01	01	01	01
Central Library (01)	01	01	0	0	01	01
Administrative Building (01)	0	0	0	0	01	01
TOTAL	57 (98%)	50 (86%)	23 (40%)	14 (24%)	38 (66%)	19 (33%)

Source: Roknuzzaman, 2006

Table 4.3 describes that all units except administrative building (98%) provided teachers with computer access amenities. Teachers also had Internet access in all net linked units without administrative one (86%). Mainly research students (Masters, M.Phil, and PhD) could have access to computers and Internet for applied and research purposes in 23 (40%) and 14 (24%) units respectively. General students had partial access to computers and Internet in some of the departments, institutes, and faculty labs. Administration staffs had access to a computer in 38 (66%) units and 19 (33%) units had internet connection.

4.5 E-Learning in Bangladesh:

One of the most emerging sectors of Bangladesh is ICT sector. It is considered as thrust sector by the government of Bangladesh with the overall education sector. These sectors need much development in terms of quality for contribution in the gross development of the country. Low and uneven education participation, poor quality education, low per capita incomes, a rapidly growing population, corruption, globalization, lack of political commitment, and rapidly advancing technology are the challenges that Bangladesh faces and these challenges should be in consideration for development in e-Learning. In the sector of e learning in Bangladesh some initiatives already in action. Considering the growth of ICT, sector opportunities are now promising to introduce Learning programs in this Bangladesh in broader aspect. A number of technological, broad economic and social trends that have accelerated in recent years is driving E-learning sector. One of the most influential thing in this aspect is demand for higher education in developing and developed countries. Any sorts of joint efforts will be welcome to introduce the system at the national educational and professional learning systemin order to capitalize the benefits of this e-Learning system (Akbar, 2005). Yearly Budget and Progress rate of development works shown in table 4.4goads the e-Learning improvements.

Table-4.4: Yearly Budget and Progress rate of development work :

Financial Year	Budget (in Taka ,00000)	Progress rate
2011-12	2882.00	68.42%
2012-13	13730.00	95.44%
2013-14	96258.29	75.92%
2014-15	81141.27	102.16%
2015-16	95409.00	120.55%
2016-17	159452.00	79.00%
2017-18	326046.00	90.03%

Source: Annual Report, 2018. (ICT Division, Bangladesh) (Published: 15/10/2018)

4.6 Benefits of ICT in enhancing quality education

ICT is one of the most influential things to enhance the quality of education. Howeverthe following are considered as the benefits derived from the use of ICT in education (Nwosu and Ugbomo, 2012):

Active learning: ICT enhanced learning, activated through resources for evaluating, measuring and analyzing information. Thereby providing a general platform for student inquiry and this will build the technical expertise and create new knowledge.

Learners can choose what to learn when they need to learn it becauseICT-enhanced learning is also "just-in-time" learning. Therefore, learners learn whenever appropriate, work on real-life problems in-depth, making learning less abstract and more relevant to the learner's life situation.

Collaborative learning: ICT accelerate collaborative learning because ICT-supported learning encourages interaction and cooperation among students, teachers, and experts regardless of where they are. Supported learning gives participants the privilege of working with people from different cultures, apart from modelling actual world experiences, thus helping to improve the teaming and communication skills of the learners as well as their global awareness. It helps learning done throughout the learner's lifetime by expanding the learning space.

Creative Learning: Rather than the regurgitation of received information, ICT-supported learning promotes the manipulation of existing information and the creation of real-world products

Integrative learning: A thematic, integrative approach to teaching and learning is promoted by ICT-enhanced learning. This approach removes artificial differentiation

between the different disciplines and between theory and practice, which characterizes the traditional approaches of the classroom.

Evaluative learning: In nature, ICT enhanced learning is student-driven and diagnostic. ICT enhanced learning recognizes that there are several different learning paths and knowledge articulations, rather than static, text based or print based education technologies.

Exploring and discovering rather than merely listen and remember are allowed to learners by ICTs.

The comparison below helps to extrapolate how the ICT implementation can help the quality education assurance and ICT benefits improvements in Bangladesh.

Table-4.5: Comparison of development activities and achievement during 2015-16 & 2016-17 fiscal years at a glance:

No.	Subject	2015-2016	2016-2017
01.	Tele-density	84.43%	87.32%
02	Internet Density	39.34%	45.29%
03.	Number of 3G Mobile Subscribers	2.89 Crore	3.60 Crore
04.	Number of Internet Subscribers	6 .32 Crore	7.33 Crore
05.	Licensee Institutions	138	268
06.	Daily International Incoming call (Minute)	8.65 Crore	6.92 Crore
07	Voice Call Charge(Average/Tk.)	0.83 Paisa	. 0.81 Paisa
08.	Internet Bandwidth Price(Tk.)	625 Taka	625 Taka
09.	BTS	69,009	78,066

At 2016-2017 Fiscal Year Revenue Income was 4,066.40 Crore Taka.

Source: Annual Report, 2017 (BTRC)

4.7 Barriers of ICTIntroduction intoEducation in Bangladesh

Effective implementation of ICT in education in Bangladesh is deterred by a number of retarding factors. The following recommendations are suggested for improvement on the current situation (Khan et al., 2012):

Firstly, commitment from the government of Bangladesh, administrators, teachers, parents, students, and the community is a requirement for effective implementation of ICT in education. To overcome the barriers which prevent the use of technology in classroom settings, all the stakeholders and responsible authorities including teachers and other staff should be aware of the importance of technology in improving student's learning and should strive, so that students can be benefitted from this ICT.

Secondly, in a developing country like Bangladesh, another major barrier to the implementation of ICT is lack of resources within educational institutions. Lack of computers including hardware and software really delimits the use of ICT by teachers. Lack of computer integration is a result of limited resources which in turn brings about insufficient computer experience for both teachers and students (Rosen & Weil, 1995; Dupagne&Krendl, 1992; Winnans& Brown, 1992; Hadley &Sheingold, 1993). In order to effective implementation of ICT, the stakeholders and school authorities need to be provided with sufficient facilities and apparatuses.

Thirdly, to increase the presence of girls at school some necessary steps has been taken by the Government of Bangladesh. Hence, to encourage women and girls to adopt ICT, strategies and proper policies are necessary to be formulated. It is not plausible to implement ICT in educationwithout necessary empowerment of women. While planning for adoption and implementation of ICT, the policy-makers shouldbe more attentive to

attune all sectors including those excluded also like women, rural communities and disabled (Sharma, 2003).

Fourthly, implementation of ICT in educational institutions effectively in Bangladesh depends largely on teachers and principals, who needdeep professional development due to lack of knowledge and skills. Watchfulcare needs to be given to in-service training for both teachers and heads and pre-service drill for newly chosentutors before joining the consistent classes to inform them about the important part of technology in schools situations and to help them on how to concoct and use ICT knowledgeably. Specializedexpansion is essential for teachers to enable them to efficiently use technology to progress student erudition (Afshari*et al*, 2009). Grounded on faculty effort and school needs, staff progressmust be collaboratively shaped. It must fixtrainers to use technology effectively in their training. But this training should not entailjust short training, which is not sufficient to shape proper familiarity and assistances. Training must be ongoing experiences rather than one-shot workshops, so that novices/instructors can be kept up to date with latest technologies (Fullan, 1992). Throughout their instructor training lineupsinstructors need to be given chances to exercise using technology more virtually so that they can see paths in which technology can be utilized to enlarge their schoolroomdoings (Rosenthal, 1999).

Fifth, software companies which are local should be heartened to toil together with instructors to harvest Bangla software programs suitable for the instructors and students who don’t know English. Software engineers and teachers must work with each other and spot critically how a variety of teachers communicate in the classroom and how suitable forms of software supporting diverse skills and paths of teaching and knowledge can be better established for teachers to practice in subject teaching (Mumtaz, 2000).

Lastly, teachers should feel self-assured and relaxed using computers, through the use of computers on a dependable basis for instructional actions to implement computers in the teaching space. Educators must comprehend the price of computing in teaching to be able togive assistanceto their pupils and to take care of meaningful erudition (Novak 1998). So altering teachers' bad attitudes is vital for snowballing their computer skills. For this reason, Teachers need to hold a positive attitude to the use of technology when they want to effectively use technology in their classes. Such kind of attitude is established when those mentors are adequatelyhappy with technology and are well-informed about its use (Harrison & Rainer, 1992; Afshari et al, (2009). Schools can go only so far to inspire ICT use; actual take-up hinge largely on teachers' personal feelings, skills and attitudes (Mumtaz, 2000). Even if teachers are served with updated technology and helpful networks, they may not be passionate enough to use it in the teaching space. Educators need to be given the indication that ICT can make their teachings more stimulating, relaxed, more amusing for them and their students, more pleasurable and more inspiring. As ICT is a comparativelynovel field in the Bangladesh education structures, more in-depth research ought to be conducted associatedwithmixing of ICT into classroom circumstances, to demonstrate that ICT can make their educations more stimulating, calmer and well-organized.Though various hindrance to implement ICT in Bangladesh exist, there are some achievements of Bangladesh in the ICT sector which inspire the government of Bangladesh to implement ICT more effectively in future.

Table – 4.6:Achievements of Bangladesh in ICT**:** International Prizes and Honor

Sl. No.	Activities/Institution	Title of the Award	Category of Wining Award	Year of Achievement
1	Multimedia Talking Book	Henry Viscardi Achievement Award 2017		December 2017
2	Autism Barrta (Autism News)	Asia Pacific ICT Alliance (APICTA) 2017		December 2017
3	MuktaPaath	WSIS Award 2018		March 2018
4	OnlinePoliceClearance	WSIS Award 2018		March 2018

	Certificate			
5	EkSeba (One Stop Service)	President Award 2018 of Open Group		April 2018
6	a2i Programme	International Invention, Innovation & Technology Exhibition" (ITEX) 2018	Prizes in Innovation Categories	May 2018

Source: Annual Report, 2018. (ICT Division, Bangladesh)

A number of factors obstructing the extensiveacceptance of ICT in teaching acrossall areas. These factors are lack of training among recognized teaching experts, a lack of subsidy to backingup the acquisition of thetechnology, a lack of inspiration andnecessity among teachers to implement ICT as teaching utensils (Starr, 2001). Nevertheless, in current times, reasonshave emerged that have reinforced and fortified moves. To adopt ICTs into teaching space andlearning settings this moves helped a lot. These have included a mountingnecessity to explore competences in relation toprogram delivery, the chances for flexible delivery provided by ICTs (Starr 2001). The rising use of the Internet and WWW as tools for information access and communication and the volume of technology to deliver support for tailored educational programs toencounter the requirements of individual pupils (Kennedy &McNaught, 1997).After moving to 21stcentury, these aspects and several others are bringing durable forces to bearon the acceptance of ICTs in education and current trends recommend we will soon see large-scalechanges in the way education is premeditated and brought as a consequence of thechances and affordances of ICT.

CHAPTER FIVE

DATA COLLECTION AND PRESENTATION

CHAPTER FIVE

DATA COLLECTION AND PRESENTATION

5.0 Introduction

This chapter describes about the data collection procedures and summary of data presentation. The chapter is mainly divided into four sections: section 5.1 is sampling distribution; section 5.2 is quantitative data presentation, section 5.3 is qualitative data presentation and finally section 5.4 discusses summary of the chapter.

5.1 Sampling distribution

Data are collected from the different respondents by using triangulation research approach. Survey data arecollected from 400 students and 100 teachers. Moreover, 4 FGDsand 5 in-depth interview have beenconducted with alumnus and their concerned employers.Distribution of sample survey has been showed in theTable 5.1 based on region and category of the respective universities.

Table 5.1: Distribution of sample based on region and category of universities

Location	Private University	Public University	Total
Universities (08)			
Dhaka	02	01	03
Sylhet	03	02	05
Total	**05**	**03**	**08**
Teachers (100)			
Dhaka	23	16	49
Sylhet	31	30	61
Total	**54**	**46**	**100**
Students (400)			
Dhaka	94	56	150
Sylhet	138	112	250
Total	**232**	**168**	**400**
Grand Total			500

The Table 5.2 shows sampling distribution of teachers of survey data in different universities.

Table 5.2: Distribution of sample teachersin different universities

Location	**Dhaka**	**Sylhet**	**Total**
Teachers (100)			
Private Universities			
East West University, Dhaka	13	-	13
Daffodil International University, Dhaka	10	-	10
Leading university, Sylhet	-	13	13
Metropolitan University, Sylhet	-	10	10
Northeast University Bangladesh, Sylhet	-	08	08
Total	**23**	**31**	**54**
Public Universities			
Dhaka University, Dhaka	16	-	16
Shahjalal University of Science and Technology, Sylhet.	-	18	18
Sylhet Agricultural University, Sylhet	-	12	12
Total	**16**	**30**	**46**
Grand Total			**100**

The Table 5.3 shows the sampling distribution of surveyed students.

Table –5.3: Distribution of sample students in different universities

Location	**Dhaka**	**Sylhet**	**Total**
Teachers (400)			
Private Universities			
East West University, Dhaka	50	-	50
Daffodil International University, Dhaka	44	-	44
Leading university, Sylhet	-	50	50
Metropolitan University, Sylhet	-	48	48
Northeast University Bangladesh, Sylhet	-	40	40
Total	**94**	**138**	**232**
Public Universities			
Dhaka University, Dhaka	56	-	56
Shahjalal University of Science and Technology, Sylhet.	-	72	72
Sylhet Agricultural University, Sylhet	-	40	40
Total	**56**	**112**	**168**
Grand Total			**400**

The Table 5.4 and Table 5.5 exhibit sampling distribution of students and teachers of survey data showed based on different discipline.

Table 5.4: Number of Respondents (Students) in different disciplines

Name of discipline	No. of Respondents	Percentage (%)
Physical Science	56	14.0
Applied Science & Engineering	64	16.0
Life Science	60	15.0
Social Sciences	64	16.0
Business Administration	65	16.0
Agriculture science	60	15.0
ICT & Others	29	08.0
Total	**400**	**100.0**

Table 5.5: Number of Respondents (Teachers) in different discipline

Name of discipline	No. of Respondents	Percentage (%)
Physical Science	14	14.0
Applied Science & Engineering	16	16.0
Life Science	15	15.0
Social Sciences	16	16.0
Business Administration	16	16.0
Agriculture science	15	15.0
ICT & Others	08	08.0
Total	**100**	**100.0**

5.2 Quantitative data presentation

This section calls out the quantitative data about the ICT access, infrastructure, and ICT used by the respondents both (teachers and students) in the sampled institutions. The overall quantitative data were collected from a survey of teachers and students those are

the main participants of using ICT in higher educational level are presented in the form of frequency distribution and descriptive statistics.

The following Table5.6 and Table 5.7 show respondents having personal computer which is considered as fundamental requirements of using of ICT in the educational institutions.

Table 5.6: Having Personal Computer of the respondents (Students)

Having personal computer	**Number of respondents**	**Percentage (%)**
Only Desktop	42	10.5
Only Laptop	265	66.2
Both Laptop and Desktop	20	05.0
Don't have any one	73	18.3
Total	**400**	**100.0**

Table 5.7: Having Personal Computer of the respondents (Teachers)

Having personal computer	**Number of respondents**	**Percentage (%)**
Only Desktop	20	20.0
Only Laptop	70	70.0
Both Laptop and Desktop	10	10.0
Don't have any one	0	0.0
Total	**100**	**100.0**

5.2.1 Descriptive Statistics (Students)

5.2.1.1 Accessibility of the Technical Equipment

Table –5.8: Descriptive Statistics of the Accessibility of the Technical Equipment

Variable	**Degree of Accessibility (%)**			**Mean**	**S.D**
	Not accessible 1	**Restricted to access 2**	**Free to access 3**		
Personal Computers	12.8	15.8	71.5	2.59	.706
Interactive Whiteboards	52.3	14.5	33.3	1.81	.906
Video Conferencing Systems	60.8	16.3	23.0	1.62	.835
Learning Management Systems (WebCT, Moodle etc.)	61.0	18.8	20.3	1.59	.805
Audio Equipment (Including Software)	58.3	16.0	25.8	1.68	.858
Digital Photo Cameras (Including Editing Soft wares)	60.0	14.0	26.0	1.66	.864
Digital Video Cameras (Including Editing Soft wares)	67.0	13.0	20.0	1.53	.807
Mobile Phones	17.8	14.3	68.0	2.50	.779
Projection Systems	35.3	35.0	29.8	1.95	.805

For improving ICT sector in Bangladesh, it is essential to ensure greater the accessibilities to the technical equipment's. Using technological facilities depends on having personal computer or using computers in the lab of educational institution. The above Table 5.8 shows the descriptive statistics. It resemblesthat 71.5 percent respondents got free access of personal computer and 33.3 percent got interactive whiteboards for using technology while conducting their education. In present world, video conferencing system is mostly

used for communication purpose. This method is one of the most effective ways of communication. It is crucial to improve the existing video conferencing system as this study has found that about 61 percent respondent report that the video conferencing system is not available in their educational institutions. Ithas also been found that there are a number of other learning methods such as learning management system, audio equipment's, digital photo cameras, and digital video cameras have not been introduced yet. Hence, students regularly face a lot of problems in digital life. Though 68.0 percent students have a mobile phone which is not enough to get all ICT services. However, 35.3 percent respondents report that they have no access in projection systems.

5.2.1.2 Descriptive Statistics of the Application of ICT

Just getting a little facilities from information technology is not enough in digital life. An application of ICT is critical inimproving learning outcomes in the educational sectorespecially in the area of higher education. Around 18 percent respondents agree with the statement that their teacher frequently use ICT during their class lectures. However, majority of the respondents, approximately 78.2 percent report that sometimes their teachers use ICT in their class lecture. It is surprising in the digital world that few teachers never use technology as a teaching method for improving quality education.

Table 5.9: Descriptive statistics of the application of ICT in class lecture

Variable	**Degree of measurement**			**Mean**	**S.D**
	Always	Sometimes	Never		
Use of ICT during lecture	18	78.2	3.8	2.17	.555

5.2.1.3 Students' knowledge on using Computer

Without knowledge, it is really impossible to use ICT equipment specially computer. Students should confidently use this equipment. Having knowledge of using various kinds of software is also important for students. The Table 5.10 below shows that 66.0 percent and 33.5 percent have strong confidence in using mouse and keyboard, respectively. A remarkable number of students (around 31.3 percent) do not expresswhether they are confident or not on customizing the desktop environment of the computer.Again, around 24 percent respondents are very confident on installing operating systems. On the other hand, only 37.0 percent respondents can confidently process their Microsoft word and 32.0 percent somehow manage to use it. Similarly, 24.8 percent and 19.0 percent are very confident on using Microsoft access and excel. However, a large percentage of students are not confident to use Microsoft office publisher. Again about 70 percent respondents report that they are not confident in using web designing. This study finds that most of the surveyed students are very confident in applyingMicrosoft power point.

Table 5.10: Students'knowledge on programs and software

Variable	**Degree of confidence attached to each variable (Very Confident = 5, No Confident= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Use of Mouse	66.0	19.0	12.8	1.5	0.8	4.48	.828
Use of Keyboard	33.5	29.5	27.3	9.0	0.8	3.86	1.009
Customizing desktop environment	25.0	22.3	31.3	13.8	7.8	3.43	1.220
Window Installation	24.3	15.5	23.8	15.8	20.8	3.07	1.454
Microsoft Word	37.0	32.0	20.0	9.5	1.5	3.94	1.041

Processing							
Microsoft Excel	24.8	29.8	28.5	14.0	3.0	3.59	1.095
Microsoft Access	19.0	18.8	24.5	28.3	9.5	3.10	1.267
Microsoft Office Publisher	11.2	9.3	18.0	19.5	42.0	2.28	1.381
Microsoft Power Point	39.5	30.8	20.3	5.8	3.8	3.97	1.080
Web Designing	1.5	5.3	6.8	16.3	70.3	1.52	.939

5.2.1.4 Descriptive Statistics of the Student's Opinion towards ICT

Students have different opinion on using ICT.Table 5.11 shows that about 70percent students strongly agree that teachers should use ICT during teaching time and 79.3 percent mention they should use ICT smartly. Again 72.0 percent students opine that their syllabus should be designed to support developing basic ICT skills. For increasing ICT based knowledge in educational sector, students should use ICT for learning purpose. Thirty three percent respondents agree that getting information using ICT is better than using print materials/books. 13.8 percent believe that they cannot study without use of ICT tools. It is really time saving process to use ICT in learning according to the 45.5 percent respondents.

Table 5.11: Students' knowledge on programs and software

Variable	Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)					Mean	S.D.
	5	4	3	2	1		
	%	%	%	%	%		
Teacher should use ICT during teaching	70.3	29.0	.8	0.0	0.0	4.70	.477
We should use ICT smartly	79.3	17.0	2.3	1.5	0.0	4.74	.573
Our syllabus should design to support in developing basic ICT skills	72.0	25.8	2.3	0.0	0.0	4.70	.507
As a student, We should use ICT for learning	73.0	24.8	2.3	0.0	0.0	4.71	.503
I think getting information using ICT is better than using print material/books	27.3	33.0	22.5	13.8	3.8	3.66	1.126
I cannot study without the use of ICT tools	13.8	28.5	27.3	26.8	3.8	3.22	1.099
I find it time saving to use ICT in learning	28.5	45.5	19.5	5.8	0.8	3.95	.882

5.2.1.5 Use of internet in learning subjects

Many research studies support that using internet in learning purpose can play a pivotal role in improving quality of education in university level in developed nation. The present study find that most of the respondents (about 60 percent)have used Internet during their learning period for updating course materialsintermittently while 39.0 percent respondents reply that they always useinternet as a method of learning subjects. But, only one percent respondents never useinternet during their learning time.

Table 5.12: Students' use of internet in learning subjects

Variable	**Degree of measurement**			**Mean**	**S.D**
	Always	Sometimes	Never		
Use of Internet during learning	39.0	60.3	0.8	2.41	.507

5.2.1.6 Purpose of using internet by students

Table 5.13: Students' use of internet in different purposes

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Study purposes	50.0	46.5	3.5	0.0	0.0	4.47	.565
Chatting	40.5	45.3	11.3	2.3	0.8	4.23	.791
Surfing	31.5	33.3	28.5	4.5	2.3	3.87	.984
Sending E-mail	60.0	35.5	3.0	1.5	0.0	4.54	.632
Preparing Assignment	67.3	29.3	2.0	1.5	0.0	4.62	.605
Preparing	80.5	17.5	20.0	0.0	0.0	4.79	.457

Presentations							
Literature Search	54.0	35.8	9.5	0.0	0.8	4.42	.725
Online Shopping	30.8	40.0	20.5	8.0	0.8	3.92	.946
Playing Games	25.0	23.8	30.0	11.5	9.8	3.43	1.250
Songs and Movies	47.5	35.8	10.0	4.5	2.3	4.22	.955

Use of internet is not only necessary for study purpose, but also essential for various types of activities like chatting, surfing, sending e-mail, preparing assignments, preparing presentation, online shopping, playing games, hearing songs and watching movies, etc. The Table 5.13 presents the overall situation and at a glance it estimates that 50.0 percent students strongly agree that they use ICT for study purpose.

Survey result also shows that about 41 percent respondents strongly agree that they useinternet for chatting. Again, majority of the respondents strongly agree that they use ICT for surfing, sending e-mail, preparing assignment and presentation, online shopping, playing games, hearing songs and watching movies.

5.2.1.7 Students' information retrieval skills by using internet

Table 5.14 describe that 14.0 percent students remark excellent position on information retrieval skill while using internet, 32.0 percent stated very good position, 41.3 percent state good position and others are on fair and poor position on that statement respectively.

Table 5.14: Students' information retrieval skills using internet

Variable		**Frequency**	**Percentage**
Information Retrieval Skills	Excellent	56	14.0

While Using Internet	Very Good	128	32.0
	Good	165	41.3
	Fair	24	6.0
	Poor	27	6.8

5.2.1.8 Students' daily time spent in online information searching

Surveyed students reply that they spent plenty of time on various kind of online information searching activities. The Table 5.15 explores that out of 400, 188 respondents spend one to three hours on online browsing which constitute 47 percent of the respondents. Only 1.5 percent spends more than ten hours for this purpose. Scanning journals is a significant way to enhance knowledge and 75.5 percent spends less than one hour for scanning journals in internet. About 20.0 percent spends one to three hours and others 4.5 percent spend four to seven hours. Among the respondents, 38.5 percent spends less than one hour for chatting with friends. 41.8 percent spends one to three hours and 16.0 percent spends four to seven hours and others spent more than eight hours for chatting with their friends. Downloading articles is a significant work for students to complete their higher studies and for that purpose they take help from internet and spend lots of their valuable time. Though it is significant work for studying, 69.8 percent spends less than one hour. This study also finds that about 43 percent respondents spends between one and three hours on internet surfing and 86.5 percent spends less than one hour for reading emails.

Table 5.15: Time Spent by Respondents in Different Online Information Searching Activities

Variable	**Frequency**	**Percentage**

Browsing	<1 Hour	120	30.0
	1-3 Hours	188	47.0
	4-7 Hours	75	18.8
	8-10 Hours	11	2.8
	>10 Hours	6	1.5
Scanning journals	<1 Hour	302	75.5
	1-3 Hours	80	20.0
	4-7 Hours	18	4.5
	8-10 Hours	0	0.0
	>10 Hours	0	0.0
Chatting with friends	<1 Hour	154	38.5
	1-3 Hours	167	41.8
	4-7 Hours	64	16.0
	8-10 Hours	9	2.3
	>10 Hours	6	1.5
Downloading articles	<1 Hour	279	69.8
	1-3 Hours	97	24.3
	4-7 Hours	21	5.3
	8-10 Hours	3	0.8
	>10 Hours	0	0.0
Visiting websites	<1 Hour	142	35.5
	1-3 Hours	171	42.8
	4-7 Hours	64	16.0
	8-10 Hours	20	5.0

	>10 Hours	3	0.8
Reading e -mails	<1 Hour	346	86.5
	1-3 Hours	45	11.3
	4-7 Hours	6	1.5
	8-10 Hours	3	0.8
	>10 Hours	0	0.0

5.2.1.9 Students' Problems using ICT

Respondents face various types of problems in using ICT for different activities. 20.5 percent strongly agrees and 36.0 percent are just agreed with the statement that the numbers of PCs are inadequate. This Table shows that 9.0 percent strongly agree that they have not enough time to use e-resources and 36.5 percent only agree with the statement. Speed of internet connection is not fast enough in educational institutions. About 48.8 percent strongly agree with the statement and 36.6 percent just agree but only 2.8 percent strongly disagree with the statement of slow internet connectivity. In a library, accessibility of printer is not sufficient. There is real deficiencyin access to printers in library. About 35 percent respondents strongly agree with the statement and around 43 percent just agree with this statement. Electricity failure is one of the biggest problems in using ICT smoothly, 19.5% strongly agree and about 28% nearly strongly agree with around 32% disagree with the stated reason. Staff didn't provide enough support to students in IT purpose while 33.8 percent are neutral on this issue. 28.5 percent respondents claim that library staff is not that supportive. It has been reported that the maximum teachers use ICT resources during their lecture time but 22.0 percent respondent's state that teachers don't use ICT resources during their lecture time. For accessing e-resources and online resources, relatively in advance searching, students have lack of knowledge on these variables.

Table 5.16 Descriptive Statistics of the Respondent's Problems in Using ICT

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Inadequate PCs	20.5	36.0	26.0	11.5	6.0	3.54	1.119
Lack of time to use e-resources	9.0	36.5	27.3	24.0	3.3	3.24	1.020
Slow internet connectivity	48.8	36.6	10.0	3.5	1.5	4.27	.889
Lack of access to printers in library	35.3	42.3	12.0	7.5	2.8	4.00	1.012
Electricity failure	19.5	28.0	16.8	32.0	3.8	3.28	1.207
Unwillingness of library staff for help	14.0	28.5	38.3	17.3	2.0	3.35	.988
Lack of support from IT staff	18.3	37.0	33.8	11.0	0.0	3.63	.906
Teachers do not use ICT resources during lecture	8.3	19.0	34.0	32.0	6.8	2.90	1.050
Lack of knowledge accessing E-resources and online resources	19.3	40.0	18.5	18.8	3.5	3.53	1.106
Lack of knowledge in advance searching	16.8	43.5	18.8	16.3	4.8	3.51	1.094

5.2.1.10 Students' opinion towards class room performance

ICT plays a vital role on enhancing classroom performance. Table 5.16 indicates respondents' opinion on getting ICT services for increasing class room performance. Around 69.0 percent respondents strongly agree that uses of ICT in class room have really anexcessive impact on teaching process. On other side, 58.0 percentstrongly opine that ICT accelerate learning process. Consequently, about 47.0 percent respondents strongly

agree that teachers generate meaningful and engaging learning experiences through ICT and 56.3 percent agreethat use of ICT improves presentation skills of teacher. Use of ICT also play a significant role on improving communication skills. Again, around 57.0 percent respondents strongly agreethat use of ICT improve communication skills. As a result of using ICT both teachers and students can enjoy their teaching. 48.5 percent strongly agree that ICT enhances teaching environment.

Table 5.17Descriptive Statistics of the Respondent's opinion towards Classroom Performance

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Use of ICT have great impact on teaching process	68.5	28.5	1.5	1.5	0.0	4.64	.593
ICT accelerate learning process	58.0	38.3	3.8	0.0	0.0	4.54	.569
Teachers generate meaningful and engaging learning experiences through ICT	46.5	40.8	10.0	2.8	0.0	4.31	.762
Use of ICT improve presentation skills of teacher	56.3	33.8	8.5	1.5	0.0	4.45	.713
Use of ICT improve communication skills	57.3	30.5	8.5	3.0	0.8	4.41	.826
Student enjoy learning	48.4	41.1	7.6	3.0	0.0	4.35	.749
Teacher enjoy teaching	37.0	46.5	15.0	0.8	0.8	4.18	.765
ICT enhancing teaching environment	48.5	37.3	12.0	1.5	0.8	4.31	.798

5.2.1.11 *Students' opinion towards Examination and Academic Result Performance*

This study hypothesizes that ICT takes a significant a role for improving academic result and examination performance. Again, this study finds that around 48 percent respondents strongly agree and about 39 percent respondents just agree with the hypothesizedstatement. Students strongly agree with the opinion that use of ICT help to conduct examination smoothly are 44.5 percent while 43.5 percent respondents are just agree with the statement. In the current world, ICT is more useful in accessing e-library resources rather than physical library.Around 31 percent respondents strongly agree with the previous statement while 38.5 percent respondents just agreethat ICT is more convenient for accessinginformation than print materials for the students' examination preparation. On the other side, 49.5 percent respondents agree with the statement that describes ICT can foster better teaching and improved academic achievement of the students. The following Table 5.18represents that students are moderately satisfied with the statement that describe how ICT help to do better in academic result performance.

Table 5.18: Respondent's opinion towards Examination and Academic Result Performance

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Use of ICT help to do better preparation in examination	48.3	38.8	10.3	2.0	0.8	4.32	.796
Use of ICT help to get resources for organizing students' examination	44.5	43.5	9.8	1.5	0.8	4.30	.764
Use of ICT for accessing information better than physical library	30.5	38.5	16.5	14.8	0.0	3.85	1.019

I think getting information through ICT is better than print material/books for the students' examination preparation.	31.8	25.0	23.5	14.5	5.3	3.64	1.215
ICT can foster better teaching and improved academic achievement of the students.	36.3	49.5	12.0	1.5	0.8	4.19	.759

5.2.1.12 *Students' opinion towards Job Market Performance*

Academic result and class room performance are not enough to get a good job in the contemporary world. Knowing ICT is more significant than previous performances. For entering into good job in the current world, students must have the good knowledge on ICT. About 72.0 percent students strongly agree with the opinion that describes ICT knowledge giving support to take opportunity entering into new job while 24.3 percent just agree. Knowledge of ICT opens the job market for graduate students. 48.0 percent of the respondents strongly agree with this statement and 41.8 percent just agreed. Around 66.0 percent respondents strongly agree followed by 26.5 percent respondents who just agree that job seekers can take competitive advantage in the job market because of their sound ICT knowledge. About 55 percent respondent strongly agree followed by around 36 percent respondents just agreed that ICT prepares candidate for future job market. The following Table 5.19 shows the importance of ICT knowledge for preparing anyone in job market performance.

Table 5.19: Respondent's opinion towards Job Market Performance

Variable	**Degree of agreement or disagreement attached to each variable**	**Mean**	**S.D.**

	(Strongly agree = 5, Strongly Disagree= 1)						
	5	4	3	2	1		
	%	%	%	%	%		
ICT learned students get advantages in job market.	72.0	24.3	2.3	0.8	0.8	4.66	.637
ICT open the job market for graduates.	48.0	41.8	9.5	0.0	0.8	4.36	.716
ICT help to take competitive advantage from the job competition	66.0	26.5	6.8	0.8	0.0	4.58	.652
ICT support to take special benefits in job market	59.5	33.3	5.8	1.5	0.0	4.51	.675
ICT prepares candidate for future job market.	55.3	35.8	6.8	1.5	0.8	4.43	.750

5.2.1.13 *Students' opinion towards other performance*

ICT dramatically changes the present era. Technology is now creating platform for inducing research knowledge. The following Table 5.20shows that 63% respondents strongly agreeon the statement that ICT is the key platform for increasing research knowledge. Consequently, 52.0 respondents reply that ICT not only support to increase research knowledge, but also important for offering educational opportunities. Again, around 44.0 percent respondents strongly agree with the statement that ICT increases learner motivation and engagement. Among all the respondents, 45.5 percent of the respondents agree with the opinion that ICT facilitates the acquisition of basic skills. ICT can also affect the delivery of mode of education and hence ICT motivates the teacher to enjoy teaching profession. Finally, use of ICT can improve quality of teaching performance at higher education is strongly supported by the 59% respondents.

Table 5.20: Respondent's opinion towards others performance

Variable	Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)					Mean	S.D.
	5	4	3	2	1		
	%	%	%	%	%		
ICT help teacher to improve research knowledge	63.0	34.0	1.5	1.5	0.0	4.57	.675
ICT is a potentially powerful tool for offering educational opportunities	52.0	41.3	5.3	0.8	0.8	4.43	.697
ICT increase learner motivation and engagement	43.5	37.3	17.0	15	0.8	4.21	.830
ICT facilitates the acquisition of basic skills	37.5	45.5	12.5	4.5	0.0	4.16	.810
ICT can affect the delivery of education and enable wider access to the same	33.0	42.5	21.5	3.0	0.0	4.06	.815
ICT motivates teacher to enjoy teaching profession	27.0	46.8	21.0	4.5	0.8	3.95	.852
Use of ICT improve quality of teaching at higher education	59.5	31.0	5.3	3.5	0.8	4.45	.809

5.3.1 Descriptive Statistics (Teachers)

5.3.1.1 Teachers' opinion towards Quality of ICT Support

Developing ICT infrastructure is very essential for improving performance in the class room, examination processes, and academic result in the higher educational institutions in Bangladesh. Teachers are required to use ICT for the purpose of ensuring effective class performance. Hence, they expect ICT support and it should be unique. Majority of the teachers tell that the quality of ICT in teaching environment are not excellent. But, 60.0 percent respondents say that quality of ICT support is good enough while 25.0 percent and 5.0 percent teachers support that the quality of ICT was very good and excellent respectively.

Table 5.21: Descriptive Statistics of the Quality of ICT Support

Variable		Frequency	Percentage
Quality of ICT Support	Excellent	5	5.0
	Very Good	25	25.0
	Good	60	60.0
	Fair	10	10.0
	Poor	0	0.0

5.3.1.2 Teachers' opinion towards use of internet during lecture period

The present study finds that maximum teachers (60.0 percent respondents) useinternet during their lecture time occasionally (Table 5.22). About 40.0 percent always use internet and there are no respondents who didn't use ICT during their lecture time. Internet expedites in the class room to ensure effective outcome on class performance.

Table 5.22: Descriptive Statistics of Use of Internet during Lecture by teacher

Variable	Degree of measurement			Mean	S.D
	Always	Sometimes	Never		
Use of Internet during lecture as a teacher	40.0	60.0	0.0	2.40	.492

5.3.1.3 Teachers' opinion towards knowledge about computer

Without prior knowledge, it is really impossible to use ICT equipment specially computer. Teachers should confidently use this equipment. Having knowledge of using various kinds of software is also important for teaching profession. Survey finds that 65.0 percent and 60.0 percent respondents have strong confidence on using mouse and keyboard, respectively. About 15.0 percent respondents show their neutral position on the statement of customizing desktop environment but 40.0 percent respondents strongly agree with this statement. Surprisingly, 40.0 percent respondents are very confident on installing windows. Again, 55.0 percent respondents can confidently process their Microsoft word and 30.0 percent are just using it. Similarly, 40.0 percent and 55.0 percent respondents are

very confident on using Microsoft access and excel respectively. But there is a remarkable percentage of teachers who are not confident on using Microsoft office publisher i.e. about 20.0. Again 37.65 percent are not confident on using web designing. This study finds that teachers are very confident on using Microsoft power point.

Table 5.23:Descriptive Statistics of the Teacher's Knowledge about Computer

Variable	**Degree of confidence attached to each variable (Very Confident = 5, No Confident= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Use of Mouse	65.0	5.0	20.0	10.0	0.0	4.25	1.095
Use of Keyboard	60.0	10.0	20.0	10.0	0.0	4.20	1.082
Customizing desktop environment	40.0	45.0	15.0	0.0	0.0	4.25	0.702
Window Installation	40.0	35.0	10.0	15.0	0.0	4.00	1.054
Microsoft Word Processing	55.0	30.0	10.0	5.0	0.0	4.35	.857
Microsoft Excel	55.0	30.0	10.0	5.0	0.0	4.35	.857
Microsoft Access	40.0	30.0	15.0	15.0	0.0	3.95	1.077
Microsoft Office Publisher	30.0	25.0	25.0	10.0	10.0	3.55	1.290
Microsoft Power Point	65.0	25.0	10.0	0.0	0.0	4.55	.672
Web Designing	15.0	15.0	25.0	10.0	35.0	2.65	1.466

5.3.1.4 Teachers' opinion towards Application of ICT

Delivering class room lectures should be based on ICT. The Table 5.24 provides a clear view of the application based opinion. The Table reveals that50.0 percent teachers agree

with this statement. There is no respondent who disagree or strongly disagree with the present statement. About 35.0percent teachers feel fear in using ICT. About 45 percent teachers agree or strongly agree that syllabus is supportive for developing basic ICT skills. There are some teachers who have the knowledge of using ICT but they have no interest to use it while teaching. Average numbers of respondents are neutral in this regards.Table 5.24shows that some teachers (25.0 percent) strongly agree that they can't teach their students without the use of ICT. Some of the teachers (30.0 percent) strongly agree that ICT should not be used in teaching because it is time consuming in teaching.

Table 5.24: Teacher's Opinion towards Application of ICT

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Teacher should use ICT during teaching	40.0	50.0	10.0	0.0	0.0	4.30	.644
I feel fear in use of ICT	5.0	35.0	10.0	10.0	40.0	2.55	1.438
Our syllabus does not support in developing basic ICT skills	15.0	30.0	15.0	10.0	30.0	2.90	1.487
I know how to use ICT but not interested in using it for teaching	5.0	35.0	10.0	20.0	30.0	2.65	1.359
I think getting information from print material/books is better than using ICT	10.0	30.0	20.0	30.0	10.0	3.00	1.189
I cannot teach without the use of ICT tools	25.0	20.0	30.0	20.0	5.0	3.40	1.206
I wish that ICT should not be used in teaching	10.0	20.0	10.0	5.0	55.0	2.25	1.520
I find it time consuming to use	15.0	15.0	15.0	25.0	30.0	2.60	1.435

ICT in teaching							

5.3.1.5 Teachers' use of internet for learning subjects

According to the survey analysis, table 5.25 resemble that about 50 percent teachers have used internet occasionally for learning subject materials while 30 percent teachers have used internet constantly for same purposes but 20 percent never used internet for learning or preparing subject materials.

Table – 5.25: Teacher's use of Internet in Learning Subjects

Variable	**Degree of measurement**			**Mean**	**S.D**
	Always	Sometimes	Never		
Use of Internet during learning subjects	30.0	50.0	20.0	3.00	.899

5.3.1.6 Teachers' use of internet for others activities

The following Table 5.26shows that teachers have no time to use internet other than learning purpose. About 55.0 percent strongly agree that they use internet for study purpose. 75.0 percent respondents reply that they strongly agree about the use of internet in sending email. For learning purpose, they have to use internet in searching knowledge. They do not spend lot of time in online shopping, playing games and hearing songs and watching movies.

Table 5.26: Use of Internet in various activities by Teachers

Variable	**Degree of agreement or disagreement attached to each variable**	**Mean**	**S.D.**

	(Strongly agree = 5, Strongly Disagree= 1)						
	5	4	3	2	1		
	%	%	%	%	%		
Study purposes	55.0	35.0	5.0	5.0	0.0	4.40	.80
Chatting	15.0	60.0	15.0	10.0	0.0	3.80	.82
Surfing	30.0	50.0	20.0	0.0	0.0	4.10	.70
Sending E-mail	75.0	20.0	5.0	0.0	0.0	4.70	.56
Preparing Lectures	30.0	50.0	15.0	5.0	0.0	4.05	.81
Preparing Handouts	35.0	40.0	15.0	10.0	0.0	4.00	.95
Literature Search	50.0	35.0	15.0	0.0	0.0	4.35	.73
Online shopping	30.0	45.0	20.0	5.0	0.0	4.00	.84
Playing Games	35.0	5.0	25.0	25.0	10.0	3.30	1.43
Songs and movies	40.0	30.0	20.0	10.0	0.0	4.00	1.01

5.3.1.7 Respondent's capacity of information retrieval skills

Table 5.27 shows that teachers have a great deal of expertize in retrieving information while using internet. 45.0 percent have excellent capacity and 30.0 percent are very good in this working and only 5 percent has fair and poor capacity to explore information.

Table 5.27 Respondent's capacity of information retrieval skills

Variable		**Frequency**	**Percentage**
Information Retrieval Skills While Using Internet	Excellent	45	45.0
	Very Good	30	30.0
	Good	20	20.0
	Fair	5	5.0
	Poor	0	0.0

5.3.1.8 Average time spent by Respondent's for information searching activities

The following Table 5.28 shows the average time spent by Respondent's for information searching activities

Table 5.28: Average time spent by respondents in different online information searching activities

Variable		Frequency	Percentage
Browsing	<1 Hour	5	5.0
	1-3 Hours	35	35.0
	4-7 Hours	20	20.0
	8-10 Hours	30	30.0
	>10 Hours	10	10.0
Scanning journals	<1 Hour	25	25.0
	1-3 Hours	30	30.0
	4-7 Hours	5	5.0
	8-10 Hours	25	25.0
	>10 Hours	15	15.0
Chatting with friends	<1 Hour	50	50.0
	1-3 Hours	20	20.0
	4-7 Hours	20	20.0
	8-10 Hours	5	5.0
	>10 Hours	5	5.0
Downloading articles	<1 Hour	15	15.0
	1-3 Hours	25	25.0
	4-7 Hours	30	30.0
	8-10 Hours	25	25.0
	>10 Hours	5	5.0
Internet surfing	<1 Hour	20	20.0
	1-3 Hours	20	20.0
	4-7 Hours	30	30.0
	8-10 Hours	25	25.0
	>10 Hours	5	5.0
Reading e -mails	<1 Hour	30	30.0
	1-3 Hours	40	40.0
	4-7 Hours	10	10.0
	8-10 Hours	15	15.0
	>10 Hours	5	5.0

The above Table 5.28 reveals that the respondents spendtheir time on various kinds of online information searching activities. Total 35 respondents spend one to three hours on online browsing which constitute 35.0 percent of the respondents. Only 10 percent spends more than ten hours for this purpose. Scanning journals is significant way to enhance knowledge and 25.0 percent spends less than one hour for scanning journals in internet while 30.0 percent respondents spends one to three hours and others 5 percent spends four to seven hours. Among the total respondents, around 51.0 percent spends less than one hour for chatting with their friends. 50.0 percent spent less than one hour and 20.0 percent spends one to three hours for chatting with their friends. Downloading articles is a significant activity for teachers to conduct research and to complete their research activities. For doing such works, they take help from internet and spend lots of their valuable time. Though it is significant part of studying, 15.0 percent spends less than one hour. This result indicates that 30.0 percent respondents spend more than four and less than seven hours on internet surfing and 30.0 percent spends less than one hour for reading emails.

5.3.1.9 Teacher's Problems in Using ICT

Though ICT plays a very important role in teaching learning processes, teachers also faced different types of problems in using ICT for different activities. The Table 5.29 assists to make a clear understanding of the problems related to ICT tools with university teachers. Around 20.0percent respondents strongly agree and 35.0 percent just agree with the statement that the numbers of PCs are inadequate. On the other hand, the study finds that 10.0 percent strongly agree with the statement that they have not enough time to use e-resources and 35.0 percent only agree with the statement. About 20.0 percent respondents strongly agree and 35.0 percent respondents just agree while other 40.0 percent respondents disagree that speed of internet connection is not so fast in university's

academic platform. In institution's library, accessibility of printer is not enough. There is really lack of access to printers in library. Around 25.0 percent respondents strongly agreed and 35.0 percent just agree with the previous statement. About 40% of the respondents altogether agree and strongly agree, while 55% were neutral about this statement that electricity failure is the biggest problem in smooth practicing of ICT. In present world, maximum teachers use ICT resources during their lecture time. IT staffs are not supportive to provide IT facilities to the respondents. Consequently, around 55.0 percent respondents agreethat there is a deficiency of support from IT staff in the organization. Again, 40.0 percent respondents strongly agree and agreed that students are not interested to use ICT for learning. For accessing e-resources and online resources, and advance searching, students have not sufficient knowledge.

Table 5.29: Descriptive Statistics of the Teacher's Problems in Using ICT

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Inadequate PCs	20.0	35.0	25.0	15.0	5.0	3.50	1.124
Lack of time to use e-resources	10.0	35.0	35.0	10.0	10.0	3.25	1.095
Slow internet connectivity	20.0	35.0	20.0	20.0	5.0	3.58	1.048
Lack of access to printers in library	25.0	35.0	25.0	15.0	0.0	3.70	1.010
Electricity failure	15.0	25.0	55.0	5.0	0.0	3.50	.810
Unwillingness of library staff for help	25.0	20.0	20.0	30.0	5.0	3.30	1.275
Lack of support from IT staff	25.0	30.0	25.0	20.0	0.0	3.60	1.073
Students are not interested to	15.0	25.0	10.0	35.0	15.0	2.90	1.345

use ICT for learning							
Lack of knowledge accessing E-resources and online resources	20.0	30.0	20.0	20.0	10.0	3.30	1.275
Lack of knowledge in advance searching	20.0	25.0	20.0	25.0	10.0	3.20	1.295

5.3.1.13 Teachers' opinion towards classroom performance

ICT can play a dynamic role in improving classroom performance. Table 5.30 indicates respondents' opinion on getting ICT services for increasing class room performance. Using of ICT have really a great impact on teaching process. 35.0 percent of the respondents strongly agreed with the statement and again 35.0 percent strongly agreed with another statement that describes ICT accelerate learning process. This study also finds around 40.0 percent teachers generate meaningful output and engaging learning experiences through ICT and 65.0 percent statethat use of ICT improves presentation skills of teacher. Use of ICT plays a significant role on improving communication skills. Hence, about 60.0 percent respondents strongly agree on this statement. On the other side, around 30.0 percent respondents strongly reply that both teachers and students can enjoy teaching environment.

Table – 5.30: Descriptive statistics of the respondent's opinion towards classroom performance

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
Use of ICT have great impact on teaching process	35.0	45.0	20.0	0.0	0.0	4.15	0.730

ICT accelerate learning process	35.0	50.0	15.0	0.0	0.0	4.20	0.682
Teachers generate meaningful and engaging learning experiences through ICT	40.0	40.0	10.0	10.0	0.0	4.10	0.948
Use of ICT improve presentation skills of teacher	65.0	25.0	5.0	5.0	0.0	4.50	0.810
Use of ICT improve communication skills	60.0	20.0	10.0	10.0	0.0	4.30	1.010
Student enjoy learning	35.0	50.0	10.0	5.0	0.0	4.15	0.796
Teacher enjoy teaching	35.0	35.0	25.0	5.0	0.0	4.00	0.899
ICT enhancing teaching environment	30.0	40.0	20.0	10.0	0.0	3.90	0.948

5.3.1.13 Teachers' opinion towards examination and academic result performance

According to the opinion of teachers, students will be benefited while preparing for examination through using ICT facilities. About 40.0 percent teachers strongly agree and 30.0 percent just agree with this statement. 45.0 percent teacher strongly agree with the opinion that use of ICT help to obtain resources for organizing students' examination and followed by 30.0 percent those were just agree with the statement. In the present world, ICT is considered as key platform for accessing e-resources than traditional library. 25.0 percent strongly agree with that and 40.0 percent respondents just agree. Use of ICT is more convenient for getting information than print materials for the students' examination preparation. 20.0 percent respondents agree with the statement that ICT can foster better teaching and improved academic achievement of the students.

Table 5.31: Respondent's opinion towards Examination and Academic Result Performance

Variable	Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)					Mean	S.D.
	5	4	3	2	1		
	%	%	%	%	%		
Use of ICT help to do better preparation in examination	40.0	30.0	20.0	10.0	0.0	4.00	1.005
Use of ICT help to get resources for organizing students' examination	45.0	30.0	25.0	0.0	0.0	4.20	0.816
Use of ICT for accessing information better than physical library	25.0	40.0	20.0	15.0	0.0	3.75	0.999
I think getting information through ICT is better than print material/books for the students' examination preparation.	25.0	20.0	30.0	15.0	10.0	3.45	1.290
ICT can foster better teaching and improved academic achievement of the students.	50.0	35.0	5.0	10.0	0.0	4.25	0.947

5.3.1.13 Teachers' opinion towards Job market performance

As the teachers have more information than students about job market, they can provide some valuable opinion regarding job requirements in the market as well as the role of ICT on the job market performance. This study finds that around 75.0 percent strongly agree that students must have good knowledge on ICT to enter into new job while only 5.0 percent are disagreeing or strongly disagreeing that ICT not favor for entering into new job.

About 35.0 percent of the respondents strongly agree and 30.0 percent just agree on the statement that knowledge of ICT opens the job market for graduates' students. Around 65.0 percent respondents agree or strongly agree that ICT helps to take competitive advantage in the job entry competition.Again, around 70.0 percent teachers support or strongly support that ICT prepares candidate for future job market (Table 5.32). Thus, according to the teachers' opinion, ICT knowledge is imperative for preparing anyone to provehis or her capability in the job market.

Table 5.32: Respondent's (Teachers) opinion towards Job Market Performance

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
ICT learned students get advantages in job market.	40.0	35.0	20.0	5.0	0.0	4.10	.893
ICT open the job market for graduates.	35.0	30.0	15.0	20.0	0.0	3.80	1.128
ICT help to take competitive advantage from the job competition	30.0	35.0	20.0	10.0	5.0	3.75	1.140
ICT support to take special benefits in job market	15.0	60.0	20.0	0.0	5.0	3.80	0.876
ICT prepares candidate for future job market.	35.0	35.0	25.0	0.0	5.0	3.95	1.029

5.3.1.13 Teachers' opinion towards others performance

The main concern of the study is to measure the power of ICT in improving quality of education and research work is one of the important determinants of quality education. Achieving this is really impossible without application of ICT in the current digital world. The following Table 5.33 describes how much respondents are agreed with the statement on the importance of ICT in increasing research knowledge. Around 80.0 percent of the respondents strongly agree that ICT help teacher to improve research knowledge. ICT is also a potentially powerful tool for offering educational opportunities. 25.0 percent respondents strongly agree with the statement that ICT increases learner motivation and engagement. Among all the respondents, 45.0 percent respondents agree with the opinion that describes ICT facilitates the acquisition of basic skills of teaching. Finally, application of ICT can improve the quality of teaching at higher education.

Table 5.33: Teachers' opinion towards others statement regarding performance of ICT

Variable	**Degree of agreement or disagreement attached to each variable (Strongly agree = 5, Strongly Disagree= 1)**					**Mean**	**S.D.**
	5	4	3	2	1		
	%	%	%	%	%		
ICT help teacher to improve research knowledge	80.0	15.0	0.0	5.0	0.0	4.70	0.718
ICT is a potentially powerful tool for offering educational opportunities	45.0	20.0	35.0	0.0	0.0	4.10	0.893
ICT increase learner motivation and engagement	25.0	50.0	25.0	0.0	0.0	4.00	0.711
ICT facilitates the acquisition of basic skills	45.0	35.0	20.0	0.0	0.0	4.25	0.770
ICT can affect the delivery of	10.0	45.0	45.0	0.0	0.0	3.65	0.657

education and enable wider access to the same							
ICT motivates teacher to enjoy teaching profession	40.0	40.0	20.0	0.0	0.0	4.20	0.752
Use of ICT improve quality of teaching at higher education	40.0	35.0	20.0	5.0	0.0	4.10	0.893

CHAPTER SIX

DATA ANALYSIS AND FINDINGS

CHAPTER SIX

DATA ANALYSIS AND FINDINGS

6.0 Introduction

The previous chapter (Chapter Five)presented and discussed quantitative as well as qualitative data and also the opinion of the different respondents based on sample distribution. The present chapter analysis of collected data in quantitative and qualitative form. The purpose of this chapter is to present the data analyses and to tests the hypotheses along with essential interpretations. This chapter presents an impact analysis of IT adoption in higher educational level in Bangladesh.

This chapter begins with the descriptions about the demographic profiles of the respondents (6.1) followed by student's demographic details discussed in 6.1.1 and teacher's demography discussed in 6.1.2

This chapter is organized in six main sections, commencing with an introduction in section 6.0, followed by demographic profile of the respondents in section 6.1. Section 6.3 and section 6.4 provides factor analysis and measuring effectiveness respectively. Section 6.4 and 6.5 reports hypothesis testing of the present study from perceptions of both students and teachers and findings of the hypothesis test are discussed in details. Finally, summary of the chapter is presented in section 6.6.

6.1 Demographic Profile

Demographic characteristics of the samples classify respondents according to age, sex, residential address, residents of the student. In this work, it is better way to categories the whole respondents based on these characteristics. The demographic characteristics of the students and teachers are discussed below:

6.1.1 Demographic Profile of the Students:

The age group distribution of the students are categories into five groups. This study found almost all students (About 98.5%) students were in the age group between 20 and 30 while only 1.5% students under 20 age group but there are no students were considered for this study whose age group more than 30. This analysis represented that 59 percent of the respondents were male and others were female which constituted 41 percent of the respondents. Most of the students who gave their opinion and respond in the questionnaire were living with their family. 50.5 percent respondents stay with their family followed by the 28.3 percent who live in mess and others in hall. In this respondent's group, majority of the respondents' current residential place is urban and others current residential place is rural. 63.8 percent respondents' family lived in urban and others family lived in rural area. The following Table 6.1 shows the scenario of the respondents' opinion.

Table 6.1: Demographic Profile of the Students

Variable		Frequency	Percentage (%)
Age (in years)	Below 20	6	1.5
	20-30	394	98.5
	31-40	0	0.0
	41-50	0	0.0
	Above 50	0	0.0
Gender	Male	236	59.0
	Female	164	41.0
Current Resident	Hall	85	21.3
	Mess	113	28.3
	Family Resident	202	50.5
Family Resident	Urban	255	63.8
	Rural	145	36.2

Source: Computed by the author

6.1.2 Demographic Profile of the Teachers

The age group distribution of surveyed teachers' categories into five classes. Among the respondents around 40 percent were in the age group between 31 and 40 followed by 30 percent respondents in the age group between 41 and 50. In total, 70 percent teachers have age range between 31 and 50. Only 30 percent teachers' age range were under the category above 50 and less than 30.

The present study represented that 65 percent of the respondents were male teachers and others were female which constituted 35 percent. About marital status, among the surveyed teachers, 65 percent were married and others 35 percent were single till the time of interview. In the matter of designation, 40 percent teachers hold lecturer post, 50 percent in assistant lecturer post and others 10 percent are in associate professor and professor post equally. The average number of students in their class is approximately thirty. 35 percent teachers said the average number of students in their class was respectively 20-30 and more than 50. The teaching experiences of half of the respondents was more than four years and less than ten years. There was no respondent having teaching experiences more than twenty years.

Table 6.2 Demographic Profile of the Teachers

Variable		**Frequency**	**Percentage (%)**
Age (in years)	Below 20	0	0.0
	20-30	20	20.0
	31-40	40	40.0
	41-50	30	30.0
	Above 50	10	10.0
Gender	Male	65	65.0
	Female	35	35.0

Marital Status	Single	65	65.0
	Married	35	35.0
Designation	Professor	5	5.0
	Associate Professor	5	5.0
	Assistant Professor	50	50.0
	Lecturer	40	40.0
Number of Student Per Class	Fewer than 20	0	0.0
	20-30	35	35.0
	31-40	30	30.0
	41-50	0	0.0
	More than 50	35	35.0
Teaching hours per week	Fewer than 10 hours	25	25.0
	10-15 hours	50	50.0
	16-20 hours	20	20.0
	21-25 hours	0	0.0
	More than 25 hours	5	5.0
Teaching Experiences	Less Than 1 year	5	5.0
	1-3 Years	30	30.0
	4-10 Years	50	50.0
	11-20 Years	15	15.0
	21-30 Years	0	0.0
	More than 30 Years	0	0.0
Having any technical support	Yes	80	80.0
	No	0	0.0
	Don’t Know	20	20.0

Source: Computed by the author

6.2 Reliability Analysis*for the Response of Teachers and Students:*

Reliability analysis was conducted for all collected data. The result of the reliability test on surveyed data of teachers and students are discussed in the following table:

Table – 6.3: Reliability Statistics

Reliability Determinant	Teachers' data	Students' data
Cronbach's alpha	0.915	0.894

Reliability analysis was conducted prior to other analyses. For data to be considered reliable, the value of its Cronbach's alpha should be >0.7 (Nunnally, 1978). The reliability analysis of the responses of the teachers produced a Cronbach's alpha of 0.915 meaning all items used in the questionnaire were reliable.The reliability analysis of the students' sample produced a Cronbach's alpha of 0.894 meaning all items used in the questionnaire were reliable.

6.3Factor Analysis:

6.3.1 Factor Analysis of the influential from Students' point of view:

For the purpose of study, ***exploratory factor analysis*** has been done in order to reduce the number of factors those are influential for changing using pattern of ICT in improving this sector. The exploratory factor analysis was performed in SPSS with ***varimax*** rotation on students' responses for the variables of the sub-factors. From the table 6.4 it is clear that first seven sub-factors had more power on improving performance of the students both on job and life purpose. This seven sub-factors have explained of 66.034% variance of the data and their ***Eigen values*** are more than 1.From analyzing the results of ***total variance explained*** and ***communalities*** (See table-6.5); this study identify those seven sub factors that have had more influence of changing information and communication sector. These factors are related with job market performance, examination and academic performance, class room performance and others. The following table shows the ranking among these seven sub-factors.

Table 6.4: Most Reasonable Factors based on Factor Analysis

Rank	Sub-factor	Factor	Communalities	Eigen Values	Cumulative % of variance
1	ICT help to take competitive advantage from the job competition	Job Market Performance	0.808	8.086	32.345
2	ICT help to do better preparation in examination	Examination and Academic Performance	0.756	1.846	39.730
3	ICT have great impact on teaching process	Class Room Performance	0.723	1.753	46.742
4	ICT help to get resources for organizing students' examination	Examination and Academic Performance	0.720	1.391	52.306
5	ICT for accessing information better than physical library	Examination and Academic Performance	0.712	1.289	57.464
6	Getting information through ICT is better than print materials	Examination and Academic Performance	0.711	1.114	61.918
7	Teachers enjoy teaching	Class Room Performance	0.699	1.029	66.034

Table 6.5: Total Variance Explained						
Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**

1	8.086	32.345	32.345	8.086	32.345	32.345
2	1.846	7.385	39.730	1.846	7.385	39.730
3	1.753	7.012	46.742	1.753	7.012	46.742
4	1.391	5.564	52.306	1.391	5.564	52.306
5	1.289	5.157	57.464	1.289	5.157	57.464
6	1.114	4.455	61.918	1.114	4.455	61.918
7	1.029	4.116	66.034	1.029	4.116	66.034
8	.855	3.421	69.456			
9	.793	3.173	72.628			
10	.776	3.103	75.731			
11	.720	2.881	78.612			
12	.650	2.601	81.213			
13	.605	2.421	83.634			
14	.560	2.241	85.875			
15	.506	2.023	87.898			
16	.468	1.872	89.770			
17	.438	1.752	91.522			
18	.369	1.475	92.997			
19	.356	1.425	94.422			
20	.335	1.341	95.763			
21	.297	1.189	96.952			
22	.247	.989	97.941			
23	.205	.821	98.762			
24	.182	.729	99.490			
25	.127	.510	100.000			
Extraction Method: Principal Component Analysis.						

6.3.2 Factor Analysis of the influential from Teachers' point of view:

For the purpose understanding the most influential factors, ***exploratory factor analysis*** has been done in order to reduce the number of factors those are influential in using pattern of

ICT in improving the quality education. The exploratory factor analysis was performed in SPSS with ***varimax*** rotation on teachers' responses for the variables of the sub-factors. From the table 6.6 it is clear that first seven sub-factors had more power on improving performance of the teachers both on job and life purpose. This seven sub-factors can have explained of 86.181% variance of the data and their ***Eigen values*** are more than 1.From analyzing the results of ***total variance explained*** and ***communalities*** (See Table 6.7). This study identified seven sub factors that have had more influence of changing information and communication sector. These factors are related with job market performance, examination and academic performance, class room performance and others. The following table shows the ranking among these seven sub-factors.

Table 6.6: Most Reasonable Factors based on Factor Analysis

Rank	Sub-factor	Factor	Communalities	Eigen Values	Cumulative % of variance
1	Generate meaningful and engaging learning experiences	Examination and Academic Performance	0.973	11.505	46.020
2	ICT improve communication skills	Class Room Performance	0.962	2.639	56.575
3	ICT can affect the delivery of education and enable wider access to the same	Others	0.958	1.978	64.487
4	Student enjoy learning	Class Room Performance	0.943	1.929	72.202
5	ICT learned students	Job Market	0.934	1.300	77.403

	get advantages	Performance			
6	ICT support to take special benefits	Job Market Performance	0.930	1.114	81.857
7	Teacher enjoy teaching	Class Room Performance	0.888	1.081	86.181

Table 6.7: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.505	46.020	46.020	11.505	46.020	46.020
2	2.639	10.555	56.575	2.639	10.555	56.575
3	1.978	7.912	64.487	1.978	7.912	64.487
4	1.929	7.714	72.202	1.929	7.714	72.202
5	1.300	5.201	77.403	1.300	5.201	77.403
6	1.114	4.454	81.857	1.114	4.454	81.857
7	1.081	4.324	86.181	1.081	4.324	86.181
8	.956	3.824	90.006			
9	.653	2.613	92.619			
10	.451	1.803	94.421			
11	.394	1.574	95.996			
12	.284	1.138	97.133			
13	.228	.911	98.045			
14	.153	.614	98.658			
15	.126	.503	99.161			
16	.097	.386	99.548			
17	.058	.232	99.779			
18	.038	.153	99.932			
19	.017	.068	100.000			

Extraction Method: Principal Component Analysis.

6.4 Structural Equation Modeling (Teacher's)

Structural Equation Modeling (SEM) is an extension of the general linear model that enables a researcher to test a set of regression equations simultaneously. Structural equation models usually involve latent variables with multiple indicators, in this study SEM is used to test the hypotheses developed from the theoretical model. This model helps to identify the fitness of the breakdown of the final conceptual model. To complete the study, at first SEM has been developed based on the information of university teachers those used ICT system continuously. Then again SEM model has been made from the opinion of university students in section 6.5.

6.4.1 ***Defining the Individual Constructs:*** All of the constructs used in the study are reflective in nature. In an attempt to calculate measurement errors, each of the latent constructs was measured by multiple observed items (See table 6.6.2). This study adopted a two-step technique of model through SEM analysis recommended by Anderson and Gerbing, (1988). In this technique, at first data has been analyzed through factor analysis which provides an assessment of measurement reliability, convergent and discriminant validity. Then structured equation model testing has been conducted to test the model fit and to understand the hypothesized relationships.

Prior to model test, ***descriptive statistics*** and ***correlation matrix*** for all constructs of the proposed model were examined. The results of mean, standard deviation, and correlations among the variables are shown in table 6.6.1.

Table 6.6.1: Summary of Mean, Standard Deviation and Correlations among Constructs

Constructs	Mean	S.D	Correlations

			CRP	EP	ARP	PRAC_1	PRAC_2	PRAC_3
CRP	3.54	.699	1					
EP	3.81	.286	.789**	1				
ARP	3.59	.413	.624**	.651**	1			
PRAC_1	3.89	.483	.890**	.688**	.884**	1		
PRAC_2	3.26	.425	.776**	.875**	.732**	.641**	1	
PRAC_3	3.66	.265	.656**	.756**	.856**	.764**	.744**	1

** Correlation is significant at the 0.01 level (2-tailed)
Source: SPSS output by analyzing primary data

The estimates of correlations and their standard deviations indicated that the scales are empirically distinct from each other. The correlation matrix indicates there are positive correlations among all of the study variables. Besides this, study represents that all of the variables are significant at the 0.01 level.

Table **6.6.1** represents that, ***Pearson Correlations*** co-efficient is 0.789 between classroom performance and examination performance which indicates there is a positive moderately high linear relationship and this relationship exists at the significant at the 0.01 level.

There are three indicators of ICT practices, such as PRAC_1, PRAC_2 and PRAC_3. First indicator identified the practices of ICT in study purpose, second one identified the practices of ICT in Social Media and last one is used to identify the practices of ICT is refreshment purpose. The correlations co-efficient between class room performance (CRP) and practices of ICT in study purpose is .890. The relationship between CRP and PRAC_1 is significant at 0.01 levels. The correlations between academic result performance (ARP) and practices of ICT in study purpose, examination performance and practices of ICT is social media as well as academic result performance and practices of ICT in refreshment purpose are .884, .875 and .856 respectively which indicate there are moderate relationship among them. These relationships are also significant at 0.01 levels. All

relationships between the impacts are more than 0.600 means there are moderate positive correlations among them and those relationships are significant at the level 0.01.

***6.4.2 Assessing Reliability and Validity*:** The estimates of structural relationships can be biased unless the measurement instrument is reliable and valid. So, reliability and validity should be measured to make study authentic.

Reliability of each constructs has been assessed through degree of internal consistency. This analysis was conducted prior to other analyses. For data to be considered reliable, the value of its ***Cronbach's alpha*** should be >0.7 (Nunnally, 1978). The reliability analysis of this paper sample produced a ***Cronbach's alpha*** of 0.889 meaning all items used in the questionnaire were reliable and it is marvelous.The value of reliability analysis for individual constructs has been given the following table.

Table 6.6.2: Result of Reliability and Validity

Key Factors (Constructs)	Sub-Factors (Item)	Communalities	Factor Loadings	Mean	S.D	Cronbach's α
CRP	CRP_1	.837	.913	3.56	1.432	.933
	CRP_2	.780	.864	3.61	1.328	
	CRP_3	.761	.739	3.00	1.128	
	CRP_5	.677	.694	4.51	.732	
	CRP_6	.606	.710	2.68	1.035	
	CRP_7	.660	.753	3.61	1.207	
	CRP_8	.949	.905	4.10	.829	
EP	EP_1	.813	.732	3.88	.667	.856
	EP_2	.750	.626	4.23	.571	
	EP_3	.731	.705	4.53	.949	
	ARP_1	.800	.730	4.59	.760	

ARP	ARP_2	.589	.637	4.04	.817	.795
	ARP_4	.871	.812	4.55	.797	
	ARP_6	.847	.653	2.03	.600	
PRAC_1	SP	.706	.769	4.10	1.091	.879
	PL	.869	.747	3.66	.926	
	PH	.847	.873	3.85	.521	
	LS	.747	.713	4.05	.305	
PRAC_2	CHATTING	.893	.865	4.62	.880	.821
	SURFING	.810	.892	2.33	.694	
	EMAIL	.860	.665	2.38	.606	
PRAC_3	OS	.822	.749	2.31	.968	.695
	PG	.803	.662	4.35	.805	
	S_&_M	.785	.705	3.97	.800	

Next the construct validity was calculated by the factor analysis. Where the ***Principal Component Analysis*** with ***Varimax*** rotation has been applied due to minimizes the number of variables with extreme loadings on a factor which makes it possible to identify a variable with a factor. After using the rotated component matrix, it has been assured that variables are loaded onto factors. ***Convergent validity*** means that the variables with in a single factor are highly correlated. This is evident by the ***factor loadings*** in table. The rotated component matrix (value given in Table 6.6.2) shows a very clean factors structure as all the factor structure as all the factor loading are above and all items are loaded onto single factor only.

Communalities of the items are also assessed (See table 6.6.2). Communality means the extent to which an item correlates with all other items that indicate higher communalities are better. If communalities for a particular variable is low (between 0-.4), then that

variable may struggle to lead significantly on any factor. Results showed in the table 6.6.2 represents that, communalities of all items are above 0.5 without CRP_4, ARP_3, ARP_5 and EP_4 variables. So, the values of communalities are more than 0.5 estimates that all items have pretty good quality of influence in all.

Discriminant Validity refers to the extent to which factors are distinct and uncorrelated. The rule is that the variable should relate more strongly to their own factor than to another factor. There are two primary methods that help to determines discriminant validity. The first method is to examine the rotated component matrix. Variables should load significantly only on one factor. According to the first method, factor analysis has been done by a trial and error process as there was cross loadings. Then some items were removed because they were not loaded onto same factor with other items. Rest of the items loaded onto only one factor which assured the discriminant validity.

Another method for testing validity is to examine the factor correlation matrix and correlations between the key strategic factors should not exceed 0.9 (Kenneth, 1988). Following this method, table 6.6.1 presented that all of the correlation values between factors are below 0.9 which also provide support for discriminant validity.

Overall, according to the evidence of reliability, convergent validity and discriminant validity the measurement model was believed to be appropriate.

6.4.2.1 ***Model Fit:***In this phase, a confirmatory factor analysis (CFA) using AMOS 21 was conducted to evaluate the model fit. The fit of the model was evaluated based on several fit indices. The fit of the model was considered from not only absolute model fit but also incremental model fit. Incremental fit indices, also known as comparative (Miles and

Shevlin, 2007) or relative fit indices (McDonaldand Ho, 2002), are a group of indices that do not use the chi-square in its raw form but compare the chi square value to a baseline model. At first the author determined the absolute model fit in below

Absolute Model Fit: Absolute fit indices determine how well and a prior model fits the sample data (McDonald and Ho, 2002) and demonstrates which proposed model has the most superior fit.Included in this category are the ***Chi-Squared tests, DF, P value, RMSEA, GFI, AGFI, and the RMR.***

Table 6.6.3: Results of the Absolute Model Fit

X^2	DF	X^2/DF	P value	RMSEA	GFI	AGFI	RMR
110.20	23	4.79	.000	.054	.894	.809	.044

The Chi-Square value (X^2) is the traditional measure for evaluating overall model fit and, 'assesses the magnitude of discrepancy between the sample and fitted covariance's matrices' (Hu and Bentler, 1999). Table 6.6.3 shows that, the chi-square is 110.20 (DF= 23, P<0.01). In absolute model fit, P value should be less than 0.01. In this table the P value is 0.000, so, this model is better fit according to P value indicator.

The RMSEA is the second fit statistic reported in the LISREL program and was first developed by Steiger and Lind (1980, cited in Steiger, 1990).The RMSEA tells us how well the model and its cut-off points have been reduced considerably on the last fifteen years. More recently, a cut-off value close to .06 (Hu and Bentler, 1990) on a stringent upper limit of .08 (Steiger, 2007). Table 6.6.3 represents that the RMSEA value is .054 (smaller than .08) which means a good model fit.

The Goodness-of-Fit statistic (GFI) was created by Jöreskog and Sorbom as an alternative to the Chi-Square test and calculates the proportion of variance that is accounted for by the estimated population covariance (Tabachnick and Fidell, 2007). According to Diamantopoulos and Siguaw, 2000 the ranges for GFI and AGFI from 0 to 1 with larger

samples increasing its value. The results showed in the table 6.6.3 indicate that the value of both GFI and AGFI are larger than 0.800 that measures a reasonable fit of the model. On the other hand, the lower RMR (0.044) and RMSEA indicate a better fit of the model.

Incremental Model Fit: This model is known as comparative (Miles and Shevlin, 2007) or relative fit indices (McDonaldand Ho, 2002) and use only ***NFI***, ***TLI*** and ***CFI*** rather than ***Chi-square.***

Table 6.6.4: Results of Incremental Model Fit

NFI	CFI	TLI
.846	.895	.853

Values for ***NFI***, ***CFI*** and ***TLI*** range between 0 and 1 with Bentler and Bonnet, 1980 recommending values greater than 0.09 indicating a good fit. Most recent suggestions state that the cut-off criteria should be ≥ 0.95 (Hu and Bentler, 1999). The following table shows that values for ***NFI, CFI*** and ***TLI*** are more than 0.80 and only ***CFI*** is less close to 0.90. These all results states that this model should be considered and reasonable fit.

According to the fit indices from ***CFI***, the model provided evidence of satisfactory fit. Therefore, the fit measure of the model suggested also satisfactory fit.

In addition to model fit, two other properties of the scales such as composite reliability and convergent validity were examined. The standardized factor loadings, item errors, ***Composite Reliability (CR)*** and ***Average Variance Extracted (AVE)*** are presented in table 6.6.5. The ***CR*** and ***AVE*** have been calculated using the following formulas:

$CR = (\sum\ )^2 / [(\sum\ )^2 + \sum(1 - \ ^2)]$

$AVE = = \sum\chi 2 / [(\sum\chi\ ^2 + \sum\ (1-\chi^2)]$

χ = standardized factor loading, $(1-\chi 2)$ = item error

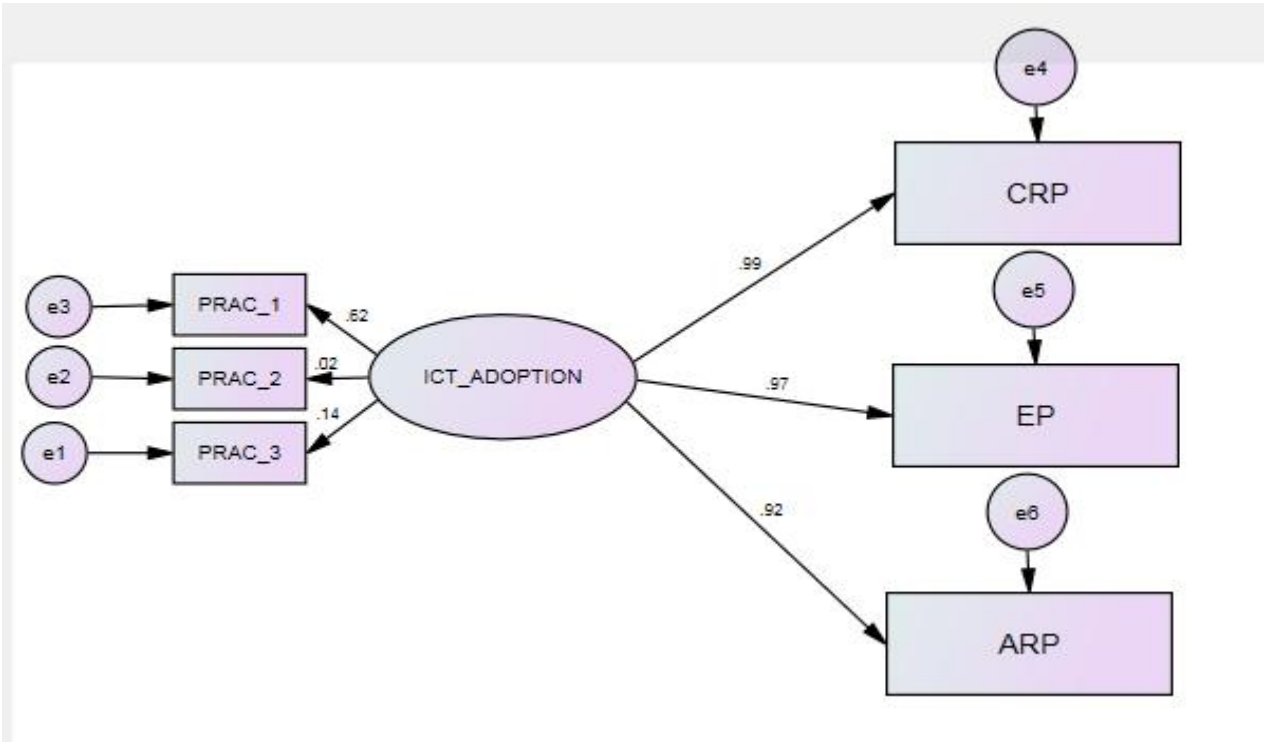
Table 6.6.5: Factor Loadings, CR and AVE

Constructs	Item	Standardized factor loadings	Item errors	CR	AVE
CRP	CRP_1	.774	.401	.910	.594
	CRP_2	.846	.284		
	CRP_3	.743	.448		
	CRP_5	.715	.489		
	CRP_6	.709	.498		
	CRP_7	.841	.293		
	CRP_8	.756	.428		
EP	EP_1	.761	.579	.748	.503
	EP_2	.779	.607		
	EP_3	.651	.424		
ARP	ARP_1	.808	.347	.800	.506
	ARP_2	.796	.366		
	ARP_4	.575	.669		
	ARP_5	.638	.593		
PRAC_1	SP	.621	.614	.792	.489
	PL	.705	.503		
	PH	.730	.467		
	LS	.737	.457		
PRAC_2	CHATTING	.648	.580	.815	.599
	SURFING	.888	.211		
	EMAIL	.768	.410		

PRAC_3	OS PG S_&_M	.621 .705 .730	.614 .503 .467	.727	.472

According to Bagozzi & Yi (1998), the cut off value is .60 for CR and .50 for AVE (Fornell & Larcker, 1981). As presented in table 6.6.5, all CR values exceeded the recommended cut off value. Again table 6.6.5 shows that AVE values also exceeded the cutoff point .50. So, composite reliability and convergent validity also have provided the evident of acceptance of the Model.

6.4.2.2 *Testing Hypothesis*: After the model was found to be acceptable by examining the model fit indices, the proposed hypotheses were tested using Structural Equation Modeling (SEM) technique with maximum likelihood estimation. The results of path analysis are depicted in Figure 6.1.



P<.01 level (two-tailed), numbers on path indicate structural coefficients.

Figure 6.1: Path Analysis
Source: AMOS graphics

Within the overall model, the estimates of the structural coefficients provide the basis for testing the proposed hypotheses. Hypotheses are tested by examining the significance level, direction and magnitude of the standardized estimates of paths that link independent variables with the dependent variable. The summarized results are presented in table 6.6.6

Table 6.6.6: Results of Path Analysis

Hypothesis	Estimates	P value	S.E.	C.R.	Result
H_1: IT ADOPTION ⟶ CRP	.998	***	.411	1.13	**Accepted**
H_2: IT ADOPTION ⟶ EP	.974	***	.287	2.52	**Accepted**
H_3: IT ADOPTION ⟶ ARP	.919	***	.251	5.8	**Accepted**

Source: AMOS output by analyzing primary data

The result shows that, the estimate value for practices of ICT in classroom performance is .998 and p value is less than .01 with standard error .411 and critical ratio 1.13. This means there is a positive significant relationship found between practices of ICT in study purpose and classroom performance. The p value is *** (000) which means this relationship is significant at level of .01.

The result shows that, the estimate value for practices of ICT in social media and examination performance is .974 and p value is less than .01 with standard error .287 and critical ratio 2.52. This means there is a positive significant relationship found between practices of ICT in social media purpose and examination performance. The p value is *** (000) which means this relationship is significant at level of .01.

The result shows that, the estimate value for practices of ICT in entertainment purpose and academic result performance is .919 and p value is less than .01 with standard error .251 and critical ratio 5.8. This means there is a positive significant relationship found between

practices of ICT in study purpose and classroom performance. The p value is *** (000) which means this relationship is significant at level of .01.

Findings from Hypothesis Test: The hypothesized relationships between practices of ICT in different purpose and classroom performance, examination performance and academic result performance are significant al .01 levels. The directional relationships between them are statistically established (Figure 6.1 and Table 6.6.6). So, $H_{1,}$ H_2 and H_3 hypotheses (alternative) are accepted at the .01 level. Finally, this study concludes that (based on teacher's opinion) practices of ICT at educational institution has direct impact on the quality of education (class room performance, examination performance and academic result performance.

6.5 Structural Equation Modeling (University Students)

Structural Equation Modeling (SEM) is an extension of the general linear model that enables a researcher to test a set of regression equations simultaneously. Structural equation models usually involve latent variables with multiple indicators, in this study SEM is used to test the hypotheses developed from the theoretical model. This model helps to identify the fitness of the breakdown of the final conceptual model. This section described structured equation modeling based on the data which are collected from university students.

6.5.1 ***Defining the Individual Constructs:*** All of the constructs used in the study are reflective in nature. In an attempt to calculate measurement errors, each of the latent constructs was measured by multiple observed items (See table 6.7.2). This study adopted a two-step technique of model through SME analysis recommended by Anderson and Gerbing, (1988). In this technique, at first data has been analyzed through factor analysis which provides an assessment of measurement reliability, convergent and discriminant

validity. Then structured equation model testing has been conducted to test the model fit and to understand the hypothesized relationships.

Prior to model test, ***descriptive statistics*** and ***correlation matrix*** for all constructs of the proposed model were examined. The results of the mean, standard deviation, and correlations among the variables are shown in table 6.7.1.

Table 6.7.1: Summary of Mean, Standard Deviation and Correlations among Constructs

Constructs	Mean	S.D	Correlations					
			CRP	EP	ARP	PRAC_1	PRAC_2	PRAC_3
CRP	4.39	.457	1					
EP	4.50	.557	.879**	1				
ARP	4.05	.600	.624**	.651**	1			
PRAC_1	4.57	.422	.780**	.688**	.785**	1		
PRAC_2	4.21	.621	.776**	.725**	.732**	.651**	1	
PRAC_3	3.85	.778	.656**	.756**	.685**	.654**	.674**	1

** Correlation is significant at the 0.01 level (2-tailed)
Source: SPSS output by analyzing primary data

The estimates of correlations and their standard deviations indicated that the scales are empirically distinct from each other. The correlation matrix indicates there are positive correlations among all of the study variables. Besides this, study represented that all of the variables are significant at the 0.01 level.

Table **6.7.1** represents that, ***Pearson Correlations*** co-efficient is 0.879 between classroom performance and examination performance which indicates there is a positive moderately high linear relationship and this relationship exists at the significant at the 0.01 level.

There are three indicators of ICT practices, such as PRAC_1, PRAC_2 and PRAC_3. First indicator identified the practices of ICT in study purpose, second one identified the practices of ICT in Social Media and last one is used to identify the practices of ICT as

refreshment purpose. The correlations co-efficient between class room performance and practices of ICT in study purpose is .780. The relationship between CRP and PRAC_1 is significant at 0.01 levels. The correlations between academic result performance and practices of ICT in study purpose, examination performance and practices of ICT is social media as well as academic result performance and practices of ICT in refreshment purpose are .785, .725 and .685 respectively which indicate there are moderate relationship among them. These relationships are also significant at 0.01 levels. All relationships between the impacts are more than 0.600 means there are moderate positive correlations among them and those relationships are significant at the level 0.01.

***6.5.2 Assessing Reliability and Validity*:** The estimates of structural relationships can be biased unless the measurement instrument is reliable and valid. So, reliability and validity should be measured to make study authentic.

Reliability of each constructs has been assessed through degree of internal consistency. This analysis was conducted prior to other analyses. For data to be considered reliable, the value of its ***Cronbach's alpha*** should be >0.7 (Nunnally, 1978). The reliability analysis of this paper sample produced a ***Cronbach's alpha*** of 0.882 meaning all items used in the questionnaire were reliable and it is marvelous.The value of reliability analysis for individual constructs has been given the following table.

Table 6.7.2: Result of Reliability and Validity

Key Factors (Constructs)	Sub-Factors (Item)	Communalities	Factor Loadings	Mean	S.D	Cronbach's α
	CRP_1	.737	.813	4.64	.593	
	CRP_3	.651	.749	4.31	.762	
	CRP_4	.766	.795	4.45	.713	

CRP	CRP_5	.707	.810	4.41	.826	.781
	CRP_7	.854	.805	4.18	.765	
	CRP_8	.687	.755	4.31	.798	
EP	EP_1	.715	.635	4.66	.637	.820
	EP_2	.850	.686	4.36	.716	
	EP_3	.831	.805	4.58	.652	
ARP	ARP_1	.700	.740	4.32	.795	.652
	ARP_2	.698	.737	4.30	.764	
	ARP_4	.768	.853	3.64	1.215	
PRAC_1	SP	.706	.769	4.47	.565	.667
	PL	.869	.747	4.62	.605	
	PH	.847	.873	4.79	.457	
	LS	.747	.713	4.42	.725	
PRAC_2	CHATTING	.893	.865	4.23	.791	.639
	SURFING	.810	.892	3.87	.984	
	EMAIL	.860	.665	4.54	.632	
PRAC_3	OS	.822	.749	3.92	.946	.773
	PG	.803	.662	3.43	1.250	
	S_&_M	.785	.705	4.22	.955	

Next the construct validity was calculated by the factor analysis. Where the ***Principlal Component Analysis*** with ***Varimax*** rotation has been applied due to minimizes the number of variables with extreme loadings on a factor which makes it possible to identify a variable with a factor. After using the rotated component matrix, it has been assured that variables are load onto factors. ***Convergent validity*** means that the variables with in a

single factor are highly correlated. This is evident by the ***factor loadings*** in table. The rotated component matrix (value given in Table 6.7.2) shows a very clean factors structure as all the factor structure as all the factor loading are above and all items are loaded onto single factor only.

Communalities if the items also have been assessed (See table 6.7.2). Communality means the extent to which an item correlates with all other items that indicate higher communalities are better. If communalities for a particular variable is low (between 0-.4), then that variable may struggle to lead significantly on any factor. Results showed in the table 6.7.2 represents that, communalities of all items are above 0.5 without CRP_2, CRP_6 ARP_3, ARP_5 and EP_4 variables. So, the values of communalities are more than 0.5 estimates that all items have pretty good quality of influence in all.

Discriminant Validity refers to the extent to which factors are distinct and uncorrelated. The rule is that the variable should relate more strongly to their own factor than to another factor. There are two primary methods that help to determines discriminant validity. The first method is to examine the rotated component matrix. Variables should load significantly only on one factor. According to the first method, factor analysis has been done by a trial and error process as there was cross loadings. Then some items were removed because they were not loaded onto same factor with other items. Rest of the loaded onto only one factor which assured the discriminant validity.

Another method for testing validity is to examine the factor correlation matrix and correlations between the key strategic factors should not exceed 0.9 (Kenneth, 1988). Following this method, table 6.7.1 presented that all of the correlation values between factors are below 0.9 which also provide support for discriminant validity.

Overall, according to the evidence of reliability, convergent validity and discriminant

validity the measurement model was believed to be appropriate.

6.5.2.1 ***Model Fit:***In this phase, a confirmatory factor analysis (CFA) using AMOS 21 was conducted to evaluate the model fit. The fit of the model was evaluated based on several fit indices. The fit of the model was considered from not only absolute model fit but also incremental model fit. Incremental fit indices, also known as comparative (Miles and Shevlin, 2007) or relative fit indices (McDonaldand Ho, 2002), are a group of indices that do not use the chi-square in its raw form but compare the chi square value to a baseline model. At first the author determined the absolute model fit in below

Absolute Model Fit: Absolute fit indices determine how well and a prior model fits the sample data (McDonald and Ho, 2002) and demonstrates which proposed model has the most superior fit.Included in this category are the ***Chi-Squared tests, DF, P value, RMSEA, GFI, AGFI, and the RMR.***

Table 6.7.3: Results of the Absolute Model Fit

X^2	DF	X^2/DF	P value	RMSEA	GFI	AGFI	RMR
102.401	21	4.96	.000	.052	.924	.822	.036

The Chi-Square value (X^2) is the traditional measure for evaluating overall model fit and, 'assesses the magnitude of discrepancy between the sample and fitted covariance's matrices' (Hu and Bentler, 1999). Table 6.7.3 shows that, the chi-square is 102.401 (DF= 21, P<0.01).In absolute model fit, P value should be less than 0.01. In this table the P value is 0.000, so, this model is better fit according to P value indicator.

The RMSEA is the second fit statistic reported in the LISREL program and was first developed by Steiger and Lind (1980, cited in Steiger, 1990).The RMSEA tells us how well the model and its cut-off points have been reduced considerably on the last fifteen years. More recently, a cut-off value close to .06 (Hu and Bentler, 1990) on a stringent upper limit of .08 (Steiger, 2007). Table 6.7.3 represents that the RMSEA value is .052

(smaller than .08) which means a good model fit.

The Goodness-of-Fit statistic (GFI) was created by Jöreskog and Sorbom as an alternative to the Chi-Square test and calculates the proportion of variance that is accounted for by the estimated population covariance (Tabachnick and Fidell, 2007). According to Diamantopoulos and Siguaw, 2000 the ranges for GFI and AGFI from 0 to 1 with larger samples increasing its value. The results showed in the table 6.7.3 indicate that the value of both GFI and AGFI are larger than 0.800 that measures a reasonable fit of the model. On the other hand, the lower RMR (0.036) and RMSEA indicate a better fit of the model.

Incremental Model Fit: This model is known as comparative (Miles and Shevlin, 2007) or relative fit indices (McDonaldand Ho, 2002) and use only ***NFI***, ***TLI*** and ***CFI*** rather than ***Chi-square.***

Table 6.7.4: Results of Incremental Model Fit

NFI	CFI	TLI
.787	.799	.865

Values for ***NFI***, ***CFI*** and ***TLI*** range between 0 and 1 with Bentler and Bonnet, 1980 recommending values greater than 0.09 indicating a good fit. Most recent suggestions state that the cut-off criteria should be ≥ 0.95 (Hu and Bentler, 1999). The following table shows that values for ***NFI, CFI*** and ***TLI*** are close to 0.80 and only ***TLI*** is less close to 0.90. These all results states that this model should be considered and reasonable fit.

According to the fit indices from ***CFI***, the model provided evidence of satisfactory fit. Therefore, the fit measure of the model suggested also satisfactory fit.

In addition to model fit, two other properties of the scales such as composite reliability and convergent validity were examined. The standardized factor loadings, item errors, ***Composite Reliability (CR)*** and ***Average Variance Extracted (AVE)*** are presented in table

6.7.5. The ***CR*** and ***AVE*** have been calculated using the following formulas:

CR = $(\sum\ )^2 / [(\sum\ )^2 + \sum(1 - \ ^2)]$

AVE = $\sum\chi 2 / [(\sum\chi\ ^2 + \sum\ (1-\chi^2)]$

χ = standardized factor loading, (1-χ2) = item error

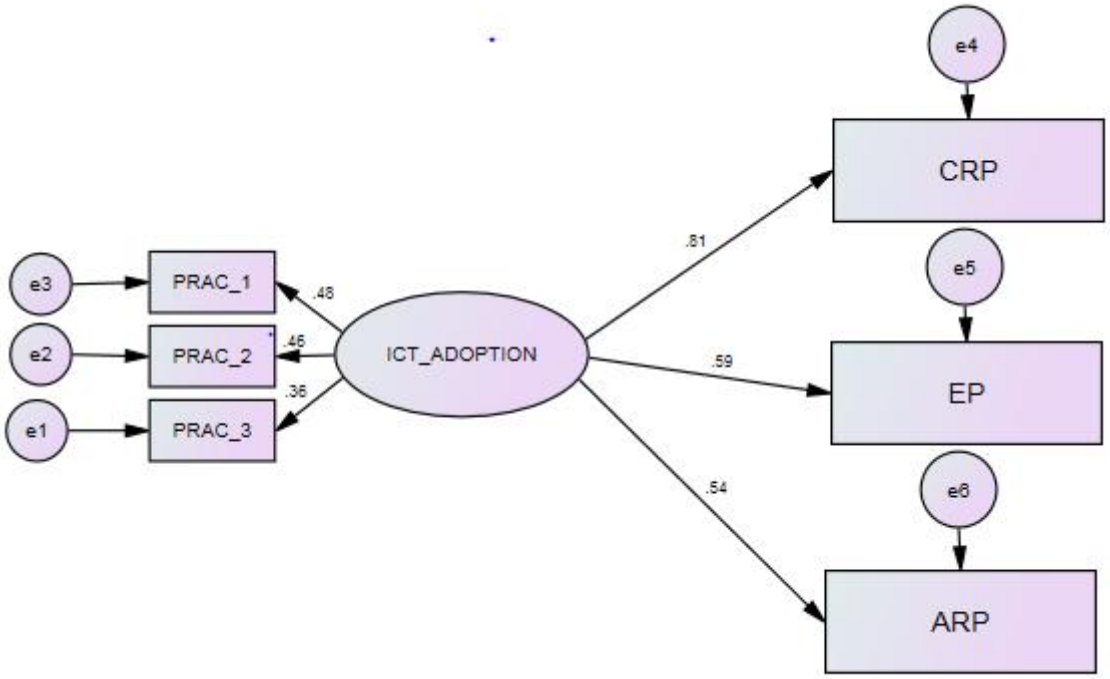
Table 6.7.5: Factor Loadings, CR and AVE

Constructs	**Item**	**Standardized factor loadings**	**Item errors**	**CR**	**AVE**
CRP	CRP_1	.756	.428	.907	.620
	CRP_3	.864	.253		
	CRP_4	.753	.432		
	CRP_5	.815	.335		
	CRP_7	.741	.450		
	CRP_8	.787	.380		
EP	EP_1	.661	.563	.810	.591
	EP_2	.879	.227		
	EP_3	.751	.435		
ARP	ARP_1	.780	.391	.830	.622
	ARP_2	.896	.197		
	ARP_4	.675	.544		
PRAC_1	SP	.721	.480	.847	.581
	PL	.705	.502		
	PH	.830	.311		
	LS	.787	.380		
PRAC_2	CHATTING	.748	.440	.846	.650
	SURFING	.788	.379		
	EMAIL	.876	.232		

PRAC_3	OS PG S_&_M	.731 .805 .830	.465 .352 .311	.832	.623

According to Bagozzi & Yi (1998), the cut off value is .60 for CR and .50 for AVE (Fornell & Larcker, 1981). As presented in table 6.6.5, all CR values exceeded the recommended cut off value. Again table 6.7.5 shows that AVE values also exceeded the cutoff point .50. So, composite reliability and convergent validity also have been provided the evident of acceptance of the Model.

6.5.2.2 *Testing Hypothesis*: After the model was found to be acceptable by examining the model fit indices, the proposed hypotheses were tested using Structural Equation Modeling (SEM) technique with maximum likelihood estimation. The results of path analysis are depicted in Figure 6.2.



P<.01 level (two-tailed), numbers on path indicate structural coefficients.

Figure 6.2: Path Analysis
Source: AMOS graphics

Within the overall model, the estimates of the structural coefficients provide the basis for testing the proposed hypotheses. Hypotheses are tested by examining the significance level, direction and magnitude of the standardized estimates of paths that link independent variables with the dependent variable. The summarized results are presented in table 6.7.6

Table 6.7.6: Results of Path Analysis

Hypothesis	Estimates	P value	S.E.	C.R.	Result
H_1: IT ADOPTION → CRP	.81	***	.355	1.23	**Accepted**
H_2: IT ADOPTION → EP	.59	***	.187	2.32	**Accepted**
H_3: IT ADOPTION → ARP	.54	***	.351	3.8	**Accepted**

Source: AMOS output by analyzing primary data

The result shows that, the estimate value for practices of ICT in classroom performance is .81 and p value is less than .01 with standard error .355 and critical ratio 1.23. This means there is a positive significant relationship found between practices of ICT in study purpose and classroom performance. The p value is *** (000) which means this relationship is significant at level of .01.

The result shows that, the estimate value for practices of ICT in social media and examination performance is .59 and p value is less than .01 with standard error .187 and critical ratio 2.32. This means there is a positive significant relationship found between practices of ICT in social media purpose and examination performance. The p value is *** (000) which means this relationship is significant at level of .01.

The result shows that, the estimate value for practices of ICT in entertainment purpose and academic result performance is .54 and p value is less than .01 with standard error .351 and critical ratio 3.8. This means there is a positive significant relationship found between

practices of ICT in study purpose and classroom performance. The p value is *** (000) which means this relationship is significant at level of .01.

Findings from Hypothesis Test: The hypothesized relationships between practices of ICT in different purpose and classroom performance, examination performance and academic result performance are significant al .01 levels. The directional relationships between them are statistically established (Figure 6.2 and Table 6.7.6). So, $H_{1,}$ H_2 and H_3 hypotheses are accepted at the .01 level. Finally, this study concludes that (based on students' opinion) practices of ICT at educational institution has direct impact on the quality of education (class room performance, examination performance and academic result performance.

6.6 Summary:

This chapter mainly followed quantitative analysis with all pretest to ensure statically accepted. In first section demographic profile of the respondents were presented to understand the characteristics of the respondents. In second section, data reliability analysis has been completed, then factors analysis (EFA) has been completed to find most influential factors as a pretest to hypothesis test. Again all the steps of model fitness test were completed then path analysis were completed and hypothesis were tested for students' opinion and teachers opinion by using SEM. Finally, chapter end with the hypothesis test and conclude that all the tested hypothesis (alternative) were accepted.

CHAPTER SEVEN

QUALITATIVE DATA ANALYSIS AND FINDINGS

CHAPTER SEVEN

QUALITATIVE DATA ANALYSIS AND FINDINGS

7.0 Introduction

This chapter discussed about the qualitative data collection, presentation and findings based on the objectives of the study. This chapter is designed to analyze the descriptive findings supplying relevant theory and propositions. These theories and propositions are reviewed and organized in (Chapter Two) for developing various perspectives on the practices and implementation of ICT for improving quality of education at universities of Bangladesh. In organizing this chapter, two issues were considered. First one is the theoretical discussion about the model and propositions in (chapter Two) and the other is the chronological order of the comparative case study. The former is used to divide this chapter into different sections and later is applied within each section. Thus, within each section the reader can see both the theory and comparative picture of the data relating to that theory. In order to simplify the presentations, attempts are made, in most cases, to develop a matrix containing theory and data. Each of the matrices is discussed in detail considering magnitude of the data. The analysis of the data presented on the basis of magnitude. There are five types of outcome are: ***Not sufficient, Natural or Usual, Reasonable, Satisfactory and up to the mark.***

Chapter categories into three section, first section discussed about the practices of ICT in the organization (University). Second section discussed about practices and need ofICT in the external environment (Business Organization), and finally third section discussed about the impact of practices of ICT in higher education.

7.1 Data collection method and instrument

This study has been conducted based on mixed method, quantitative as well as qualitative method. In case of qualitative method, FGD and in-depth interview were conducted on alumni and employers respectively. Guideline questionnaire were used to collect necessary data through in-depth interview and focus group discussion (FGD). Consequently, collected data were presented in relation with theories of ICT practices and implementation.

7.2 Practices of ICT in the organization (University)

This section describes and analyses the descriptive findings on the practices of ICT in the universities of Bangladesh. What is ICT and ICT infrastructure, what type of ICT infrastructure required in the education institutions, how it supportive in improving quality education in the organization? The discussion in this section begins with the alumni attitudes on practices of ICT (7.2.1 and 7.2.2) and followed by employers' comments on practices of ICT in the education institution (7.2.3).

7.2.1 Alumni's comments on practices of ICT

ICT infrastructure:

It is an important issue for improvement of quality education at university level in developed as developing country. As students are competing with each other globally one of the alumni of SUSTpractices of ICT is increasing day by day.

Md. Mizanur Rahaman, an alumnus of SUST, said that

> *"When I was a student of this university, I found a lab with a good number of computer and with high speed internet. University also ensured a broadband line, for this reason, we could access the journal around the world and we could download the articles using our ID. I think the ICT infrastructure of SUST is excellent".*

Another alumnus of SUST, Fatema Farjana Honey, viewed differently. She opined that

> *"As my session was 2005-2006, we have a bit generation gap with Mr. Mizan. In our time, we found few computers active in university lab. We had to compete with other students to sit in lab and to use the computers. There was a central lab for browsing, but computers were not up-to-date. For booking, the process was lengthy and time consuming. So, in my time, IT infrastructure was not Reasonable."*

Sanjida , another alumnus of leading university, added that

> *"There was no separate departmental lab in our time. We worked in the computer science lab and university central lab. There was no broadband internet connection in our campus and we would depend on the commercial cafe outside the campus." Initially the infrastructure was not good but now is good."*

Students' Knowledge of ICT:

Mr. Ariful Islamalumnus of Dhaka University said:

> *"Actually I started using technology long before entering into university. While I am entering into university, I had sound knowledge about Microsoft word, operating system and other software related to games, internet browsing etc. But while I am leaving university, I have achieved a lot from department, especially in Microsoft excel, and we have a course on this. Now it helps me a lot while I am teaching my students. As well as, I learned about SPSS software which really helps me to undertake my research. So I am really grateful to my department for enriching my knowledge."*

On that point,Fatema Farjana Honey of SUST alumni, added that the previous knowledge of ICT is important for the students to match with the curriculum of public university.

Without previous ICT knowledge, it is difficult to make assignment and power point slide.As much as I learned about excel and database, it was not enough. We did not learn any research software.

On the other hand, Saiful Karim of Daffodil university alumni said:

> *"I started using computer before entering into university. Previously, I could only work on Microsoft word. Later, I had to learn Microsoft excel, power point and other software which are useful for my career." The knowledge of ICT helps the students to make term paper and other useful project works."*

Teachers' Knowledge of ICT:

Teachers' Knowledge of ICT is also important for improving practices of ICT in education institution. Talking about this, Mizanur Rahaman said "I only know of the teachers who took our classes. There were some teachers who had good knowledge about ICT, especially who taught us some courses like Introduction to computer, Microsoft excel and research methodology. Some of the teachers with whom I am working right now, they have really good knowledge about ICT. I am not aware of the all faculty members."

Mr. Morshed alumnus of Dhaka university said:

> *"In our time there were resource constraint. Teachers had a good knowledge of technology and they tried to teach us."*

Arnob paul, alumnus of Leading university opined that We had two dedicated course towards ICT. One is Introduction to Computer and another is Database Management System which is offered from Computer Science and Engineer Department as minor course. Some of our teachers used to take classes using projectors. But I am not aware of the technical knowledge of all the teachers."

Use of ICT at Classroom Activities:

ICT played a very imperative role to increase the performance of classroom in higher education level. In that issues, Fatema Rashid Saba said:

> *"Some of the faculty members always used power point to conduct the class, many of them used excel, SPSS in class, when necessary."*

On that point, Fatema Farjana Honey, added that "Our presentation was covered by projector and power point slide. We did not feel the need for a projector in all classes." Fatema Rashid Saba said that "Not all of the teachers usually used ICT in classroom activities. Very few of them used power point but we received class materials via email."

Use of ICT for Learning and align with the Curriculum Development

With the availability of the Internet, the dependence on ICT for learning was increasing. considering this issue, Mr. Mizanur Rahaman said:

> *"while I am preparing my internship report of BBA and thesis report of MBA, ICT helped me a lot. I used to help with various YouTube channels and online courses when writing my reports. For any kind of latest information, I relied on Goggle."*

Mr. Manik, alumnus of Dhaka University said:

"University courses are now designed in a way where there is no alternative to ICT. "

Fatema Rashid Saba said that "With the availability of the Internet, the dependence on ICT for learning was increasing."

Speaking about this, Suborna Suheli, alumnus of leading university said,

> *"We have several courses related with ICT in our department like Introduction to Computer, Management Information System, and Database Management System etc. I think these courses are not enough. More ICT related courses should be included in our curriculum."*

Rakib, alumnus of Daffodil International university went on to highlight the importance of the matter, "Our courses should be such that they will be useful to us in real life." Fatema

Rashid Saba added with his words, “In our time, we had very few opportunities to learn software. Perhaps our teachers were not too keen on teaching.”

Use of ICT for Exam Controlling:

Mizanur Rahaman said, “I did not see any use of ICT in our exam controlling.” Fatema Farjana Honey agreed with the statement of previous alumni, “There was no application of ICT in our exam controlling.”

On that point, Fatema Rashid Saba said, “I can remember one thing, in our time, someone is caught when he was copying in exam. At that time, photograph of answer script was taken as a part of documentation.”

Another alumnus Dhaka university said:

> *“Examination performance also increased within the las few years, Now the university all documentation like, admission, registration, e-filing is performed as a part of technological application in exam process.”*

Use of ICT for Accessing Key Information of Students, Teachers, and Employees:

On that point, Mukul alumnus of SUST said:

> *“Our University collected some information about students by using ICT. We had separate email address for each student. While we try to open this account, we have to provide some information about ourselves. So it is a way for collecting our information. Teachers and employees also have an option to open their email address. They also provide the information to open the account. The controller of exam office preserves all information by using ICT. Now our university has opened a satisfactory system, we can withdraw our transcript by using our university website. For this reason, we need not go to university. So it is a satisfactory initiative.”*

Sanjidasaid:

"So far I know, university must have a database that keeps all records of students, teachers, and employees."

Saiful Karim of Daffodil University alumni said:

"I never had to visit the university database after passing through the university. But I have noticed a website of university where the basic information of teachers is available".

Training Facilities for Using ICT:

Speaking about this, Mizanur Rahaman said, "Actually our teacher helped us to learn about how to use technology. Along with that I got seven days long formal training facilities about using technology in research from 'SUST Research Center'." Fatema Farjana Honey said, "I did a personal course on Microsoft office." Fatema Rashid Saba viewed differently, "I cannot remember anything like this."

Availability of CAN to Access E-resources:

Accessing e-resources is one of the important platform for better practicing ICT for improving quality of education at university level. One of alumnus of explained in following way:

"In my time there was available of campus area network to access E-resources. I used my laptop to download necessary articles from reputed journals like Springer, Emerald, Wiley, Sage by using internet at free of cost. I have my few friends studied in different universities where they have not such types of facilities."

Masudur Rahman, alumnus of SUST explained:

"There was no such campus area network in our time. But in the end of our period, the broadband connection wasstarted, but now we have e-library where our students are accessing e-resources and few other facilities".

Ethical Application of ICT for Quality Education:

Ethical practice is very important in case of any type system application. Fatema Farjana Honey said:

> *"Ethical application of ICT plays a role in the development of quality education."*
>
> *Fatema Rashid Sabastated in similar way.*

University is emphasizing on using ICT, so this organization is developing their IT infrastructure. When students are admitted to university, their knowledge of ICT is low, but their ICT knowledge will be high while they come out. The teachers are playing a role in increasing the ICT knowledge of the students. The uses of ICT in the classroom is increasing. Both students and teachers are now relying on ICT for learning. The curriculum of the university is also adding a lot of ICT related subjects. Universities should use more ICTs to increase transparency in exam controlling. Employees should be given more ICT related training to better understand the use of ICT. Right now students are able to access e-resources easily because the campus area network is available. Universities should put more emphasis on ethical application of ICT to ensure quality education.

The following table the qualitative findings relate to practices of ICT at public and private universities in Bangladesh based on the FGDs with alumni.

Table –7.1: Practices of ICT in Organization (University)

Dimensions	Private Universities	Public Universities
IT Infrastructure	Up to the mark	Satisfactory
Students' knowledge of ICT	Satisfactory	Satisfactory
Teachers' knowledge of ICT	Satisfactory	Reasonable
Use of ICT at class room activities	Reasonable	Not sufficient
Use of ICT for Learning	Reasonable	Reasonable
ICT align with the Curriculum Development	Satisfactory	Satisfactory
Use of ICT for exam controlling	Satisfactory	Satisfactory
Use of ICT for accessing key information of students, teacher, and employees of the universities	Satisfactory	Satisfactory

Training facilities for using ICT	Satisfactory	Satisfactory
Availability of CAN to access E-resources	Not sufficient	Reasonable

* Some cases reasonable and some cases satisfactory

** Some cases satisfactory and some cases up to the mark

7.2.2 Alumni comments on Practices of ICT in External Environment (Business Organization)

Though alumni learned ICT practices in their institutions, now they practice ICT in their employed organization. Again what will be the performance of individual mainly depends on organization's requirements, ICT practicing nature in the organization and individual's capability. The following statements are actually what level of ICT practices in the business organization in context of Bangladesh.

Mizanur Rahaman, lecturer of Northeast University said,

"IT infrastructure is excellent in my current organization. They have separate internet line for teachers as well as separate email address. We are using ICT in our official purpose. Along with that, our university has a library where faculties can access online journal. There is a lot of ICT practice, especially when taking classes, preparing examination result etc."

Milton of Airtel, explained:

> *"almost all activates we have performed based on ICT. Because of my previous knowledge I got few advantages in case of using ICT."*

Another alumni and employee of DBBL stated in following way:

> *"Employees are good at technology. At the time of work, we help each other. Another important thing we have received on the job as well as off the job training for smooth operations of the organization. Consequently, all employees have standard knowledge for using ICT.Few employees frequently work using ICT.*

Those who are not yet using ICT are also trying to be an expert in ICT. Practically every employeebound to implement their knowledge in doing their specified job."

One employee Trust Bank and alumnus of SUST said,

"The management of the organization is trying to introduce a new and updated systems with technology. As the market is very much competitive, management is very concern about new technology and its fair practices."

Fatema Farjana Honey, Assistant professor ofNortheast University explained:

"Our operational activities are mostly ICT-based. While I contact with the section of controller of examination, I use email and they do respond quickly. We use multimedia projector in our classroom.Almost every sphere of operational activities, the application of ICT is seen. We have an updated website."

Rakib employee of DBBL explained:

"Our bank is using ICT for marketing activities Bankis currently focusing on web marketing, F-marketing. Authority produces separate advertisement through SMS, targeted email, spam email and also Facebook marketing.In this competitive era, digital marketing is important. So, our bankis emphasizing on digital marketing. He also added "Our every information is disseminated to the stakeholders through online."

Manik employee of DBBL and alumnus of Dhaka University said:

"Our attendance systems, provident fund management, payroll systems policy etc. is maintained through ICT.The practice of ICT is commonly seen in Recruitment, selection, promotion, training, and compensation related activities. Again, all

students' payment and received record of different transaction is maintained through ICT."

Milton, employee of Airtel stated about the CRM and SCM technology in following way:

"Our organization directly depends on CRM and SCM for ensuring success of the organization. ICT is full practiced in case of CRM and SCM practices to convinced customer and supplier. SMS, voice call, and email are frequently used for CRM and SCM"

Allmost all alumni focused on the practices ICT for decision making purposes. Another employeeof the trustbank explained the role of ICT in their bank in following way:

"I can say that top management, mid-level management and even operational level manager's practices ICT regarding decision making like for promotion, upgradation, recruitment, selection, performance appraisal etc."

Almost all the organizations are now moving forward with plans for advanced IT infrastructure. Both employees and management need to know about IT in order to survive this time of competition. Although everyone uses ICT in operational and marketing activities, the practice of ICT should be made more in HR, and accounts and finance activities. There is a widespread use of ICT in building relationships with the customer, but in the case of supply chain management, the use of ICT is less. This practices emergence creates a needs for supplier (University) to deliver quality output based on ICT knowledgeable.

Table – 7.2: Practices of ICT in External Environment (Business Organization)

(FGD with Alumni)

Dimensions	**Alumni**
IT Infrastructure	Up to the mark
Employees' knowledge of ICT	Satisfactory
Management's knowledge of ICT	Satisfactory
ICT at operational activities	Satisfactory
ICT at marketing activities	Satisfactory
ICT at HR activities	Satisfactory

ICT at accounts and finance	Reasonable
ICT for CRM and SCM	Reasonable *
Use of ICT for decision making	Reasonable

* Some cases reasonable and some cases satisfactory

** Some cases satisfactory and some cases up to the mark

7.2.3 Employers' comments on Practices of ICT in External Environment (Business Organization)

One of the employer of the Northeast university Prof. Dr. Tofayel Ahmed said:

> *"There is no alternative to an advanced IT infrastructure to address this century's challenges. So we have been practicing advanced technology to create a developed IT infrastructure from our inception. We look at our employees' ICT knowledge well when we recruit our employees. From my observation, I can say, our employees give priority to ICT practice at work."*

Another employer Mr. Shahjalal of Airtel explained:

> *"Top Management always emphasizes on ICT practice in every cases. As we have no alternative option to practice ICT in telecom industry, so we have to care about effective practices of ICT. We have used ICT in operational, decisional, financial activities of the firm. Our marketing activities also practiced based on ICT methods or tools."*

One of the employer of the Dhaka Bank explained ICT role in HR activities:

> *"Our human resource management activities are fully ICT dependent. We have already practiced E-recruitment. Actually we have practiced Human Resources Information Systems (HRIS)."*

Another employer of Trust bank explained the role of ICT in Accounts and Finance by following statements:

"As our organization performing banking activates, we have always dealt with financial activities. We have been using technology for our accounts and finance activities. Again we have CRM dealing with ICT based systems."

He also explained:

"We take the help of ICT to scrutinize information when making decisions."

Organizations are working to improve their IT infrastructure in order to achieve rapid success. Everyone, including employees and management, is now practicing ICT for the benefit of their work. Due to the use of technology, operational and marketing activity have reduced costs and are reaching everywhere at the fastest time. The practices of technology in HR activity is still very low that must be increased. The accounts and finance department is now getting more modern is offering online services. ICT is being practiced in various types of decisions, such as promotion and punishment related decisions.

Table – 7.3: Practices of ICT in External Environment (Business Organization)

(In-depth Interview with Employers)

Dimensions	**Employers**
IT Infrastructure	Up to the mark
Employees' knowledge of ICT	Satisfactory
Management's knowledge of ICT	Up to the mark
ICT at operational activities	Up to the mark
ICT at marketing activities	Satisfactory
ICT at HR activities	Satisfactory
ICT at accounts and finance	Satisfactory
ICT for CRM and SCM	Satisfactory
Use of ICT for decision making	Reasonable*

* Some cases reasonable and some cases satisfactory

** Some cases satisfactory and some cases up to the mark

7.3 Impact of ICT on quality education

This section describes and analyses the descriptive findings on the impact of ICT on quality education in the universities of Bangladesh. What type of role actually played ICT in improving quality of education? The discussion in this section begins with the alumni attitudes on impact of ICT on Quality Education in the Organization (University) (7.3.1) and followed by employers' comments on impact of ICT on Quality Education in the external environment (7.3.2).

7.3.1 Alumni comments on Impact of ICT on Quality Education in the Organization (University)

Teaching Process:

Literature showed ICT played a very important role in improving quality of education. One of the alumnus of SUST explained role of ICT in quality education in following way:

> *"ICT have good impact on my teaching process. Having a good idea about ICT has made it easier for me to take classes. Using ICT can cover a lot of things. Taking the class with the projector makes things clear to the students. It plays an important role in making the classroom participative. It has significant impact on teaching learning environment."*

Exam Process:

Rakib explained the role of ICT in exam process by his following statement:

> "ICT is used in all aspects of examination process. In my university, from course registration to result publications all things actually performed with ICT. The use of ICT in the exam process has greatly improved the quality of exam process. But, few private universities some exam process are performed manually. This process has direct impact on quality education.

Interactive Class:

One of the alumnus of Dhaka University stated for taking a spontaneous benefit on the class room performance, it is very important that class room should be interactive. He stated:

> *"Without using ICT, interactive class is not possible while interactive classes are much more important for quality education. Students can easily learn from the Power point presentations and using ICT in the class, we can make that class interactive easily."*

Another alumnus said that ICT in the class room has a significant impact to yield an interactive class.

Learning Process

Another alumnus of SUST explained the role of ICT in learning process in following way:

> *"Right now I am conducting several research using different technology such as AMOS, SmartPLS etc. I take help for learning from Khan Academy, YouTube etc. Again, Since the syllabus of the university level is not limited, we cannot continue our learning without the help of ICT."*

Exam Preparation:

Almost all the alumni focused on the issues that in the present world it is very important to prepared yourself for facing a challenges. ICT can be a method for solving instantaneous

problems. Internet help to learners to learn new things related to exam.Learners enrich their study materials with the help of ICT

Job Market Entry:

Mr. Masud, alumnus of Dhaka University, explained the role of ICT to enter into the job market by following way:

> *"With the consideration of our batch or immediate junior batch, most of the student get advantages in job market only they have prior knowledge of ICT. One of my friend got a lucrative position in Grameen Phone because he has extra certificate of IT from Aptech. Now, Employers clearly mention the required ICT skill in job circular, so there is no alternative to ICT skill for getting job and it has noteworthy impact on job market entry."*

Advance Research Works:

Another alumnus of SUST said:

> *"Right now every researcher depends on ICT for reading articles from reputed journal. ICT is used for collecting and analyzing data. Now a days, advance research work is completely based on ICT. From paper submission to referencing, everything we do by using ICT."*

Fatema Rashid Saba said, "Almost every researcher take help from ICT for drafting their research work."

She also commented that they can constantly developing their career with the help of ICT and they are surviving in this competitive era by using ICT. So ICT has very significant impact on research works and also on career development.

Innovative Capability:

> *Alumnus of Daffodil University explained the role of ICT in improving innovating capability, "PracticingICT in the organization has a significant impact on*

developing innovative capability of the students and teachers.Now a days, students are generating innovative ideas by the help of ICT. Again, we are achieving innovative quality which is playing a role in our quality education."

In the teaching process, students are better connected with those who use ICT. IfICT is more widely used in the exam procedure and other related tasks, the exam process will become more transparent.Again, for interactive class, students' participation is imperative where ICT can played a significant role. It is now possible to connect students and teachers more than ever with the help of technology. Students and teachers are constantly learning something new for the sake of technology. Employers prefer to hire only those who know the best use of ICT. Those interested in doing advanced research should know better about ICT. Many people are gaining innovative capability through technology.

The following table (7.4) shows the findings related to impact of practicing ICT for improving quality of education (based on the qualitative study through FGD with alumni).

Table -7.4: Impact of ICT on Quality Education (FGD with Alumni)

Dimensions	**Alumni**
Teaching Process	Significant
Exam Process	Moderate
Interactive Class	Significant
Students and teachers' engagement	Moderate
Learning process	Moderate
Exam preparation	Moderate
Job market entry	Significant
Advance research works	Significant
Career development	Very Significant

Innovative capability	Significant
Operational Performance of the employees	Very Significant
Support to Effective Decision Making	Significant

7.3.2 Employers' comments on the Impact of ICT on Quality Education in the External Environment (Business Organization)

This study found some significant findings in relation with theory from the in-depth interview with the employers of the selected firms. One of the employer of Airtel explained the role of ICT in improving performance of the firm in following way:

> ***"****If you have good knowledge of ICT, everything can be easily learned. Particularly, wherever e-resources are available, we can access them using technology. Those who have good knowledge of ICT have the privilege of entering the job market."*

Again another employer of Trust bank commented on the impact of ICT on quality education by following way:

> *University learning will be quality oriented when it is practical job oriented. We found those are the better employees in the organization, their education background is good and they are diversified knowledgeable. We found they have some ICT related course in the syllabus. Again, those of us who know better about ICT are doing very well in their careers. So ICT has significant impact on quality education."*

One of the employer of DBBL stated the impact of quality education by his following statement:

"In our organization those have previous knowledge about ICT, they are doing well. This knowledge help to the employees to be innovative.Through ICT, I got a lot of innovative ideas and few of them I shared with my superiors."

Again employer of the trust bank ltd. Stated:

"There is no doubt about the role of ICT in improving operational performance in the organization, especially in banking sector of Bangladesh. In the present era we can't think effective operations of the bank without use of ICT. We have minimized per unit operation time through application of ICT. So, ICT has also significant impact on operational performance of the firm.

Prof. Dr. Tofayel Ahmed one of the employer of Northeast University said:

"Using ICT, we can make the right decision at the fastest time."

The impact of ICT in quality education is far-reaching. There are lots of learning content available online now, only those who know the use of technology can learn from there. People need to know better about ICT if they want to get a good job. Knowing ICT can be very supportive for advance research work. Today's career success depends on knowing the best use of ICT. By using ICT in their operational activities, employees are saving both time and cost. Those who are using ICT, they are faster in making effective decision.

The following table (7.5) shows the findings related to impact of practicing ICT for improving quality of education (based on the qualitative study through in-depth interview with employers).

Table -7.5: Impact of ICT on Quality Education (In-depth Interview with Employers)

Dimensions	Employers
Learning process	Very Significant
Job market entry	Significant
Advance research works	Significant
Support to career development	Very Significant
Innovative capability	Moderate
Operational Performance of the employees	Significant
Support to Effective Decision Making	Very Significant

7.4 Summary

This chapter mainly followed qualitative analysis with all methodological procedures to ensure logical acceptance. In first section qualitative data presented mainly focused on the ICT practices in the education institutions and business organization based the data provided by alumni and employers. In second section, data analysis performed based on the data about the impact of ICT on quality education at higher education. In both, step by step process of qualitative data analysis techniques were followed and finally findings were presented in the form of tabular presentations.

Study found (based on the maximum summary comments) practices of ICT has significant on the quality education in the universities of Bangladesh.

CHAPTER EIGHT
FINDINGS AND CONCLUSION

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8.0 Introduction

This section discusses the findings with suggested recommendations related to the factors that show the impact of IT adoption on the higher education in Bangladesh. The implications of the study have also been included. Finally, the limitations, and future scope of the study have been included. In particular,this chapter is divided intothirteen sections. Section 7.1 focuses on the comparison of the demographic profile of both teachers and students. Section 7.2 discusses about the results of computer knowledge of the respondents. Section7.3 to 7.12 show the results of accessibility of the technical equipment, application of ICT, use of internet in learning subjects and various activities, problems in using ICT, time spent by respondents in different online information searching activities, respondent' opinion towards class room performance, examination performance and academic result performance respectively.Section 7.13exhibits the results of hypotheses.

8.1 Demographic Profile of the Respondents

After collecting data from both the teachers and students who are involved in teaching and learning ICT respectively, researcher analyzed the data for preparing result. The demographic profile of the respondents shows that maximum students belong to age group 20-30, whereas only 20 percent's of the teachers are aged between 20 and 30. No students belong to 30 plus age group, but 80 percent's teachers are more than thirty. The result of gender types indicates that the maximum number of the students are male, only forty one percent's are female. On the other hand, sixty five percent's are male teachers and only thirty five percent's are female teachers. This result helps to understand that male persons

are more interested to learn ICT. A good number of students hail from an urban area and more than sixty five percent's teachers are married in their professional life. The results of the learning subjects describe that almost eighty eight students are studying on business and remaining others are studying on science, social sciences and humanities. Only forty teachers are taking classes on Business out of 100 respondents. In the current world of communication, it is really impossible to study ICT without a having computer and internet connection. All teachers whom data have been collected have a desktop or laptop or both. About 19% of the students do not have any desktop or laptop. Development of ICT depends not only on having computers but also on getting technical support. The result of the data analysis shows that almost eighty percent's teachers have the technical support of ICT learning.

8.2 Computer Knowledge of the Respondents

It is really impossible to excel in academic life without having proper knowledge of applying ICT in relevant areas. A good number of respondents have very confident in using both mouse and keyboard. Both the teachers and students have knowledge on customizing desktop environment. They are very confident knowledge on windows installing and updating. To complete the daily necessary activities, it is essential to gather much knowledge on Microsoft Office. This analysis shows that the maximum number of respondents has much more knowledge on Microsoft word, Excel and Power Point. Both the teachers and students have some sort of lacking on gathering knowledge on web designing.

8.3Accessibility of the Technical Equipment

Enhancing the accessibilities of technical equipment is really essential for improving ICT sector in Bangladesh. Using technological system depends on having personal computer or

using computers in the lab of educational institution. Using interactive whiteboard is not the proper way to get knowledge on technology. Instead, personal computer and multimedia projectors aremuch more significant. The results imply that the maximum respondents got free access of personal computer. For enlarging communication purpose, video conferencing is mostly used in today's world. Almost 60% report that these systems are not accessible in their educational institution. Similar results has also been found from learning management systems, audio equipment, digital photo cameras and digital video cameras etc. Mobile phone is not enough to get all ICT services. The maximum respondents do not have access power in projection systems.

8.4Application of ICT

Providing facilities of information technology to teaching in the real fields are critically important. About 18% of the respondents agree with the statement that their teacher always use ICT during their lecture time. Nonetheless, majority of the respondents (about 73%) reports that their teachers useICT sometimes and others never use ICT in classroom lectures.

8.5Respondent's Opinion towards ICT

For improving technological sector, it is essential to increase students' knowledge on ICT through providing different kinds of ICT facilities in their educational institutions. They have to learn and use ICT smartly. Almost 70% of the students strongly agree with the statement that teachers should use ICT during lectures. Students want that their syllabus should be designed to support in developing ICT.For knowledge-based development of the technical side of education, students should use ICT for learning purpose. Almost 33% of the respondents agree that getting information using ICT is better than thatof using print materials and books.

8.6Use of Internet in Learning Subject

Among all respondents, more than sixty percent's uses internet during their learning session. Therefore, almost forty percent always use internet and only approximately one percent never use internet in their learning time. Using internet in their learning time will be helpful to get development in the ICT sector.

8. 7 Use of Internet in various activities

Utilization of internet is not only necessary for study, but also essential for various types of activities such as chatting, surfing, sending e-mail, preparing assignments and presentation for any purpose, online shopping, playing games, hearing songs and watching movies. Almost 50% percent's of the respondents suggest that both teachers and students use internet in their study. Forty percent's students strongly agree that they use ICT for chatting. Majority of the respondents strongly agree with the statement that they use ICT for surfing, sending e-mail, preparing assignment and presentation, online shopping, playing games, hearing songs and watching movies. This result also indicate that teachers have no time to use internet other than learning purpose. They use internet mostly for sending email purpose. For making learning effective, they have to use internet in examining knowledge. They do not spent lots of time in Online shopping, playing games and hearing songs and watching movies.

8.8Problems in Using ICT

Respondents faced various problems of using ICT for different activities. The most serious one is that there is an inadequate provision of personal computers (PCs). It is a fact that without having personal computer,it is really difficult to exploit knowledge from the internet. Respondents do not get enough time to use e-resources in their study purpose. Speed of internet is another essential factor along with slow internet connection. Most of

the time, both teachers and students use ICT in library and they are suffering from lack of access to printers in library. Some other factors also induce problems in using ICT. These can be referred to as frequent electricity failure, unwillingness of library staff for help, lack of support from IT staff, lack of knowledge accessing e-resources and online resources and last but not least is lack of knowledge in advance searching.

8.9 Time Spent by Respondents in Different Online Information Searching Activities

Respondents reportthat they spend numerous times on various kinds of online information searching activities. About 47% students spend one to maximum three hours on online browsing, whereas about 35% of the teachers spend one to three hours on online browsing. Scanning journals is significant way to enhance knowledge and almost twenty five percent of the teachersspend less than one hour for scanning journals in internet but approximately seventy six percent's students spend less than one hour for scanning journals in internet. Both students and teachers spend lots of time on chatting with their friends. Downloading article is one of the significant activities for students to complete their higher studies and for this they take help from internet and spend lots of their valuable time. Though it is a significant work for studying, 69.8 percent spend less than one hour, while 15.0 percent teachers spend less than one hour. Almost forty three percent students and thirty percent teachers spend one to three hours and four to seven hours, respectively for internet surfing. They also spend some valuable times for reading emails in using internet.

8.10Respondent's opinion towards Classroom Performance

For improving class room performance in the contemporary world, ICT plays a significant role. Application of ICT have really a great impact on teaching process. Almost 69% students strongly agree with the statement, whereas 35% teachers strongly agree with same. ICT also helps to accelerate learning process. A good number of students who strongly agree with the statement are really more than that of number of teachers. In the

learning process, presentation skill is essential for both teachers and students. Use of ICT plays a significant role on improving both presentation and communication skills of the teachers. Nearly40% respondents pronounce that teachers generate meaningful learning experiences through ICT. As a result of using ICT, both teachers and students can enjoy their teaching. About 50% students believe that ICT enhances teaching environment, while 30% teachers believe the same.

8.11Respondent's opinion towards Examination and Academic Result Performance

As a result of using ICT, students will be benefited to prepare for the examination because ICT helps to do better preparation in examination. Teachers also think that their students get benefited to make a plan and preparation for examination through using available ICT facilities. It is quite interesting to describe that almost similar number of teachers and students strongly agree with the statement that use of ICT helps to get resources for organizing students' examination. In the present world, ICT is being used to a greater extent than library because through ICT library resources can be accessed. About 25% students strongly agree with the statement, whereas the corresponding number of teachers is 30%. Using of ICT is much more convenient for getting information than print materials for the students' examination preparation. A great number of respondents agree that ICT can foster better teaching and improved academic achievement of the students.This analysis represents that respondents are moderately satisfied with the view that ICT helps themto perform greater in the academic fields.

8.12Respondent's opinion towards Academic Result Performance

Academic result and class room performance are not enough to get a good job in today's world.Knowledge of ICT is much more important than academic and other previous performances. For getting a good job now-a-days, students must have the good knowledge on ICT. A great proportion of the student strongly agreewith the opinion that ICT can

foster better teaching and improve academic achievement of the students. About 40% teachers strongly agreewith the opinions that ICT can induce students to get advantages in the job market. Knowledge of ICT opens the job market for graduate students. The result of this study also shows that ICT helps to gain competitive advantage in the job market. This discussion implies that ICT helps a lot to have good preparation for the potential job market.

8.13 Discussion for the Results of Hypotheses

8.13.1 Discussion for the Results of Students

In this section, recorded data from the survey has been presented to answer research questions developed in the previous chapters. For better understanding of the data and the relationships of the variables under investigation, demographic analysis of the data as well as extensive descriptions have been presented. Descriptive statistics normally describes the respondents' samples and their response rates. The preliminary data analysis includes descriptive statistics and composite mean values of estimated variables. Reliability test has been conducted to analyze the data set for further analysis and checked the reliability of the questionnaire. Through applying structural equation modeling, researcher tests the alternative hypotheses of this study. The summary results of the hypotheses that have been generated for students are given in Table 8.1.

Table 8.1: The Summary Results of the Hypotheses (Students)

H_1	ICT adoption is positively related with classroom performance	**Accepted**
H_2	ICT adoption is positively related withexamination performance	**Accepted**
H_3	ICT adoption is positively related with academic result performance	**Accepted**

The first hypothesis states that ICT adoption is positively related with classroom performance in the higher educational level in Bangladesh. The estimated value for variables those are related with class room performance impacting on IT adoption has a statistically significant value .998 ($p<.01$). It means that IT adoption had positive impact on class room performance in the educational sector in Bangladesh. After analyzing the results of structured equation modeling, hypothesis 1 has been accepted for the opinion of students.

The second hypothesis states that ICT adoption is positively related with examination performance in the higher educational level in Bangladesh. The estimated value for variables those are related with examination performance impacting on IT adoption have a statistically significant value .974 ($p<.01$). It implies that IT adoption has had a positive impact on examination performance in the educational sector in Bangladesh. After analyzing the results of structured equation modeling, hypothesis 2 has been accepted for the opinion of students.

The third hypothesis states that ICT adoption is positively related with academic result performance in the higher educational level in Bangladesh. The estimated value for variables those are related with academic result performance impacting on IT adoption have a statistically significant value .919 ($p<.01$). It implies that IT adoption has a positive impact on academic result performance in the educational sector in Bangladesh. After analyzing the results of structured equation modeling, hypothesis 3 has been accepted for the opinion of students.

8.13.2 Discussion for the Results of Teachers

The results of hypotheses have been presented for the teachers of higher educational level in Bangladesh. Before using structured equation modeling, researchers examined both

composite reliability and discriminant validity. The estimated values of generated hypotheses have been shown in Table 8.2 below:

Table 8.2: The Summary Results of the Hypotheses (Teachers)

H_1	ICT adoption is positively related with classroom performance	**Accepted**
H_2	ICT adoption is positively related withexamination	**Accepted**
H_3	ICT adoption is positively related with academic result performance	**Accepted**

The first hypothesis states that ICT adoption is positively related with classroom performance in the higher educational level in Bangladesh. The estimated value for variables those are related with class room performance impacting on IT adoption has a statistically significant with estimated value .81 ($p<.01$) implying that IT adoption has a positive impact on class room performance in the educational sector in Bangladesh. After analyzing the results of structured equation modeling, hypothesis 1 has been accepted for the opinion of teachers.

The second hypothesis states that ICT adoption is positively related with examination performance in the higher educational level in Bangladesh. The estimated value for variables those are related with examination performance impacting on IT adoption had a statistically significant with estimated value .59 ($p<.01$) meaning that IT adoption has a positive impact on examination performance in the educational sector in Bangladesh. Hypothesis 2 has been accepted after explaining structural equation modeling with respect to the opinion of teachers.

The third hypothesis states that ICT adoption is positively related with academic result performance in the higher educational level in Bangladesh. The estimated value for variables those are related with academic result performance impacting on IT adoption have had a statistically significant with estimated value .54 ($p<.01$). This implies that IT adoption has a positive impact on performances in academic results in the educational sector in Bangladesh. After analyzing the results of structured equation modeling, hypothesis 3 has been accepted for the opinion of teachers.

CHAPTER NINE

CONCLUSION AND POLICY RECOMMENDATIONS

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CONCLUSION AND POLICY RECOMMENDATIONS

The overall objective of this study is to assess the impact of ICT on quality education in the university level education in Bangladesh. The main aims arei) to focus on ICT's contribution to enhanced quality in teaching and learning and a broad access to learning materials; ii) to examine the existing relationship between teaching quality and teacher's motivation, intensity of ICT use and performance of student; iii) to identify whether ICT helps to access in broad range of study materials; iv) to draw out a guideline to improve quality of education through ICT application in different disciplines of the university.

The conclusion, policy recommendations, limitations of the study, and future research directions have been discussed in the following subsections.

Conclusions

This section is designed to outline the conclusions that are drawn from this research. On the basis of data description and analysis of these data, the main conclusion of the study is that quality of education will be determined by the performance of ICT within organization (University), and the performance of ICT in the external environment (Business Organization) which depends on practice level of ICT in the university education.

Proposed ICT framework or model consists of three different components, each of which direct relationship with improvement of quality education. The broad proposition of the proposed ICT model discussed and analyzed under three components. Again, each dimension consists of a few other factors which have had a direct impact on individual improvement of that component. The main framework of the model is an interaction among the components and their relationship on the improved practices of ICT.

Based on reviewed literature and proposed model, this study developed three hypotheses which were tested based on collected data. On the basis quantitative data collected from teachers and students from selected sampled organization,It has been found that each of the factors identified earlier has a direct impact on selected dependent variables (class room performance, examination performance, academic result performance) which were determined the quality of education at university level.The hypothesized relationships between practices of ICT in different purpose and classroom performance, examination performance and academic result performance are significant at .01 levels (Table 6.6.6 and 6.7.6)and conclude that practices of ICT have direct and positive impact on quality education. This study also found that practices of ICT are highly positively correlated with class room performance, examination performance, academic result performance which are .0.890, 0.688, and 0.884 based on the teachers' opinion and 0.788, 0.688, and 0.785 based on the students' opinion respectively (Table 6.6.1 and 6.7.1).

On the other hand, qualitative study found based on the FGD with alumni that ICT has substantialimpact on different dimensions of quality education are teaching process, interactive class, job market entry, advance research works, career development, innovative capability, operational performance of the employees, support to effective decision makingwhile in-depth interview with employers found ICT has significant impact on different dimensions of quality education are learning process, job market entry, advance research works, support to career development, operational performance of the employees, and support to effective decision making.

It has been concluded that ICT's contributes directly to enhance quality in teaching and learning. Findings section also reveals that the teaching qualities andteacher's motivation also depend on the intensity of ICT use. Finally, the study has found that ICT directly

supportsto access in broad range of study materials which ultimately improve the quality of education through ICT application in different disciplines of the university.

9.1 Policy Recommendations

The findings of the study have a number of implications for top level executives of the universities those who involved in the key decision-making process of the universities and also for those who are contemplating the ICT application in the institution. However, all these practical implications must he considered in the light of the limitations of the study

i. Findings from this study implies that the universities should undertake proper initiatives to adopt impeccable system of ICT for ensuring quality education at source. From the prevailing literature, it is found that there exists strong and positive associations between ICT and quality education. This study investigates the applications of primarydata to theories are also highly supportive of the stated hypothesis. Hence, existing universities (both public and private) can go for further research to apply those findings tentatively and identify the impact of ICT related factors on enhancing quality education in the context of Bangladesh.

ii. Universities need to focus on developing substantial ICT infrastructure in campus to support the students and teachers' academic and research needs for quality output.

iii. Universities may take necessary steps to control the practices of ICT to mitigate the problems of misuse of application of ICT in higher education (both for students and teachers).

iv. Government may have taken policies to integrate ICT in relevant areas of higher education for administration, class room participation, innovation and academic research to reap the benefits of ICT practice.

9.2 Limitations of the study

The present study like many others has its limitations:

i. Firstly, this study is based on users understanding level about meaning, significance, and application of ICT and multiple realities in which the practices of ICT have taken place. Although the quality education model emerged from theory and data, but the inclusion of higher number of samples may reveal different results.

ii. Secondly, the study is mainlybased on general, agriculture and science and technology universities but has not considered any engineering or medical universities or type of specialized higher institution.

iii. Finally, field work of the study has been conducted mainly based on survey data, FGD and in-depth interview from October 2017 to September 2018. Thus the findings of the study actually is based on the respondents and participants' contributions in that period. As the study has been conducted on the practices of ICT which changes rapidly because of technological innovation, the findings of the study may not be the same afterwards.

9.3 Future Research Directions

On the basis of the findings of this study and also considering its limitations, the researcher can suggest some directions for future research. This will contribute to fair practices of ICT as an area of the study.

i. Firstly, this research has given special attention to the impact of ICT on quality education in the universities of Bangladesh. It leaves open the question of integration of ICT in total education sector. It might measure managerial efficiencies, operational efficiencies and also cost benefit analysis of application of ICT application.

ii. Secondly, this study has conducted on some employers, alumni, students, and teachers at a single point of time (i.e. cross-sectional study) but study may be based on longitudinal study to capture the dynamism of impact of ICT.

iii. Finally, this research has focused on the quality education framework which incorporates organization (University), external environment (Business Organization) and adoption of ICT which have a direct relationship between practices of ICT and quality education. Hence, there emerges possible areas of conducting research on: impact of integration among the factors of ICT on the efficiencies of education systems.

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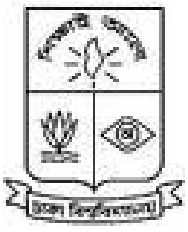
Appendix - A[1]

Sample In-depth Interview Guide

Research Title:
The Impact of ICT on Quality Education at the Universities of Bangladesh: An Empirical Study

Researcher:
Md. Zillur Rahman
Assistant Professor
Department of Business Administration
Shahjalal University of Science and Technology, Sylhet-3114
E-mail: zillursustbba@gmail.com
Cell: 01716-609814

IN-DEPTH INTERVIEW GUIDE



Department of Management Information Systems
University of Dhaka
Dhaka-1000, Bangladesh

Name of Interviewer : MD. ZILLUR RAHMAN

Date :

Name of Interviewee :

Designation of Interviewee :

Start Time :

End Time :

INTERVIEW GUIDELINE

The following guidelines are followed for collecting data through 'In-depth' interview. Management level people or employers are probed asking what, and how questions to give more insight information.

CONCEPT:

- Information Systems (IS), Information Technology (IT), Information and Communication Technology (ICT)
- Practices of ICT
- Quality Education
- ICT and Quality Education

STRATEGIC ESSENCE:

- Benefits of using ICT at higher education
    - Class performance
    - Teaching performance
    - Result performance
    - Job market performance
    - Organizational performance
- Riskof using ICT at higher education

FRAMEWORK:

- Current practices of ICT
    - Role of University Authorities
    - IT infrastructure
    - Student -Teacher participation in using ICT
- Existing infrastructure of IT & IS
    - Hardware
    - Software
    - Networks
    - Human resources (technical users & End users)
    - Data management
- Needs of expansion
- Problems faced

Appendix - A^2

In-depth interview guideline (Employers)

Question: What do you mean by ICT?

Question: How can you differentiate ICT from Information Systems?

Question: How can you define Quality education at higher education?

Question: Have your organization practices ICT at operational level?

Question: Have your organization practices ICT at management level?

Question: Have your organization practices ICT at strategic level?

Question: What is the idea about ICT of the different users in your organization?

Question: What is the current practice of ICT in your organization?

Question: What factors will you mention that affect the improved practices of ICT?

Question: Do you think corporate people have a role to improve practices of ICT in your organization?

Question: What are the factors influencing to increase the role of corporate people to improve practices of MIS in your organization?

Question: Do the employees of your organization are satisfied by using ICT?

Question: What is their motivation in participation newly developed information systems?

Question: What are the factors influencing to the employee participation of IS in` your organization?

Question: Do you think good ICT knowledge at university level directly related to job entry performance of the job seekers.

Question: Do you think ICT education is important in university level to improve productivity of the organization?

Question: Do you think good ICT knowledgeable students means good operational executives in organizational career?

Appendix - B[1]

Questionnaire for respondents (Students)

Dhaka University

Department of Management Information Systems

Ph.D Research Questionnaire for Students
(Very confidential)

S.N. of Interviewee:	
Date of Interview :	____/____/_____
Time of Interview :	

This questionnaire will be used only for research purpose. The answers will be kept confidential. Your honest judgment will be highly appreciated.

Title: The Impact of ICT on Quality Education at the Universities of Bangladesh: An Empirical Study

A. Personal Information:

i. Name:
ii. Name of your University:
iii. Name of your Department:
iv. Student's current resident Hall Mess Family resident
v. Family resident of the student: Urban Rural
vi. Current semester of the student: …….....…….....…….....
vii. Admission Session: …….....…….....……...
viii. Guardian's Profession:_____ Guardian's Monthly Income:_____
ix. Age: …….....…….....…….....…….....
x. Sex: Male ☐ Female ☐

INFRASTRUCTURE OF ICT

1.0 What School Subjects are you studied? *Check all that apply.*

- Business (please specify)
- Social Sciences (please specify)
- Life science (please specify)
- Engineering (please specify)
- Humanities (please specify)
- ICT (please specify)
- Other (please specify)

2.0 Do you have your own computer?

- Yes, a desktop computer

- Yes, a laptop computer
- Yes, both of them
- No

3.0 Could you please estimate the time you use ICT (information and communication technology) for personal use?

- *Hours_____Per week*

4.0 Could you please estimate the time you use ICT for your studies (including classes)? *Hours/week*

5.0 What kind of technical equipment is accessible for you as a student?

		Not accessible	**Restricted to access**	**Free access**
5.1	Personal computers			
5.2	Interactive whiteboards			
5.3	Video conferencing systems			
5.4	Learning Management Systems (WebCT, Moodle etc.)			
5.5	Audio equipment (including software)			
5.6	Digital photo cameras (including editing software)			
5.7	Digital video cameras (including editing software)			
5.8	Mobile phones			
5.9	Projection system			
5.10	Other (please specify below)			

CURRENT PRACTICES OF ICT

6.0 Application of ICT:

Use of ICT	**Always (3)**	**Sometimes (2)**	**Never (1)**
Use of ICT by teacher during lecture			

7.0 Respondent's Knowledge of Computer:

	Student's Knowledge of Computer	**Very Confident (5)**	**Quite Confident (4)**	**Confident (3)**	**Low confident (2)**	**Not Confident (1)**
7.1	Use of Mouse					
7.2	Use of Keyboard					
7.3	Customizing Desktop Environment					
7.4	Window Installation					

7.5	Microsoft Word Processing					
7.6	Microsoft Excel					
7.7	Microsoft Access					
7.8	Microsoft Office Publisher					
7.9	Microsoft Power Point					
7.10	Web designing					

8.0 Respondent's opinion towards application of ICT:

	Student's Opinion Towards ICT Use	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
8.1	Teacher should use ICT during teaching					
8.2	As a student, We should use ICT smartly					
8.3	Our syllabus should design to support in developing basic ICT skills					
8.4	As a student, We should use ICT for learning					
8.5	I think getting information using ICT is better than using print material/books					
8.6	I cannot study without the use of ICT tools					
8.7	I find it time saving to use ICT in learning					

9.0 Use of Internet by Respondents in Learning their Subject

Use of Internet	**Always (3)**	**Sometimes (2)**	**Never (1)**
Use of Internet by Students in Learning their Subjects			

10.0 Internet Use by Respondents for different activities

	Purposes of using ICT	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
10.1	Study purposes					
10.2	Chatting					
10.3	Surfing					
10.4	Sending E-mail					
10.5	Preparing Assignment					
10.6	Preparing Presentations					

10.7	Literature Search					
10.8	Online shopping					
10.9	Playing Games					
10.10	Songs and movies					

11.0 Respondent's Information Retrieval Skills

Opinion	**Excellent (5)**	**Very Good (4)**	**Good (3)**	**Fair (2)**	**Poor (1)**
Information Retrieval Skills While Using Internet					

12.0 Time Spent by Respondents in Different Online Information Searching Activities

	Activities	**< 1 Hour**	**1-3 Hours**	**4-7 Hours**	**8-10 Hours**	**>10 Hours**
12.1	Browsing					
12.2	Scanning journals					
12.3	Chatting with friends					
12.4	Downloading articles					
12.5	Internet surfing					
12.6	Reading e -mails					

13.0 Problems faced by respondents in using ICT relate to accessing E-resources and online searching

	Factors	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
13.1	Inadequate PCs					
13.2	Lack of time to use e-resources					
13.3	Slow internet connectivity					
13.4	lack of access to printers in library					
13.5	Electricity failure					
13.6	Unwillingness of library staff for help					
13.7	Lack of support from IT staff					
13.8	Teachers do not use ICT resources during lecture					
13.9	Lack of knowledge accessing E-resources and online resources					
13.10	Lack of knowledge in advance searching					

IMPACT OF ICT ON QUALITY EDUCATION

14.0 Student's Opinion Towards ICT Use to Improve Quality of Higher Education

	CLASS ROOM PERFORMANCE	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
14.1	Use of ICT have great impact on teaching process					
14.2	ICT accelerate learning process					
14.3	Teachers generate meaningful and engaging learning experiences through ICT					
14.4	Use of ICT improve presentation skills of teacher					
14.5	Use of ICT improve communication skills					
14.6	Student enjoy learning					
14.7	Teacher enjoy teaching					
14.8	ICT enhancing teaching environment					
	EXAMINATION AND ACADEMIC RESULT PERFORMANCE					
14.9	Use of ICT help to do better preparation in examination					
14.10	Use of ICT help to get resources for organizing students' examination					
14.11	Use of ICT for accessing information better than physical library					
14.12	I think getting information through ICT is better than print material/books for the students' examination preparation.					
14.13	ICT can foster better teaching and improved academic achievement of the students.					
	JOB MARKET PERFORMANCE					
14.14	ICT learned students get advantages in job market.					
14.15	ICT open the job market for graduates.					
14.16	ICT help to take competitive advantage from the job competition					
14.17	ICT support to take special benefits in job market					
14.18	ICT prepares candidate for future job market.					
	OTHERS					
14.19	ICT help teacher to improve research knowledge					

14.20	ICT is a potentially powerful tool for offering educational opportunities					
14.21	ICT increase learner motivation and engagement					
14.22	ICT facilitates the acquisition of basic skills					
14.23	ICT can affect the delivery of education and enable wider access to the same					
14.24	ICT motivates teacher to enjoy teaching profession					
14.25	Use of ICT improve quality of teaching at higher education					

NEGATIVE IMPACT OF ICT ON EDUCATION

List the negative impact of using ICT		**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						

If you have any additional comment on using ICT please write here:

Thanks for your cooperation.

Appendix – B^2

Questionnaire for respondents (Teachers)

Dhaka University

Department of Management Information Systems

Ph.D Research Questionnaire for Teacher
(Very confidential)

S.N. of Interviewee:	
Date of Interview :	____/____/_____
Time of Interview :	

This questionnaire will be used only for research purpose. The answers will be kept confidential. Your honest judgment will be highly appreciated.

Title: The Impact of ICT on Quality Education at the Universities of Bangladesh: An Empirical Study

1. Personal Information:

1.0 Name:

1.1 Name of your University:

1.2 Name of your Department:

1.3 Name of your Faculty:

1.4 Age: …….....…….....…….....…….....

1.5 Sex: Male ☐ Female ☐

1.6 Marital status: …….....…….....…….....

1.7 Designation:

2.0 CURRENT PRACTICES OF ICT

2.1 Average number of students per class

- Fewer than 20
- 20-30
- 31-40
- 41-50
- More than 50

2.2 Teaching hours per week: *

- Fewer than 10
- 10-15 hours
- 16-20 hours
- 21-25 hours
- More than 25 hours

2.3 How long have you been teaching (at any university)?

- Less than 1 year
- 1-3 years
- 4-10 years
- 11-20 years

- 21-30 years
- More than 30 years

2.4 What School Subjects are you trained to teach? *Check all that apply.*

- Business (please specify)
- Social Sciences (please specify)
- Life science (please specify)
- Engineering (please specify)
- Humanities (please specify)
- ICT (please specify)
- Other (please specify)

2.5 Do you have your own computer?

- Yes, a desktop computer
- Yes, a laptop computer
- Yes, both of them
- No

2.6 Could you please estimate the time you use ICT (information and communication technology) for personal use?
Hours_____/Per week.

2.7 Could you please estimate the time you use ICT for your studies (including classes)?
Hours_____/Per week

2.8 Is there technological support available for teachers at your institution?

- Yes
- No
- Don't know

3. Technological support in the institution:

Technological Support	**Excellent (5)**	**Very Good (4)**	**Good (3)**	**Fair (2)**	**Poor (1)**
Quality of ICT support					

4. Application of ICT:

Use of ICT	**Always (3)**	**Sometimes (2)**	**Never (1)**
Use of ICT as a teacher during lecture			

5.What technological devices have used in the courses you have taken?

		Never	**Rarely**	**Less than half the time**	**About half the time**	**More than half the time**	**Almost always**
5.1	Personal computers						
5.2	Interactive whiteboards						
5.3	Video conferencing systems						
5.4	Learning Management Systems (e.g. Web CT, Moodle etc.)						

5.5	Audio equipment (including software)						
5.6	Digital photo cameras (including editing software)						
5.7	Digital video cameras (including editing software)						
5.8	Mobile phones						
5.9	Projection system						
5.10	Other (please specify below)						

6. 0Respondent's Knowledge of Computer:

	Teacher's Knowledge of Computer	**Very Confident (5)**	**Quite confident**	**Confident (3)**	**Low confident (2)**	**Not Confident (1)**
6.1	Use of Mouse					
6.2	Use of Keyboard					
6.3	Customizing Desktop Environment					
6.4	Window Installation					
6.5	Microsoft Word Processing					
6.6	Microsoft Excel					
6.7	Microsoft Access					
6.8	Microsoft Office Publisher					
6.9	Microsoft Power Point					
6.10	Web designing					

7. **Respondent's opinion towards application of ICT:**

	Teacher's Opinion Towards ICT Use	**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
7.1	Teacher should use ICT during teaching					
7.2	I feel fear in use of ICT					
7.3	Our syllabus does not support in developing basic ICT skills					
7.4	I know how to use ICT but not interested in using it for teaching					
7.5	I think getting information from print material/books is better than using ICT					
7.6	I cannot teach without the use of ICT tools					
7.7	I wish that ICT should not be used in teaching					
7.8	I find it time consuming to use ICT in teaching					

8. Use of Internet by Respondents in Learning their Subject

Use of Internet	Always (3)	Sometimes (2)	Never (1)
Use of Internet by Teachers in Learning their Subjects			

9. Internet Use by Respondents for different activities

	Purposes of using ICT	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
9.1	Study purposes					
9.2	Chatting					
9.3	Surfing					
9.4	Sending E-mail					
9.5	Preparing Lectures					
9.6	Preparing Handouts					
9.7	Literature Search					
9.8	Online shopping					
9.9	Playing Games					
9.10	Songs and movies					

10. Respondent's Information Retrieval Skills

Opinion	Excellent (5)	Very Good (4)	Good (3)	Fair (2)	Poor (1)
Information Retrieval Skills While Using Internet					

11. Time Spent by Respondents in Different Online Information Searching Activities

	Activities	< 1 Hour	1-3 Hours	4-7 Hours	8-10 Hours	>10 Hours
11.1	Browsing					
11.2	Scanning journals					
11.3	Chatting with friends					
11.4	Downloading articles					
11.5	Internet surfing					
11.6	Reading e -mails					

12. Problems faced by respondents in using ICT relate to accessing E-resources and online searching

	Factors	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
12.1	Inadequate PCs					
12.2	Lack of time to use e-resources					
12.3	Slow internet connectivity					
12.4	lack of access to printers in library					
12.5	Electricity failure					
12.6	Unwillingness of library staff for help					
12.7	Lack of support from IT staff					
12.8	Students not interested to use ICT for learning					
12.9	Lack of knowledge accessing E-resources and online resources					
12.10	Lack of knowledge in advance searching					

IMPACT OF ICT ON QUALITY EDUCATION

13. **Teacher's Opinion Towards ICT Use to Improve Quality of Higher Education**

	CLASS ROOM PERFORMANCE	Strongly Agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)
13.1	Use of ICT have great impact on Teaching process					
13.2	ICT accelerate learning process					
13.3	Teachers generate meaningful and engaging learning experiences through ICT					
13.4	Use of ICT improve presentation skills of teacher					
13.5	Use of ICT improve communication skills					
13.6	Student enjoy learning					
13.7	Teacher enjoy teaching					
13.8	ICT enhancing teaching environment					
	EXAMINATION AND ACADEMIC RESULT PERFORMANCE					
13.9	Use of ICT help to do better preparation in examination					
13.10	Use of ICT help to get resources for					

	organizing students' examination					
13.11	Use of ICT for accessing information better than physical library					
13.12	I think getting information through ICT is better than print material/books for the students' examination preparation.					
13.13	ICT can foster better teaching and improved academic achievement of the students.					
	JOB MARKET PERFORMANCE					
13.14	ICT learned students get advantages in job market.					
13.15	ICT open the job market for graduates.					
13.16	ICT help to take competitive advantage from the job competition					
13.17	ICT support to take special benefits in job market					
13.18	ICT prepares candidate for future job market.					
	OTHERS					
13.19	ICT help teacher to improve research knowledge					
13.20	ICT is a potentially powerful tool for offering educational opportunities					
13.21	ICT increase learner motivation and engagement					
13.22	ICT facilitates the acquisition of basic skills					
13.23	ICT can affect the delivery of education and enable wider access to the same					
13.24	ICT motivates teacher to enjoy teaching profession					
13.25	Use of ICT improve quality of teaching at higher education					

NEGATIVE IMPACT OF ICT ON EDUCATION

14. Negative impact of ICT on higher education:

List the negative impact of using ICT		**Strongly Agree (5)**	**Agree (4)**	**Neutral (3)**	**Disagree (2)**	**Strongly Disagree (1)**
14.1						
14.2						

14.3						
14.4						
14.5						
14.6						
14.7						
14.8						
14.9						
14.10						

If you have any additional comment on using ICT please write here:

Thanks for your cooperation.