ANALYSIS OF BHUTAN'S INFORMATION AND COMMUNICATION TECHNOLOGY

POLICIES TOWARDS COUNTRY DEVELOPMENT

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จีวาน กุรุง : การวิเคราะห์นโยบายทางเทคโนโลยีสารสนเทศและการสื่อสารของภูฏานต่อการพัฒนาประเทศ. (ANALYSIS OF BHUTAN'S INFORMATION AND COMMUNICATION TECHNOLOGY POLICIES TOWARDS COUNTRY DEVELOPMENT) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: Pattarasinee Bhattarakosol, 69 หน้า.

ระหว่างกลุ่มประเทศกำลังพัฒนา เทคโนโลยีสารสนเทศและการสื่อสารได้กลายเป็นเครื่องมือสำคัญในการพัฒนาและได้แสดงให้เห็นถึงผลที่ยิ่งใหญ่ต่อเศรษฐกิจ เมื่อมองถึงแนวโน้มของเทคโนโลยีสารสนเทศและการสื่อสารนี้ รัฐบาลของประเทศภูฏาน จึงมีความพยายามอย่างมากที่จะนำเทคโนโลยีนี้มาใช้งาน แม้ว่าสถานการณ์ของประเทศภูฏานจะถือได้ว่าเริ่มต้นได้ช้ากว่าประเทศอื่น แต่รัฐบาลได้มีความมุ่งมั่นในการพัฒนาโครงสร้างที่จำเป็นเพื่อรองรับเทคโนโลยีนี้ เนื่องจากภูฏานเป็นประเทศที่มีขนาดเล็ก มีข้อจำกัดและทรัพยากรค่อนข้างน้อย ดังนั้นรัฐได้ตระหนักถึงความจำเป็นที่จะสร้างองค์ความรู้สู่สังคมภายใต้เทคโนโลยีสารสนเทศและการสื่อสารแทนการพัฒนาโดยรัฐเพียงส่วนเดียว อีกทั้งรัฐได้มองเห็นว่าองค์ความรู้อันเกี่ยวเนื่องกับเศรษฐกิจนี้เป็นวิถีทางที่จะเร่งการพัฒนาเศรษฐกิจและสังคมของประเทศได้เท่าเทียมกับการเพิ่มโอกาสของการว่าจ้าง

นโยบายที่ได้นำสู่การดำเนินการโดยรัฐบาลมีความต้องการเพื่อให้ได้บรรลุเป้าหมายและวัตถุประสงค์ของการพัฒนาประเทศ แต่จนถึงขณะนี้แล้วการศึกษาด้านอิทธิพลของนโยบายที่ได้วางไว้เหล่านี้ต่อการเติบโตของประเทศ ยังมีน้อยหรืออาจไม่เคยมีมาก่อน ปัญหาที่สำคัญอันเป็นประเด็นที่น่าสนใจขณะนี้คือ นโยบายเหล่านี้ได้ส่งผลต่อการพัฒนาประเทศจริงหรือไม่ การปรับปรุงนโยบายเหล่านี้จะสามารถทำไปในทิศทางใด งานวิจัยนี้ได้พยายามที่จะค้นหาผลกระทบและอิทธิพลของนโยบายที่กำหนดโดยรัฐต่อสภาวะการแข่งขันและการเติบโตทางเศรษฐกิจของภูฏาน

ภาควิชา	คณิตศาสตร์และวิทยาการคอมพิวเตอร์	ลายมือชื่อนิสิต	....
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JEEVAN GURUNG: ANALYSIS OF BHUTAN'S INFORMATION AND COMMUNICATION TECHNOLOGY POLICIES TOWARDS COUNTRY DEVELOPMENT. ADVISOR: ASST. PROF. PATTARASINEE BHATTARAKOSOL, Ph.D., 69 pp.

Among the developing countries, Information and Communication Technologies (ICT) is radically becoming a major tool for development and has shown a huge contribution to the economy. Seeing potential of ICT, the Royal Government of Bhutan (RGoB) has also taken a huge effort towards adopting it. Although Bhutan is a late starter, the RGoB is putting considerable efforts towards developing the infrastructures needed to strengthen it. Being a small country with limited and scarce resources; the RGoB realizes that it cannot rely on it alone and so it plans to build a knowledge based society empowered by ICT. They see knowledge based economy as a way to boost socio-economic development of the country as well as increase employment opportunities.

Policy has already been put in place by the government aimed to achieve the goals and objectives for development. So far there has been little or no study done on the influences of these policies towards the growth of Bhutan. The big question to be asked now is: Is it having any contribution to the development of the country or not? How can there policies be further improved? This research will try to explore the impact and influences of the RGoB's ICT policy on the competitiveness and growth of the economy in Bhutan.

Department:	Mathematics and Computer Science	Student's Signature	....
		Advisor's Signature	....
Field of Study:	Computer Science and Information Technology		
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CHAPTER 1

INTRODUCTION

Overview

Currently, most countries in the world use computer technology and the Internet to build up their economy and the value of their citizen's life. Various aspects of implementation of information technology (IT) and the Internet have been researched. Since the objective of IT is to increase the working efficiency of organizations and sectors, the ICT law and strategies have been already framed by the government. The ICT laws or frameworks of government's are necessary to monitor and evaluate various aspects, such as political, socio-economic and cultural impacts of it. As a consequence the direction or country's development related to ICT can be clearly defined. One good example that ICT has been fully implemented with positive impact is Singapore. The Singapore government has focused in the use of ICT in Health care, education etc. and especially in their business. Thus, ICT laws and procedural documents have been drawn and effectively activated. Consequently, these high technologies with good government supports persuade other countries to invest their money in Singapore market. Another country in Asia that follows Singapore in this direction is Malaysia. The Malaysian Government started implementing ICT to stimulate their economics both products and services many years ago.

Although numerous countries in the world have implemented ICT as a core service to their citizen, Bhutan is another example where this technology has just been implemented in the past few years. According to the fact that Bhutan is a landlocked country nestled in the arms of eastern Himalayas which lies in between China and India, there is a possibility that new technologies are hard to reach to every region. Moreover, the Bhutan is counted as one of the least developed countries with a population of 738,267, as of 2011. Nevertheless, Bhutan Information and Communications Technology Policy and Strategies (BIPS) were developed in July, 2004 with the objectives as follow:

- To use ICT for Good Governance;

- To create a Bhutanese Info-culture; and

- To create a "High-Tech Habitat".

The Royal Government of Bhutan in a clear direction for the sectors to harness the potential of ICT (as per the ICT policy of Bhutan) had laid a financial outlay for the Information and the Media Sector of Nu.112 million in the last 10th 5-Year Plan (RGoB FYP) for the development of ICT and Media Sector for improving, upgrading and expanding the existing nationwide infrastructure. The Royal Government of Bhutan believes that ICT can help achieve poverty reduction and has recognized ICT as an important tool to achieve its development objectives. It has the capability to improve efficiency and transparency of institutions and markets and also facilitate the participation and empowerment of the poor.

The developing countries as well as least developed countries see the ICT technology as a bridge to reduce the gap between the two. With the governments putting such an emphasis in promoting ICT in the development of the country, it's not known how this guiding policy for ICT would impact economy of the country. Additionally, there is little or hardly few previous studies performed to assess it. So, an evaluation on the impact the ICT policy has on the economy needed to be performed and as a result, some proper suggestions can be presented to bring out the ICT efficiency of the country. This paper aims to discover the impact ICT policy has on the economy of the country as well as the impacts it has on the private sectors in Bhutan. Furthermore, one of the expected results should be able to determine how the private sectors expect support from government for growing their business.

1.1.   Problem Formulation and Motivation

Many countries have adopted ICT as a tool for development. Recently Bhutan has also followed suit and adopted ICT as one of the development tools. Government has invested a lot of resources and has also introduced various projects such as Chiphen Rigphel, an ambitious human capacity building project, Thimphu Tech Park, Community E-centers etc. but there has been hardly any studies done on the impact of it on the development of the country. This study intends to shed some light on the impacts of the adopted ICT policy.

1.2.   Objectives

This research tries to bring out the impacts of ICT policy that has been framed and adopted currently by the Royal Government of Bhutan. It will try to give a clearer picture about the current scenario of ICT tools being implemented in sectors such as Education, Health care, Agriculture and the private sectors and how the guiding ICT

policy has an impact in the implementation of ICT tools aimed towards the country's development.

1.3.   Thesis Scope

The scopes of this Thesis are listed below as follows:

1. The primary data were collected from respondents for evaluating the impact on private sector. They were all Bhutanese citizens working in the private sector spread across Bhutan.

2. Secondary data was used to evaluate the impact of ICT policy on Education sector. All the respondents were Bhutanese teachers teaching from primary school to higher secondary schools across different districts in Bhutan.

3. Reports, articles from websites and newspaper were also used for the results.

1.4.   Benefit and Expected Outcomes

This study tries to show the impact of ICT policy on various sectors in the country. It will help to analyze whether this ICT tools currently in place are really having an impact or not towards getting the maximum benefits from it. The policy is important for the overall implementation of the technology towards the development of the country. If the guiding policy framed by the RGoB is either not having an impact or not living up to the current challenges, corrective measures can be adopted to strengthen it so as to reap the highest benefits in the future.

1.5.   Thesis Structure

The structure of this thesis is divided into six chapters. First Chapter contains the background studies, scope of the thesis, and limitation of the study, expected benefits and problem formulation. Second Chapter clearly explains the literature review related to the research. In Third Chapter paper consists of elaborated details of the research method. Fourth Chapter shows analysis results and Fifth Chapter presents the conclusion of the study showing how the ICT policy can impact the integration of ICT in various agencies and sectors.

CHAPTER 2

LITERATURE REVIEW

Information and Technology is an important tool and is said to be playing a key role in the socio-economic development of the country. Billions of dollars are spent each year on Information Technology across the globe. The Royal Government of Bhutan (RGoB) has been putting considerable effort in adopting it **to** enhance GNH by building a knowledge based society empowered by ICT. Various projects have been initiated under the leadership of the RGoB in an effort to make these Information and Technology tools readily available to the people. This chapter will cover the past and present scenario of ICT in ASIA as well as in Bhutan.

2.1.   ICT in Asia

Over the past decades, ICT has become a vital infrastructure in the transformation towards the information society and knowledge-based economy. As the fact that almost all organizations in the world are using Information Communication Technology (ICT) in their daily business. Moreover, Gatautis [1] found the use of ICT as an important opportunity in improving work processes in enterprises and organizations. The adoption of ICT might also generate competitive advantages that affect and/or influence the company's productivity growth.

ICT is thought as the backbone as well as an essential catalyst for various activities, such as productivity, and business activity. The advancement of it has created many opportunities for country's development. As an established technology, ICT has an impact on several key areas like financial, healthcare, education, government, and spurred innovations in business sectors etc.

Sefika et al. [2] state that ICT can have an impact on basic services since it enables an access to information for improving and providing better services. Furthermore, it opens up opportunities as well as increased positive education. It has the ability to enable users to learn new skills that can improve chances of them to achieve better employment opportunities. As an example, in France, 700,000 direct jobs have been created through sectors such as e-commerce, IT equipment and software, the internet access services and VoIP over the last 15 years. Besides it is expected to create another 450,000 by 2015 [3].

A study conducted by Atkinson and McKay [4] on the role that information technology plays in the economy, based on an assessment of the existing research, it states that the money spent on computing technology delivers a relatively higher gain (three to five times) in worker productivity than those in other investments. Apart from the large enterprises who can invest huge amounts of money, Kramer et al [5] elaborated that ICT can also assist small and medium-sized enterprises to progress ahead by overcoming barriers if used efficiently. However, at the same time, two considerations should be made while addressing the impact of ICT which are [6].

- Time should be given for the investments on ICT to payoff; and

- It should be noted that ICT is just one factor and that there are several other factors which can contribute to the better performance of the firm.

In addition, Cerquera et al. [7] stated that some adopting companies might reap the benefits of ICTs earlier while others may experience its benefits later.

Major changes have been seen in the way ICT services are delivered. Gatautis [1] stated that development of ICT can increase the performance efficiency. So, transformation of economic entities arose. Moreover, ICT has been proven and acknowledged as an engine of the 21st century and beyond [8]. The widespread of this technology can offer new opportunities to stimulate economic growth. According to International According to International Telecommunication Union (ITU) data, it shows that the global revenue from telecommunication services was 1.5 trillion US$ (2010) i.e. 2.4% of the world's GDP [9] .

In the year 2010, a growth in Gross Domestic Product (GDP) in some Asian countries is elaborated in Figure 2.1; it is obvious that Thailand that was under the political crisis during that period still had the highest growth rate of GDP. Furthermore, there was no implementation of 3G technology in Thailand although some countries in Asia implemented it years before might reap the benefits of ICTs earlier while others may experience its benefits later.
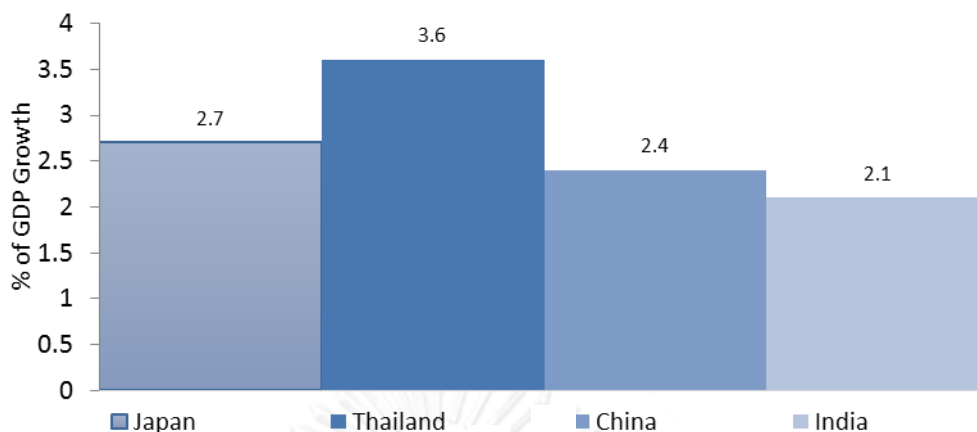
Figure 2.1: Percentage of GDP (Revenue earned) of 2010 [10]

Since the wireless communication technology has a rapid growth in the recent time, especially the development on mobile communication, there are various technologies had been implement, started from 1st generation which allowed people to talk via the digital signal using mobile devices. Then, the development of 2nd and 2.5th generation, or called as 2G and 2.5G, had been implement to enhance the communication services such as SMS (short message services) and MMS (multimedia message services). Currently, most of the Asian countries have implemented 3rd generation technology (3G) while European countries are moving to 4th generation, or 4G.
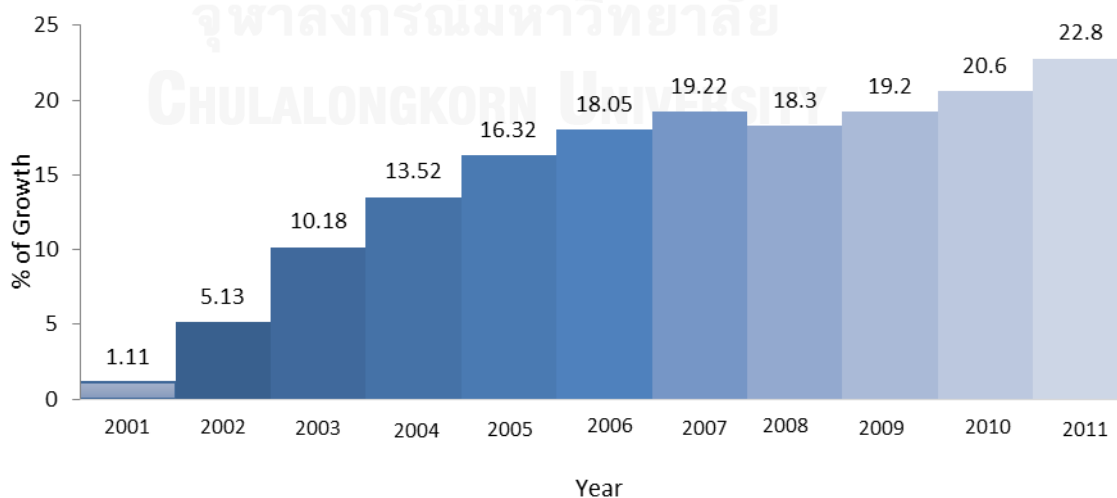
Figure 2.2: Growth of 3G Services in ASIA (Sultana, 2013)

As shown in Figure 2.2 above, based on the study of Sultana [10] over the past 10 years, Asia has seen the growth of 3G service from 1.11% (2001), 19.22% (2007) and 22.8% (2011). Going through the figures below, it can fairly be stated that there is a steady growth of ICT usage in Asia (China, Thailand, Japan, and India). Figure 2.3 shows the percentage of individuals using the Internet in these four countries. The growth has been exponential in most of the countries case. In 1995, the percentage of individual's usage in China was 0%, Thailand was 0.07%, Japan was 1.59%, and India was 0.03%. Additionally, in 2005, it rose to 8.52%, 15.03%, 66.92%, 2.39%; and 42.3%, 26.5%, 79.05%, 12.58% in 2012 respectively. Japan has the highest rate of individual usage of the Internet. This data can be interpreted that people in Japan has chances to gain information from everywhere around the world better than other countries.
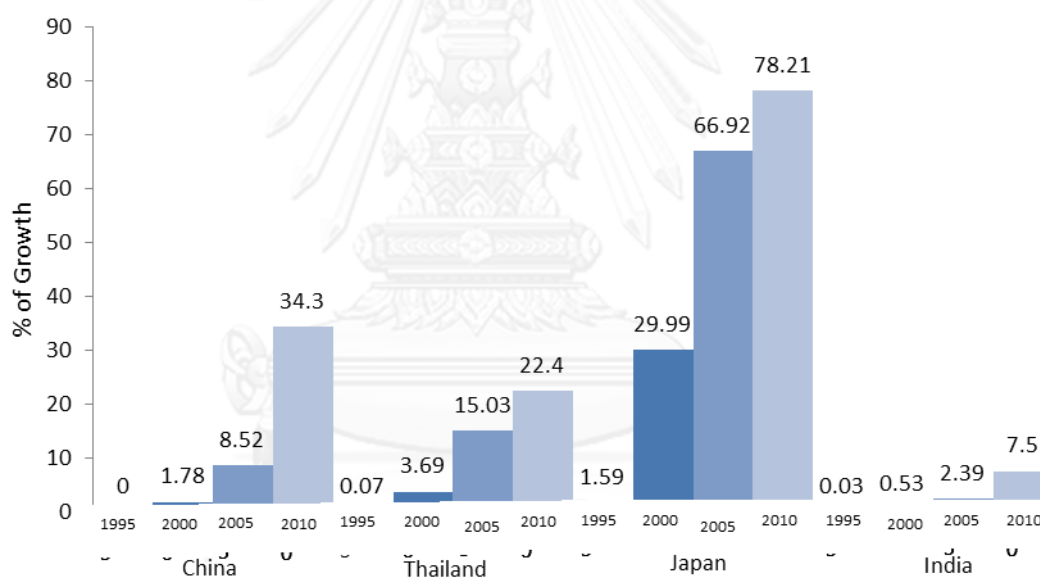
Figure 2.3: Percentages of individuals using the Internet during 1995-2012 [11]

Similarly, Figure 2.4 elaborates the growth of percentage of mobile-cellular subscriptions per 100 inhabitants. In 1995, it was 0.29% in China, 2.2% in Thailand, 9.41% in Japan, and 0.01% in India. Furthermore, in 2005, China was 29.84%, Thailand was 46.46%, Japan was 75.98%, and India was 8%. The last statistical which measured in 2012, China was 80.76%, Thailand was 127.29%, Japan was 110.91%, and India was 69.92%.
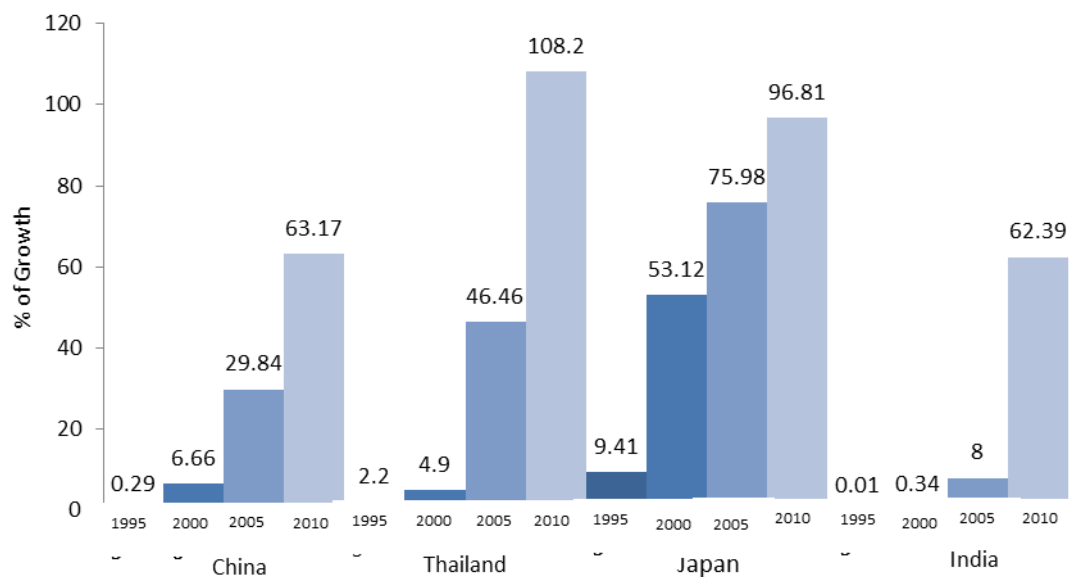
Figure 2.4: Percentages of Mobile-cellular subscriptions per 100
inhabitants during 1995-2012 [11]

Based on the line graph presented in Figure 2 and Figure 3, although Japan and China are countries that have the higher rate of individual usage of the Internet than Thailand, surprisingly that the subscriptions of mobile-cellular of both countries are lower than Thailand within the last two years. This might be an effect from the government management policy of each country towards the Internet usage. Additionally, it might also reflect the financial situation of each country during 1995-2010 and 2010-2012 which the economics of Japan was in crisis while situation in Thailand is getting better from military's revolution.

The enormous opportunities that exists in the IT and related field should be encouraged and promoted. The priority should be to prepare the IT strategy and activate it. With Information and Communication Technology (ICT) having an impact on the development of the country, ICT Policy is needed to monitor and evaluate political, socio-economic and cultural impacts of it (ICTs). Anie [12] notes that Information and Communication Technology (ICT) Policy is an official document that reflects the goals, objectives, strategies, etc. to support, guide and regulate the application and ICT operation for development. Policy makers should develop ICT policies to harness the potential of ICT as it provides a clear direction for ICT to achieve these.

As per the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), 1999, the diversity and convergence of ICT with other policy such as education policies, cultural and linguistic policies, information policies etc. need to be taken into account as well so that these policies will be logical and consistent with the rest. In the study of "The Economic and Social Benefits of ICT Policies in Nigeria", Anie [12] further added that the development of ICT complements with the development of other sectors and is linked.

The government of every nation plays an active role in formulating the policy. They should proactively engage both private sectors as well as civil society in framing the ICT policy to create an enabling environment through policy improvements. The objectives of these policies should be focused on helping all firms benefit from the ICT to move forward in this digital era which can lead to the achievement of the Millennium Development Goal (MDG). Mohamadian et al. [13] from Iran found that policy makers in recent years have widely addressed the impact ICT has on businesses and also on economic environment.

According to the McKinsey survey [14]which was done across several countries, they found that most of the companies agree that the government's action do affect their businesses. It is also noticed majority of the companies particularly in India feel that if the 'government advocate for the interest of the Industry/companies, it will have the greatest effect on the economic value of the company.

In case of some countries, ICT technologies or ICT Policy may not have any contribution. In one of the workshop hosted by University of Manchester's center for Development [15] they identified four issues as to why it (ICT policy or the ICT technologies) was not making quiet the development contribution like they could. These factors are listed below:

1. Consistency with Main Development Challenges:

    The developing countries seldom review and incorporate ICT strategic role to face the three major challenges which are: a. Economic Stability in the case of global downturn, b. Stability of political situation against war and terrorism and c. Environmental stability from the threat of climate change. Without this incorporation, the policy might not be that effective.

2. Consistency with Information and Communication Technologies for Development (ICT4) Value Chain:

Coherent ICT policy contains horizontal coherence that ensures that ICT policy puts together all the elements required for e-readiness that makes ICT available and also supports the utilization of it as well as vertical coherence which ensures that integration of policy at each stage of the value chain. Though horizontal coherence has progressed with time, there is less proving of proper impact assessment within current policies. In case of vertical coherence there is lack of coherence between public agencies in many developing nations which holds back the proper impact/use of new technology.

3. Consistency with Development Policy:

ICT's were neglected initially while formulating national development policies. Later even though when it was given importance it had no/hardly any correlation with other policy meant for delivery of development. Only few nations see the role of ICT's in development policies today as one of the key tools whereby other nations isolate it as delivery mechanism only.

4. Delivery of ICT Policy Consistency:

ICT Policy is likely to fail in the absence of a good leader. With a strong leadership with a good vision, the contribution of ICT in development can be effective.

The key reason could be that the ICT policy does not address to the current or forthcoming needs of the market as well as not putting the policy into proper practice. The lack of commitment from the leaders in the ICT sector [16] plays a negative role too.

2.2. ICT in Bhutan

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

As Bhutan is a late starter in adopting ICT, it was only in the year 1963 that telecommunication network or analog network was first launched in Bhutan and later in June 1999, the Internet and television connection. There are four ISPs in the country i.e. DrukNet (BT), TashiInfocom, DrukCom and SamdenTech (the latter three

being the Private ISP) at the moment. The number of the Internet subscribers drastically increased from 11,886 in 2009 to 109,526 by the end of 2012 and the Internet penetration rate achieved was 22.7%. In addition, the density of mobile users has also significantly increased standing at 77.8% from every 100 inhabitants.

Bhutan also saw a steady growth of 11.3% in Transport & Communications Sector in 2012. Figure 2.5 below shows a summary of the growth of telecommunications sector in Bhutan. As of now the whole 20 Dzongkhags (Districts) of Bhutan is connected via fiber optic cable through the initiative of Ministry of Information and communication (MoIC), Bhutan.
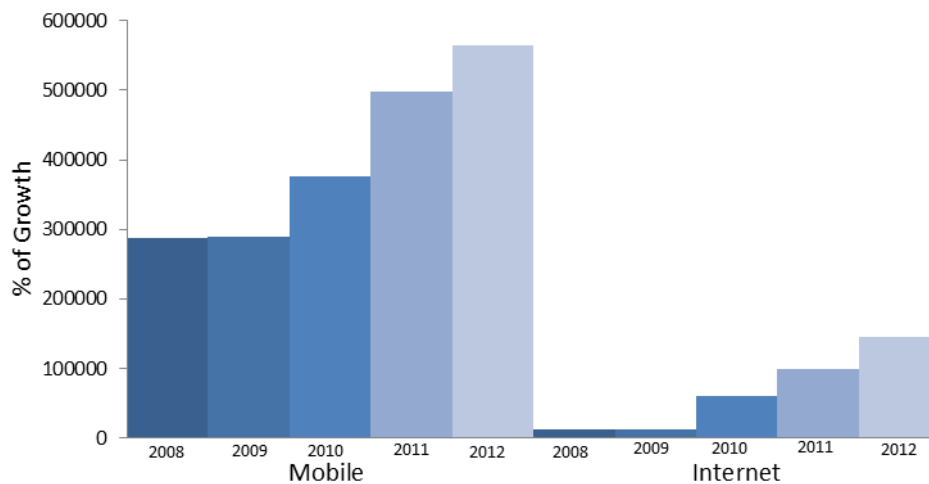
Figure 2.5: A summary of the growth of telecommunications sector in Bhutan In 2012 [17]

The first development activities began in Bhutan in 1958 with the visit of the then-India's Prime minister, Pandit Jawaharlal Nehru. The first development plan was prepared and implemented in the period 1961-1966. As per the Bhutan's Industry Policy, 2012, Cottage, Small, Medium and Large industries are defined as per the investments made. 98% of the total private industry constitutes of Cottage, Small and Medium Industry or small and medium enterprises (SMEs). The major contributors to Bhutan's economy are the hydropower industry and Tourism sector.

Observing the growth of ICT around the globe the Royal Government of Bhutan recognized ICT as an important tool to achieve its development objectives. Bhutan built its first Grade 'A' IT business park in the country, Thimphu TechPark. This business park has objective to increase productive employment opportunities of the country. Chiphen Rigphel is another ambitious human capacity building project

designed to help Bhutan to successfully transition to a modern Knowledge Society, which was launched on April 30, 2010. It has a target to provide ICT skills to over a quarter of the population of Bhutan [18, 19](India, 2011)

Tobgay et al. [16] have stated that ICT being a very new in Bhutan, the following are some of the few prominent challenges faced by these (ICT) sector:

- Lack of Awareness and Understanding

- Lack of ICT Expertise and Skills

- Acute shortage of skilled ICT manpower in the country

- Lack of Private Sector Participations

- Lack of Budget for ICT Sector

- Poor Content in the National Language

As ICT is still a new phenomenon in Bhutan, a lot of emphasis has been put by RGoB to harness the power of ICT for acceleration of social and economic growth through supportive government policies, programs and plans towards the betterment of ICT. BIPS (Bhutan Information and Communications Technology Policy and Strategies) [20] was developed for the sole purpose of how ICT could be integrated in the overall development strategy of the country. For ICTs to have a major impact the aim of the policy should not be on developing the infrastructure only, it should strengthen the capacities to use such tools. The implementation of ICT policies is a precondition to the emergence of a strong market economy.

Bhutan Information and Communications Technology Policy and Strategies (BIPS) was developed in July, 2004 and was later replaced by 'Bhutan e-Government Master Plan [21] It was solely driven by the need to:

- Establish the current state of ICT readiness, identify gaps and chart way forward

- Identify/prioritize ICT projects across the whole-of Government and guide ICT spending

- Align to global technology developments and trends.

- Garner support of all agencies to collectively leverage ICT in Government service delivery

In this age of global information and knowledge economies, ICT has become a fundamental part in both developed and developing country and its importance is expected to keep increasing. Most businesses, industries and individuals depend on ICT as it enables productivity and communications. Seeing the impact ICT has on the economy of the country, National ICT Policy are being implemented in an attempt to support, guide and regulate all ICT initiatives to achieve a common set objectives by harnessing the potential of ICT.

Despite the important role ICT plays in an economy, no research has been done on the impact ICT policy has on Private sectors in Bhutan. This paper will try to bring forward the impacts of ICT on Private sectors in Bhutan, the expectations of the Private sectors from the government, as well as how the private sectors think they can help themselves to grow.

2.3.   Role of ICT in Government

Every government has a huge and complex role to play in the country. The government is only able to play a greater and better role if its operation and management processes are greatly enhanced. In case of Bhutan the government is more than willing to adopt the use of ICT. The Minister for Information and Communications Ministry, Lyonpo D. N Dhungyel stated that "ICT is the future" and it will empower the people. Recently the RGoB in a bid to increase efficiency of the bureaucracy processes, has decided to adopt GoogleApps, an online office suite, so as to maximize the significant impact on its operations and boost its efficiency [22]. Bhutan is the first country where the national government has adopted the cloud platform technology.

The government has already been offering services to the people through online public service projects such as G2C (Government to Community, which supports the community), G2B (Government to Business supports the business sector), online Tax filing and other such projects [23]. It has plans to use ICT for good governance through more projects in line with the e-government master plan to achieve sustainable economic development [24]. Government has also signed a Memorandum of Understanding (MoU) with Singapore in a bid to develop ICT manpower and expertise [25].

2.4.   Role of ICT in Private Sector

As more and more educated population are joining the workforce, the need of private sector has become a necessity to absorb them to address the

unemployment challenges [26] the private entrepreneurs, institutions, schools and other interested individuals should be encouraged to participate in the promotion of this important technology [21]. The Royal Government of Bhutan has set up various organizations with the aim to increase the efforts towards developing the private sectors. It has been one of the important priorities since the 6th Five Year Plan (FYP 1987-1992). Organization such as Bhutan Chamber of Commerce & Industrial private non-profit making organization which comprises members of business community across the country was established in 1980 under the Royal Command of His Majesty the King. It provides various services with the mission to Protect & Promote the Private Sector of Bhutan. The World Bank has been helping the government in their endeavour to train the people on the use of ICT tools. The youths trained would finally be joining the private sectors [27].

Despite SMEs (Small and medium enterprises) development given high priority, Wangyal [28] notes the lack of comprehensive policy formulation by the government and that the efforts made by the government to develop these cottage and small enterprise are carried out in isolation. Asian Development Bank states that though Bhutan has maintained good economic growth and made good progress towards the Millennium Development Goals (MDG), it still has various challenges to overcome such as narrow economic base, inadequate private sector involvement in economic development etc. [29]

2.5.   Role of ICT in Education System

Over the past few years Bhutan has seen a steady growth of ICT. ICT has become a driving force in the modern day education system in many countries. Every year around 40 billion dollar are spent on education technology [30]. The Royal Government of Bhutan having noticed the benefits and importance of ICT have followed suit in implementing and integrating these tools to enhance and strengthen the teaching and learning process in the schools of Bhutan to achieve knowledge based society. His Majesty King Jigme Singye Wangchuk, the 4th King of Bhutan once said "The future of the nation lies in the hands of our younger generations." The RGoB believe that the future of Bhutan lies in the proper education of its youth using the best tools that make significant contributions and have positive impacts in the teaching and learning process. ICT can be the best answer in this case for Bhutan because of the country's geographical condition as it will enable the transmission of information between long distances.

The Education Ministry in Bhutan has given importance to this integration of ICT in the education system and has included it in various policies like 10th Five Year Plan [20], Tertiary Education Policy of the Kingdom of Bhutan [31], Bhutan e-Government Master Plan [21]. They feel that it will empower both the teacher and the students in their teaching and learning process. Khan and Hasan [32] also agree to it saying ICT can potentially transform the nature of education system away from the traditional system. It has also been deemed important for development of adequate ICT infrastructure for advancing education.

As per the Constitution of Bhutan, the Government shall provide free education to everyone up to the tenth standard. The accessibility of higher education after that shall be made based on merit [33] [34]. Currently there are 409 out of 553 schools connected with internet [35], 137 computer laboratories [36] and 3046 computers across Bhutanese schools. Chiphen Rigphel Project has established another 168 computer laboratories on top of the existing IT laboratories in various schools under the ambitious human capacity building project to bring the ICT literacy to the students. All tertiary education institutions have leased line internet connectivity as well as computers labs. IT literacy has been introduced in all schools as a tool subject. Though the introduction of such tools will be high in cost, it will be cost effective and give good dividends in the future.

Chiphen Rigphel Project have trained 2000 out of 7,932 teachers (as of 2013) to equip them with the basic knowledge of ICT and have made it compulsory for all the other teachers to undergo the same [21]. Such trainings are also found to be necessary by various study conducted to improve the attitude of the teachers in integrating ICT tools in their daily teaching activities (Al-Senaidi et al., 2009). A study done by Tenzin and Bhattarakosol [37] also further shows that the teachers in Bhutan have positive view in integrating the ICT tools in their teaching and the Education ministry supports this endeavour in building the human capacity [38].

2.6. Role of ICT in Healthcare System

Since the modern health care system started in Bhutan in the early 1960's, there has been a remarkable growth despite being landlocked and a mountainous country with a difficult rugged terrain. As of 2005, the life expectancy of people increased to 66 years compared to 37 years in the 1960's. The mortality rate of the infants also decreased to 40.1 per 1000 in 2010 from 90 back in 1990. Back in 2011, the government had set up at least 31 hospitals, 184 BHUs (Basic Health Unit) and ORCs

(Out Reach Clinics) meant for providing primary health care services. These health care services were accessible to approx. 95% of the population [39].

As per the constitution of the Kingdom of Bhutan, Section 21 and 22 under Article 9 [33] [40] states that "the state shall provide free access to basic public health services in both modern and traditional medicines" and "the state shall endeavour to provide security in the event of sickness and disability or lack of adequate means of livelihood for reasons beyond one's control". The government continues to give priority to quality universal health care services and spends about 3.23 % of its GDP on it. The RGoB is keen to provide 100% access to health care professionals countrywide through technology-enabled solution like E-Health and telemedicine (already implemented but limited to few hospitals and BHU's) to offer better diagnosis.

Despite the improvement in the health care services and infrastructures, the health sector faces new challenges and issues such as 1) Expanding coverage, 2) Health workforce, 3) Sustainability 4) Emerging diseases etc. [41]. The government wants to harness the potential of ICT tools such as telemedicine and health information systems so it can overcome the geographic condition of the country through improved accessibility of better health services [42]. This can also address the shortage of doctors and health care workers in Bhutan [43] [41] so as to ensure better medical services to the people.

As of recent year, ICT have made its way towards health sector. It is believed that ICT will improve the overall service delivery and communications between the heath care workers and the patients. As the speed of information is vital in health care services, ICT can assist the health care personals in their decision making process [44]. For example the Singaporean government has emphasized on adopting ICT in healthcare infrastructure in both the medical field as well as administrative section to improve the overall services [45]. ICT can help improve diagnostic process as well as save precious time. Singapore's public healthcare system have implemented the various ICT tools such as 1) Medical procedures, 2) Information sharing, 3) Medical services to patients and 4) Apps such as E-diet etc. [45].

2.7.   Role of ICT in Agricultural System

Agriculture in Bhutan plays a major role. It is the single largest sector that provides livelihood for more than half of the country's population. Five decades ago, agriculture was practiced widely and was a major source of income for both the

people and the government. Bhutan has since then made a good progress from agrarian sector to tourism and hydroelectricity sector. In spite of all these progress, agriculture mainly subsistence farming still employs 60% (as of 2011) of the Bhutanese population as they live in rural areas and also contributes about 16.20% to country's GDP [39]. This is quite alarming for the government because this very agricultural sector was contributing 24.7% to the GDP and was providing livelihood to 79% of the population in 2004 [46].

Bhutan being a small country is mainly import driven and relies on other countries for import. In 2011 alone, Bhutan imported about 11619 MT of vegetables valued at about Nu. 170 million[1] [47]. Other problems that Bhutan faces are the dominant practice of subsistence farming as land holding is quite fragmented among the population. It is found to be one of the main reasons for poverty in rural areas [48].

The government realizes the country's dependence for import of basic agricultural products and is putting lots of emphasis on promoting agriculture sector to minimize this dependence. The Ministry of Agriculture and Forestry (MoAF) in line with Kingdoms Vision 2020 has an agenda to meet the national food security and self-sufficiency by 2020 [21] [49]. Lots of foreign aids in the form of grants and assistances has been received from other countries [50] [51] so far and continue to do so.

Agriculture is also seen as an alternate employment opportunity generation for the rural population. Various projects has been taken up by Ministry of Agriculture and Forests like establishing the Department of Agricultural Marketing and Cooperatives (DAMC), for promoting effective marketing of agricultural products agricultural to enhance farmer's livelihoods; IAT Farm and Landscape Greening Project, for promoting vegetable farming using organic farming mechanisms [52]; Fallowing wetland [53]; free distribution of hybrid seeds [54] [55] etc.

Information and communication technology is thought to be an idle and appropriate tool in this endeavour. It is seen as an integral part of supporting farmers. Some of the strategies mentioned under this project are to develop a website/portal for better dissemination of information and marketing information system for better accurate and reliable data. Having access to High speed Internet means the employees can more information and make better informed decision as Larry Page, CEO and cofounder, Google stated that it will benefit the people immensely if correct information is shared with the right people in a proper way.

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[1] 1 US$ = 61 Nu.

CHAPTER 3

RESEARCH METHOD

In order to find out impacts of ICT policy in Bhutan, many types of data must be collected to answer that whether ICT causes positive or negative impact on the development of the country. This section will elaborate on the data collection method.

3.1. Data Gathering Method

This study has an aim to measure impacts of ICT policy towards the development of the country. The main aim of the survey is to figure out the impacts of ICT Policy on Education, Health Care, Agriculture and Private Sectors in Bhutan as well as the existing conditions. As the topic of this Thesis is vast, the data collection must be performed using a specific questionnaire because of large amount of the sample group. We will need to use secondary data along with reports, academic papers and newspaper articles in this study. The sample group for the private sectors include the respondents who are working in the Private sector across three different districts in Bhutan. The respondents in the Education sample refer to the teachers who all are teaching primary and high schools in Bhutan. Respondents for private sectors sample must answer the self-managed questionnaire through social networking site i.e. Facebook as well as through e-mails. These methods provide the flexibility to access it; anytime, everywhere.

In order to disclose success or failure of ICT government's policy, many aspects have to be measured. One indicator that is obvious is to figure out whether the success in business of private sectors is related to the asset values from government's support. The barriers and influencing based government's policy can affect the volume of investment cost of any business companies. It can affect other sectors such as Education, Healthcare and Agricultural sector as well. In the situation of product-based companies, a suitable government ICT policy should be able to afford the industrial process. Additionally, the aggregation of software usage for the business or industrial process should be determined since the economy of Bhutan is not strong when compared with many other countries in Asia. Thus, the ability to use licensing software is very limited in the entire country. As a consequence, the IT-skill determination in business companies must also be defined.

The fact that the implemented questionnaire for collecting data on private sectors must be of standard and also trustable; the questionnaire is modified from the survey of Northwest Business ICT in 2007. This original survey has an aim to measure the extent the businesses adopting the ICT on the economic performance. Moreover, it was well designed and tested by the SQW Consulting Company based in United Kingdom.

The implemented questionnaire is divided into two parts: the demography part, and the part that contains indicators with a list of impacts of ICT policies towards Bhutan's Development. The questionnaire uses various types of measurement style such as nominal scale and Likert scale (1-strongly disagree to 5-strongly agree). Example of this questionnaire is drawn in Figure 3.1. Figure 3.1.(a) presented some examples of demography information while Figure 3.1.(b) shows examples of considered factors.

Figure 3.1: Questionnaire Example

The data was collected from 206 participants under many business organizations. Unfortunately, four samples had to be deleted as its data was inconsistent. Only 98.05% of the total samples collected from respondents working in private sectors are used in data analysis. Within this data set, 66.7% of the respondents were male and 80% of them were undergraduates (qualification). Each participant had to answer 23 questions, including all types of communication tools, such as TV and Radio, Mobile Phone, Internet etc. Furthermore, the abilities to access and use ICT tools

with availability of the services, and the ICT infrastructures of the country are integrated in this questionnaire. The process of data gathering was performed for two months.

CHAPTER 4

DATA ANALYSING METHOD

The analysis of results has been divided into five parts. The Chi-square test has been performed for analysis on the impact of ICT policy on Private sector only. Descriptive Analysis has been performed in case of Education sector. The rest of the results on Healthcare, Agriculture and Economy were resources adopted in the form of reports, academic papers and newspaper articles.

Referring to all aspects that are measured and drawn in the questionnaire, the analysis method is based on categories analysis using Chi-square and cross tabular data is employed to make comparisons with 0.05 significant confident intervals (**α**) or 95% confident level. Chi Square test is performed to find out whether there is a significant association/relationship between the two categorical variables in a sample. This will show the relationship between the two variables in the population. The main objective of this analysis is to see which characteristics of ICT policy impacts the development of the country.

The formula for the Chi-square test is as follows:

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

χ_c^2 Chi-square

E_i Expected value

O_i - Observed value

The objective of the analysis was to study the impact of ICT policy on private sectors and education in Bhutan. SPSS version 17 is used for statistical analysis; a software package widely used and is quite popular among the researchers. Total data that are analysed is 201 (98.05%) out of 206 final collected samples for analysing the impact on private sector. Five samples were rejected as they were not complete. Secondary data from Tenzin and Bhattarakosol [37] was used to analyse the impact on

Education sector. The total sample used was 466. Conclusions from some statistical analysis were performed using descriptive statistics and general frequency distribution values.

CHAPTER 5

RESULT ANALYSIS

Results Analysis is divided into three parts:

a) Primary Data for Private sector measurement

- Category Analysis - Chi-square and Cross Tabular Data

b) Secondary Data for Education sector measurement

- Descriptive Analysis

c) Reports, Academic Papers and Newspaper Articles for Govt., Healthcare and Agriculture sector measurement

- Government, Healthcare and Agriculture Sector

It's interpreted as follows: First shows the Demographic details, Second; the Descriptive statistics and the third; Chi Square analysis

5.1. Demographic details from Primary Data

There were 206 respondents out of which 201 samples were selected. Majority of the respondents were males as compared to females.
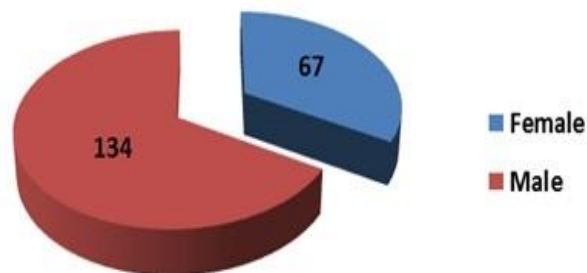
Figure 5.1 Categorization of Gender

The Figure 5.1 shows there were 134 (67%) male and 67 (33) female respondents.
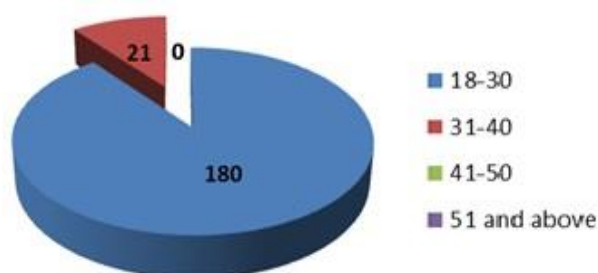
Figure 5.2: Categorization of Age

Figure 5.2 shows that 180 (90%) of the respondents were between the age of 18-30 and 21 (10%) respondents were aged between 31-40 years old. There were no respondents aged between 41-50 and 51 and above.
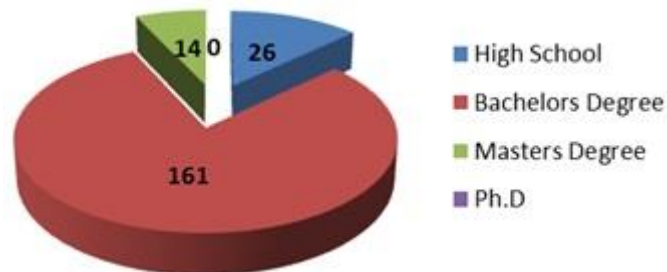
Figure 5.3: Categorization of Qualification

Figure 5.3 shows the qualification of the respondents. 161 (80%) of them had done their Bachelor's degree, 26 (13%) of them, high school and 14 (7%) of them Master's degree. None of the respondents had Ph.D qualifications.

Figure 5.4: Categorization of ICT Proficiency Skills

Figure 5.4 shows that 146 (73%) in this group are below and up to average in ICT proficiency skills. 55 (27%) of them are advanced users.
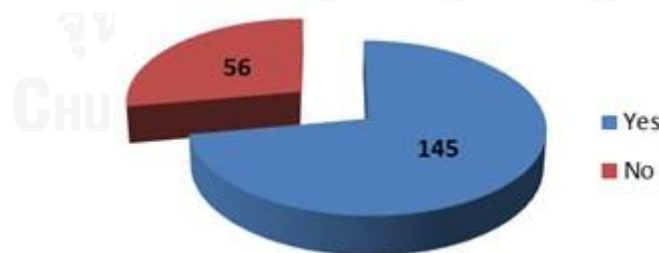
Figure 5.5: Categorization of access to High Speed Internet

Figure 5.5 shows that 145 (72%) of the respondents have access to High Speed Internet and 56 (28%) of them do not.
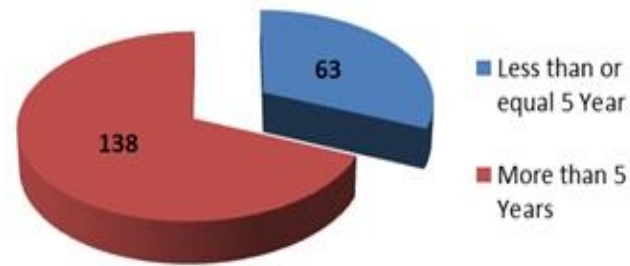
Figure 5.6: Categorization of ICT Usage Experience

Figure 5.6 shows that 138 (69%) of the respondents have been using ICT tools for more than 5 years and 63 (31%) have been using it for less than 5 years.
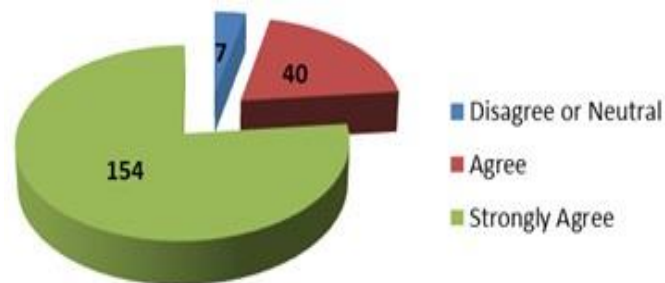
Figure 5.7: Categorization of ICT Benefits

Figure 5.7 shows that 154 (77%) of the respondents Strongly Agree that there are benefits of using ICT tools. 40 (20%) Agree upon on this as well. 7 (3%) of them are Neutral and Disagree about the benefits of ICT tools.

5.2.   Demographic details from Secondary Data

The secondary dataset consists of 466 respondents. They were Bhutanese teachers teaching in various schools spread across Bhutan.
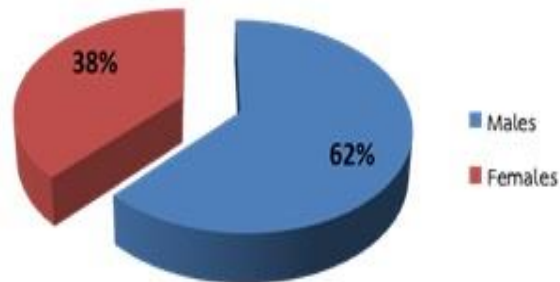
Figure 5.8: Categorization of Gender

Figure 5.8 show that the respondents in the secondary data set were 290 males and 176 females.
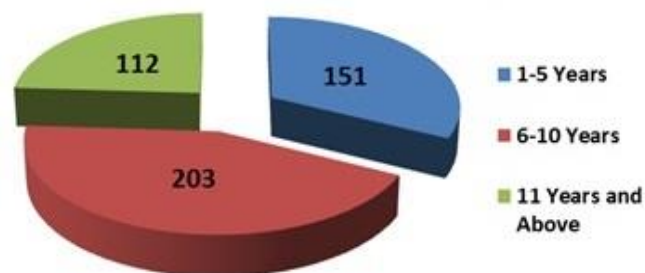
Figure 5.9: Categorization of teaching experience

Figure 5.9 show that 151 the respondents had between 1-5 years of teaching experience and 203 of them had between 6-10 years of experience. 112 of them had over 11 years of experience in teaching.

5.3. Descriptive Statistic

The fundamental result indicates that most ICT-users (76.6%) feel that ICT tools provide benefits for their daily activities.

Table 5.1: Perceived benefits of using ICT

Perceived benefits of using ICT		
Scale	Agree/Strongly Agree	Neutral/Disagree
Access new sales opportunities	90.50%	9.50%
Access markets outside Bhutan	94.50%	5.50%
Make our staff more productive	89.60%	10.40%
Enabling to reduce the number of staff we need	74.10%	25.90%
Do more to exploit the ICT investment we've already made	82.60%	17.40%
Higher profits if ICT is used better	82.60%	17.40%

Referring to Table 5.1, it is clear that most companies would like to have better market share, especially outside the country. Another expectation is to reduce working staffs and at the same time increase productivity within the existing staff number. As a consequence, the increasing ICT investment is considered for higher ICT benefits. Most of the respondents agree the better use of ICT can open up new sales opportunities outside Bhutan in the International market and also build a good relationship with the customers. 82.6% of them agree that more investments will help the company to gain higher revenue.

Table 5.2: Companies with ICT Documented Strategy

ICT Documented Strategy		
Scale	Frequency	Percent
Yes	79	39.30%
No	49	24.40%
In the process	38	18.90%
Don't Know	35	17.40%

Table 5.2 shows that although ICT users realize beneficial from their uses, the study shows that only 39% of observed companies have implemented formal documents of ICT strategy. Thus, these companies are able to plan for their ICT investment and maintenance costs of equipment. 18.9% are in the process of drafting it.

Table 5.3: Importance of ICT

Importance of ICT		
Scale	Frequency	Percent
1	3	1.50%
2	1	0.50%
3	1	0.50%
4	2	1.00%
5	7	3.50%
6	5	2.50%
7	12	6.00%
8	43	21.40%
9	46	22.90%
10	81	40.30%
Total	201	100%

Table 5.3 shows that approximately 40% graded the importance of ICT at 10 (1 being the least and 10 the highest on the scale of 10/10) and above 96.6% have graded 5 and above. The companies realize the benefits of ICT.

Table 5.4: Staffs Using Computer Daily at Workplace

Staff Using Computer Daily at Workplace		
Scale	Frequency	Percent
Less than or equal to 50%	63	31.3
More than 50%	138	68.7

Table 5.4 reflects that 68.7% of company has more than 50% employees who use computer for their daily job. Most of them are aware about the potential of the ICT and how it enhances their performances.

Table 5.5: Staff Using Internet Daily at Workplace

Staff Using Internet Daily at Workplace		
Scale	Frequency	Percent
Less than or equal to 50%	71	35.3
More than 50%	130	64.7

Table 5.5 shows that more than 50% of the employees use Internet to complete their daily task. 64.7% of the companies have staffs using Internet to daily.

Table 5.6: Investment in ICT Equipment

Investment in ICT Equipment[2]		
Scale	Frequency	Percent
Less than 1 million	23	11.4%
1-2 million	28	13.9%
More than 2 million	25	12.4%
Not Disclosed	66	32.8%
Don't Know	59	29.4%
Total	201	100%

Table 5.6 shows that as 40.3% of the companies have rated highly the importance of the ICT, 11.4% of them spent less than 1 million, 13.9% spent between 1-2 million and 12.4% spent more than 2 million in ICT equipment.

32.8% chose not to disclose and 29.4% were not sure how much they invested in ICT equipment's.

Though the companies have differed amount invested in ICT equipment's, 83.6% of these companies are having website to disseminate information.

Table 5.7 further shows that 10.4% of them are in the process of developing one and just 5.5% do not have it.

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[2] In Ngultrums

Table 5.7: Company having Websites

Company having Website		
Scale	Frequency	Percent
Yes	168	83.60%
No	11	5.50%
In the process of developing it	21	10.40%
Others	1	0.50%

Table 5.8: Future Education Trend

Future Education Trend		
Scale	Frequency	Percent
Strongly Disagree	2	0.40%
Disagree	2	0.40%
Neutral	25	5.40%
Agree	178	38.20%
Strongly Agree	259	55.60%
Total	466	100.00%

Table 5.8 shows Bhutanese teachers believe technology will be the future trend in education with 55.6% of the teachers strongly agreeing and 38.2% agreeing to the statement. Less than 1% teachers feel that technology will not be future trend in education in Bhutanese education system.

Table 5.9: Make Teaching Lively

Make Teaching Lively		
Scale	Frequency	Percent
Strongly Disagree	3	0.60%
Neutral	34	7.30%
Agree	159	34.10%
Strongly Agree	270	57.90%
Total	466	100.00%

Agreeing that the technology will be the future trend in education, 57.9% strongly agree and 34.1% agree that technology can make teaching more lively and interactive compared to the traditional teaching method. Please refer Table 5.9 for more details.

Table 5.10: Most Suitable Technique

Most Suitable Technique		
Scale	Frequency	Percent
Strongly Disagree	5	1.10%
Disagree	9	1.90%
Neutral	78	16.70%
Agree	254	54.50%
Strongly Agree	120	25.80%
Total	466	100.00%

25.8% strongly agree and 54.5% (Table 5.10) agree that technology is the most suitable teaching technique as it is makes teaching more lively and interactive. Only 3% of the teachers feel otherwise.

Table 5.11: Design Activities To Learn Through Internet

Design Activities To Learn Through Internet		
Scale	Frequency	Percent
Strongly Disagree	64	13.70%
Disagree	108	23.20%
Neutral	143	30.70%
Agree	121	26.00%
Strongly Agree	30	6.40%
Total	466	100.00%

Most Bhutanese teachers (36.9%) don't think that they can design activities to learn through the Internet (Table 5.11). This could due to lack of skills in using computer efficiently. With the Chiphen Rigphel project having been launched, it might take some time to see the results.

Other reason could be lack of good internet connection due to geographical landscapes as well as high cost of internet.

Table 5.12: Get Financial Support

Get Financial Support		
Scale	Frequency	Percent
Strongly Disagree	104	22.30%
Disagree	147	31.50%
Neutral	134	28.80%
Agree	60	12.90%
Strongly Agree	21	4.50%
Total	466	100.00%

Even though most teachers agree that technology is the future trend in teaching and despite the effort of the RGoB, the lack of sufficient funds for procuring and implementing the ICT tools in the schools are lacking. Among the Bhutanese teachers, 22.3% strongly disagree and 31.5% disagree that the school get sufficient financial support for the ICT implementations (Table 5.13). Rest of the teachers, 12.9% Agree and 4.5% Strongly Agree, that the schools get enough financial support.

The impact of not getting sufficient financial support from the government does effect the implementation of technology in aiding teaching learning process. 10.3% strongly disagree and 21.2% disagree that they get adequate hardware support. Majority of the teachers (35.4%) have a neutral thought on this with 26.8% agreeing and 6.0% strongly agreeing they get enough hardware support. Apart from hardware support some teachers (10.5% strongly disagree and 23.2% disagreeing) also say they don't get software supports which are essential in delivering the contents. 37.3% are neutral on this with 24.0% agreeing and 4.9% strongly agreeing they get the required software support.

With the hardware and software support to aid teaching, the need for technical help is essential to make sure that these tools are working round the clock. 9.7% strongly disagree and 20.0% disagree that they get proper technical help. Nonetheless 20.0%

agree and 20.0% strongly agree that they get proper technical help with 20.0% of the Bhutanese teachers being neutral.

Table 5.13: Hardware, Software and Technical Help

Scale	Get H/W[3] Support	Get S/W[4] Support	Get Technical Help
	Frequency (Percent)		
Strongly Disagree	48 (10.3%)	49 (10.5%)	45 (9.7%)
Disagree	99 (21.2%)	108 (23.2%)	93 (20.0%)
Neutral	165 (35.4%)	174 (37.3%)	126 (20.0%)
Agree	125 (26.8%)	112 (24.0%)	148 (20.0%)
Strongly Agree	28 (6.0%)	23 (4.9%)	54 (20.0%)
Total	465 (99.8%)	466 (100.0%)	466 (100.0%)

Table 5.14: Technology will Replace Teacher in Future

Technology will Replace Teacher in Future		
Scale	Frequency	Percent
Strongly Disagree	36	7.70%
Disagree	43	9.20%
Neutral	137	29.40%
Agree	171	36.70%
Strongly Agree	79	17.00%
Total	466	100.00%

Table 5.14 shows that with proper hardware and software support along with a good technical help the teachers feel that the technology can replace the teachers in the future. It is essential for a country like Bhutan with a rugged terrain and remote areas,

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[3] H/W - Hardware

[4] S/W - Software

that technology play a good part. Recently the RGoB came up with iSchool project [56, 57] where six schools were connection with the help of technology. Lessons as well as ideas were shared among the teachers and students between these schools using video conferencing tools. This could help bridge the lack of specialized subject teachers across Bhutan which is affecting the academics of the students [58]. This technology could help teachers in one location deliver a lesson to more than one class and then be accessed later. Offline education materials are also being promoted using software such as "Rigsum Sherig Collection" developed by Rigsum Institute for free distribution which is aimed to help the teachers and students [59]. This will enable the students to have access to the lessons anytime, anywhere.

Table 5.15: Look Forward to Use Technology

Look Forward To Use Technology		
Scale	Frequency	Percent
Strongly Disagree	11	2.40%
Disagree	28	6.00%
Neutral	112	24.00%
Agree	223	47.90%
Strongly Agree	92	19.70%
Total	466	100.00%

Keeping in mind the potential benefits of ICT Technology, 47.9% agree and 19.7% strongly agree that they are looking forward to use it to assist their teaching by making teaching more lively and interactive (Table 5.15).

Table 5.16: Plan to Use Technology In Future

Plan To Use Technology In Future		
Scale	Frequency	Percent
Strongly Disagree	4	0.90%
Disagree	6	1.30%
Neutral	46	9.90%
Agree	234	50.20%
Strongly Agree	176	37.80%
Total	466	100.00%

37.80% Strongly Agree and 50.20% Agree that they plan to use ICT Technology in their teaching methods in the future. Table 5.16 further shows that just 1.30% Disagree and 0.90% Strongly Disagree.

5.4. Chi-Square test Results:

5.4.1. Comparison between genders with regard to staffs using Computer daily at work

Hypothesis was framed to find the existence of association between genders with regard to using computer daily at office. Chi-square test is used to find the significant difference and validate them.

H_0: There is no significant difference in staff using computer daily at office between genders.

H_1: There is at least one significant difference in staff using computer daily at office between genders.

The results show that there is no statistical significance, X^2 (1, N = 201) = .416, p > 0.05, between male and female staffs using computer daily at office. The reason is that there is no discrimination in ICT usages between male and female in Bhutan. Therefore null hypothesis H_0 is accepted.

The Table 5.17 also shows that there is hardly difference between female (71.6%) and male (67.2%) using computer daily in the office. In Bhutan there are no restrictions for either male or female to have access to computers. All the employees are given freedom to use it.

Table 5.17: Cross-tab between Staff Using Computer Daily and Gender

Staff Using Computer Daily	Gender	
	Female	Male
Less than or equal to 50%	19 (28.4%)	44 (32.8%)
More than 50%	48 (71.6%)	90 (67.2%)

5.4.2. Comparison between genders with regard to staffs using the Internet daily at work

Hypothesis was framed to find the existence of association between genders with regard to using Internet daily at office. Chi-square test is used to find the significant difference and validate them.

H_0: There is no significant difference in staff using internet daily at office between genders.

H_1: There is at least one significant difference in staff using internet daily at office between genders.

There was no significant difference found in genders using the Internet daily in their workplace. X^2 (1, N = 201) = 1.317, p > 0.05, shows no statistical significance in this result. Null hypothesis H_0 is accepted here. Like stated earlier the male and female are given equal opportunities in every domain of economy in Bhutan.

In the Table 5.18, the company has more than 50% of the female (70.1%) and male (61.9%) using the Internet daily in the workplace.

Table 5.18: Cross-tab between Staff Using Internet Daily and Genders

Staff Using Internet Daily	Gender	
	Female	Male
Less than or equal to 50%	20 (29.9%)	51 (38.1%)
More than 50%	47 (70.1%)	83 (61.9%)

5.4.3. Comparison between companies having ICT documented strategy with regard to Investment in ICT Equipment

Hypothesis was framed to find the existence of association between companies having ICT documented strategy with regard to Investment in ICT Equipment. Chi-square test is used to find the significant difference and validate them.

H_0: There is no significant difference in Investment in ICT Equipment between companies having ICT documents.

H_1: There is at least one significant difference in Investment in ICT Equipment of a company to have ICT documents when comparing with others.

There is at least one significant difference between companies having ICT strategy document when it comes to making investment in ICT equipment. Chi square result, X^2 (1, N = 201) = 30.946, p < 0.05 shows it. Most of the private companies in Bhutan are small with few big companies.

The private companies that rely more on the power of ICT for service delivery usually have ICT documented strategy. As the document contains the guideline on the direction of the company, it allows it to make investments in ICT equipment.

Table 5.19: Cross-tab between ICT Documented Strategy and Investment in ICT Equipment

ICT Documented Strategy	Investment in ICT Equipment				
	Less than 1 million	1-2 Million	More than 2 million	Not Disclosed	Don't Know
Yes	11 (5.5%)	13 (6.5%)	17 (8.5%)	21 (10.4%)	17 (8.5%)
No	6 (3.0%)	7 (3.5%)	3 (1.5%)	21(10.4%)	12 (6.0%)
In the process	5 (2.5%)	6 (3.0%)	4 (2.0%)	14 (7.0%)	9 (4.5%)
Don't Know	1 (0.5%)	2 (1.0%)	1 (0.5%)	10 (5.0%)	21 (10.4%)

Table 5.19 shows the same with 5.5% companies (Annual investment less than 1 million), 6.5% companies (Annual investment between 1-2 million) and 8.5% companies (annual investment more than 2 million) as compared to companies without ICT strategy which makes 3.0% companies (Annual investment less than 1 million), 3.5% companies (Annual investment between 1-2 million) and 1.5% companies (annual investment more than 2 million).

Those companies who are in the process of drafting it consists of 2.5% companies (Annual investment less than 1 million), 3.0% companies (Annual investment between 1-2 million) and 2.0% companies (annual investment more than 2 million). Most companies chose not to disclose.

5.4.4. Comparison between access to High Speed Internet with regard to Qualifications

The hypothesis was framed to find the existence of association between High speed Internet and Qualification. It checks whether qualification plays a role when it comes to using high speed internet.

H_0: There is no significant difference in accessing to high speed Internet when the qualification is different

H_1: There is at least one significant difference in accessing to high speed Internet when the qualification is different

No significant difference found in accessing to high speed Internet when the qualification is different. The chi-square test shows no statistical significance in this

result, X^2 (2, N = 201) = 5.897, p > 0.05 and therefore null hypothesis H_0 is accepted here as well.

The table 5.20 however shows that there is at least one significant difference in accessing high speed Internet when the qualification is different. Table 5.20 shows that 54.7% having access to High Speed Internet are holding Bachelor's Degree as a qualification, whereas only 11.4%, holding High School Certificates and 6.0% holding Master's Degree are having access to High Speed Internet. The reason for this difference could be that most of the working population are having Bachelor's Degree as minimum qualification.

Table 5.20: Cross-tab between High Speed Internet and Qualification

High Speed Internet	Qualification		
	High School	Bachelor's Degree	Master's Degree
Yes	23 (11.4%)	110 (54.7%)	12 (6.0%)
No	3 (1.5%)	51 (25.4%)	2 (1.0%)

5.4.5. Comparison between "having access to High Speed Internet" with regard to Gender

The hypothesis was framed to check whether there exists any association between Genders when it comes to having access to High Speed Internet.

H_0: There is no significant difference in accessing to high speed Internet when the gender is different

H_1: There is at least one significant difference in accessing to high speed Internet when the gender is different

The chi square test, X^2 (1, N = 201) = .792, p > 0.05, show that there is no significant difference in accessing to high speed Internet when the gender is different. As both male and female are given equal access to resources.

Table 5.21 also supports this with 76.1% female and 70.1% male having access to High Speed Internet with just 23.9% female and 29.9% male not having access.

The reason could be that both female and male are having equal access to the ICT facilities in workplace so there exist no gender discrimination. Table 5.17 and Table 5.18 support this as well.

Table 5.21: Cross-tab between Access to High Speed Internet and Gender

High Speed Internet	Gender	
	Female	Male
Yes	51 (76.1%)	94 (70.1%)
No	16 (23.9%)	40 (29.9%)

5.4.6. Comparison between "having access to High Speed Internet" with regard to ICT proficiency

Hypothesis was formulated to test whether ICT proficiency plays a significant role when it comes to having access to High Speed Internet.

H_0: There is no significant difference in having access to High Speed Internet when the ICT proficiency is different

H_1: There is at least one significant difference in having access to High Speed Internet when the ICT proficiency is different

The result of the chi square test, X^2 (1, N = 201) = 4.980, p < 0.05, show that there is a significant differences when it comes to ICT proficiency playing a role in having access to High Speed Internet.

Howsoever, in Table 5.22, it shows that users with "Below and up to Average" (49.3%) ICT proficiency is having more access to High Speed Internet as compared to "Advanced" (22.9%) in ICT proficiency. The reason might be that most of the most of the users in Bhutan are not that efficient when it comes to ICT proficiency. Figure 5.4 support this as well. Moreover majority of the population of Bhutan are based in agriculture sector.

Table 5.22: Cross-tab between Access to High Speed Internet and ICT proficiency

High Speed Internet	ICT proficiency	
	Below and up to Average	Advanced
Yes	99 (49.3%)	46 (22.9%)
No	47 (23.4%)	9 (4.5%)

5.4.7. Comparison between having access to High Speed Internet with regard to ICT benefits and ICT proficiency

Hypothesis was formulated to test whether having access to High Speed Internet plays a significant role when it comes to ICT benefits and ICT proficiency. Two hypotheses were framed with "Having access to High Speed Internet" and "Not having access to High Speed Internet.

1. To test whether having access to High Speed Internet with regard to ICT benefits and ICT proficiency

    H_0: There is no significant difference in having access to High Speed Internet between ICT benefits and ICT proficiency.

    H_1: There is at least one significant difference in having access to High Speed Internet between ICT benefits and ICT proficiency.

The result X^2 (1, N = 145) = 6.030, p < 0.05, show that there is at least one significant difference "Having access to High Speed Internet" with regard to ICT benefits and ICT proficiency.

The Table 5.23 also shows that 50.3% of the "Below and up to Average users" and 29.0% of the "Advance" user strongly agrees to it. 15.2% of the "Below and up to Average users" and 2.1% of the "Advance" agrees to it as well. Only 2.8% and 0.7% disagree or are Neutral about it.

Having access to High speed Internet means the employees can more information and make better informed decision as Larry Page, CEO and cofounder, Google stated that it will benefit the people immensely if correct information is shared with the right people in a proper way. It will result to economic gains. In Bhutan one of the major revenue generators is tourism which relies heavily on ICT for information sharing to the outside world.

2. To test whether having No access to High Speed Internet with regard to ICT benefits and ICT proficiency

    H_0: There is no significant difference in having no access to High Speed Internet between ICT benefits and ICT proficiency.

    H_1: There is at least one significant difference in having no access to High Speed Internet between ICT benefits and ICT proficiency.

Chi Square Test show no significant difference, X^2 (1, N = 56) = 1.937, p > 0.05, when it comes to ICT benefits and ICT proficiency with no access to High Speed Internet.

Howsoever, Table 5.23 shows that even though they don't have access to High Speed Internet 55.4% of the "Below and up to Average" and 14.3% of the "Advanced" users feel that ICT still benefits them. One reason for this could be that thee employees feel that they are able to use various software's and Intranet facilities to share information and files among themselves in their offices which are more convenient than the traditional method.

Table 5.23: Cross-tab between High Speed Internet with regard to ICT benefits and ICT proficiency

High Speed Internet	ICT benefits	ICT proficiency	
		Below and up to Average	Advanced
Yes	Disagree or Neutral	4 (2.8%)	1 (0.7%)
	Agree	22 (15.2%)	3 (2.1%)
	Strongly Agree	73 (50.3%)	42 (29.0%)
No	Disagree or Neutral	2 (3.6%)	0 (0.0%)
	Agree	14 (25.0%)	1 (1.8%)
	Strongly Agree	31 (55.4%)	8 (14.3%)

5.4.8. Comparison between ICT benefits with regard to ICT proficiency

Hypothesis was formulated to test whether being more proficient in ICT will result into better ICT benefits.

H_0: There is no significant difference in ICT benefits when the ICT proficiency is different

H_1: There is at least one significant difference in ICT benefits when the ICT proficiency is different

The users who are more proficient in using ICT tools see a higher benefit from ICT. The Chi-square result, X^2 (1, N = 201) = 8.688, $p < 0.05$ shows at least one significant difference.

Table 5.24 also proves that 51.7% of the "Below and up to Average" user and 24.9% of the "Advanced" user Strongly Agree to it with just 3.0% of the "Below and up to Average" user and 0.5% "Advanced" user disagreeing about it. The people who are more proficient in using ICT tools are able to exploit more benefits from it. As Bhutan is a mountainous country, the users with good ICT proficiency are able to use it for

more gainful purposes. Using it, they can avoid having to travel to far off places and save time as well as money.

Table 5.24: Cross-tab between ICT benefits and ICT proficiency

ICT benefits	ICT proficiency	
	Below and up to Average	Advanced
Disagree or Neutral	6 (3.0%)	1 (0.5%)
Agree	36 (17.9%)	4 (2.0%)
Strongly Agree	104 (51.7%)	50 (24.9%)

5.4.9. Comparison between Gender with regard to ICT policy Awareness and ICT policy formulation

Hypothesis was formulated to test whether gender plays a significant role when it comes to being aware of the ICT policy and ICT policy formulation. Two hypotheses were framed with Female and Male being aware of the ICT policy and the agency responsible for ICT policy formulation.

1. Female who are aware of the ICT policy are also aware of the agency responsible for ICT policy formulation.

   H_0: There is no significant difference in Female between ICT policy Awareness and ICT policy formulation.

   H_1: There is at least one significant difference in Female between ICT policy Awareness and ICT policy formulation.

The female who are aware of the ICT policy are also aware about the agency responsible for framing the ICT policy. The result shows that X^2 (1, N = 67) = 13.049, $p < 0.05$, during the Chi square test.

Table 5.25 shows that majority strongly agree on both being aware of existing ICT policy and its formulating agency.

2. Male who are aware of the ICT policy are also aware of the agency responsible for ICT policy formulation.

   H_0: There is no significant difference in Male between ICT policy Awareness and ICT policy formulation.

H_1: There is at least one significant difference in Male between ICT policy Awareness and ICT policy formulation.

As in the case of the female the male too are aware of the ICT policy in place and the agency responsible for formulating it. Chi square result, X^2 (1, N = 134) = 36.165, p < 0.05 show that majority of them are aware. Both female and male who are aware of ICT policy are also aware of the agency responsible for formulating it. This could be due to having to deal with the ICT policy. Moreover Bhutan is a small country with fewer Ministries compared to rest of the world.

Table 5.25: Cross-tab between Gender with regard to ICT policy Awareness and ICT policy formulation

Gender	ICT policy Awareness	ICT policy formulation		
		Disagree or Neutral	Agree	Strongly Agree
Female	Disagree or Neutral	9 (13.4%)	13 (19.4%)	7 (10.4%)
	Agree	2 (2.99%)	13 (19.4%)	14 (20.9%)
	Strongly Agree	0 (0.0%)	2 (2.9%)	7 (10.4%)
Male	Disagree or Neutral	16 (11.9%)	20 (14.9%)	6 (4.5%)
	Agree	3 (2.2%)	33 (24.6%)	29 (21.6%)
	Strongly Agree	1 (0.7%)	8 (6.0%)	18 (13.4%)

5.5. Discussion on ICT in Government

ICT enables the government to change the way it runs. It will make the processes more efficient. Government has decided to automate the office processes by deciding to adopt GoogleApps and move to e-governance [60]. Moreover as per the new plan, e-GIF (electronic government interoperability framework), would allow information sharing among the agencies in the government targeted for good governance and as well as eradicate the incompatibility issue in sharing of information [61].

5.6. Discussion on ICT in Private Sector

Many countries feel that ICT has the potential to lead the country towards enhancing the economic growth. It enables the companies to connect with the broader market and become more competitive. It is thought that it will increase the productivity and efficiency of its employees as well. One desired outcome as per the governments

master plan is to help develop the ICT industry and promote its usage among the private sector. As the private sector is one of the major sources of employment in Bhutan, the Prime Minister of Bhutan, Lyonchhoen Tshering Tobgay during one of the summit between the leaders from Government, Business and Civil Society, Better Business Summit said that "development of private sector growth should be given serious thought" and that the ICT sector has the potential to provide huge opportunity [62]. This was echoed by the president of Bhutan Chamber of commerce and Industry, Ugen Tshechup and he added that private sector will soon be the main employing sector of university graduates [63]. The need for government to help diversify the economy through policies favouring private sector was highlighted. Countries such as US and India have been doing that for a while. Example in India, e-commerce industry has taken a major leap and is worth $3.1 billion annually [64].

5.7. Discussion on ICT in Education Sector

The governments and private sectors are investing lots of budget on education technologies. In case of Bhutan, ICT can play a major role because of the geographical terrain. Being one of the least developed countries, many of the schools are located in remote areas of Bhutan. As most of the schools face shortages of quality teachers, ICT can be an answer to this problem. There has been much initiative by the government to integrate ICT tools in the education system. Recently a project called "iSchool" was launched connecting 6 schools out of which few are located in the remote area. The teachers already feel that this technology is helping them share knowledge with teachers. Teachers are being able to teach a particular subject to more than 100 students seated in a classroom spread over 6 schools across Bhutan [57].
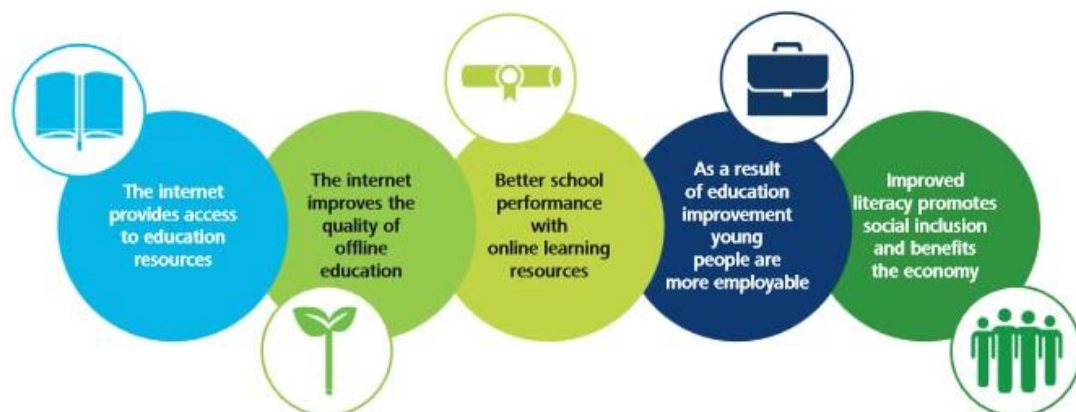
Figure 5.10: How Internet and Technology help in Education [65]

One of the ICT tools is the "Internet". The benefit of the Internet in the education system can be seen in the figure 5.10 above. As the fibre optic connection is already across all the dzongkhags of Bhutan, this iSchool project could help the students receive a quality education. One reason mentioned in the fourth annual report reflected that one of the many reasons that youth quit school linked with access to school, like having to walk long distances [66]. ICT could help bridge this problem by making online and offline classes available in the near future. So far no data for IT literacy are available for the schools and tertiary educational institutes at the moment [67].

Figure 5.11: Student using learning stations from Hole-in-the-Wall Project

5.8.   Discussion on ICT in Health Care

The integration of ICT in health care system has been long thought by the government. As the state provides health services to the people for free [68], it intends to provide the best service it can offer. Bhutan already faces a shortage of health specialist and have to recruit from other neighbouring countries [69], so the integration of ICT becomes pivotal. Considering such shortcoming, Telemedicine project was initiated in the year 2000, with the aim to provide medical consultation by the health workers based in remote areas. Such a program by the Government of Maharashtra (India) enabled the process of diagnosis by seven times in three year with increase in the number of patients reached [65]. As per the Health ICT Masterplan, the government already has plans to automate the whole process of service delivery and make it a web-based system as well as other ICT projects such as Hospital Information System, Web based Bhutan Medical Supplies Management System (BMSMS) etc. [21]. Estonia is one such example where it has made the health

care services online [70]. Bangladesh, which share similar economy with Bhutan, has already seen the benefits of implementing ICT in health care system [71].
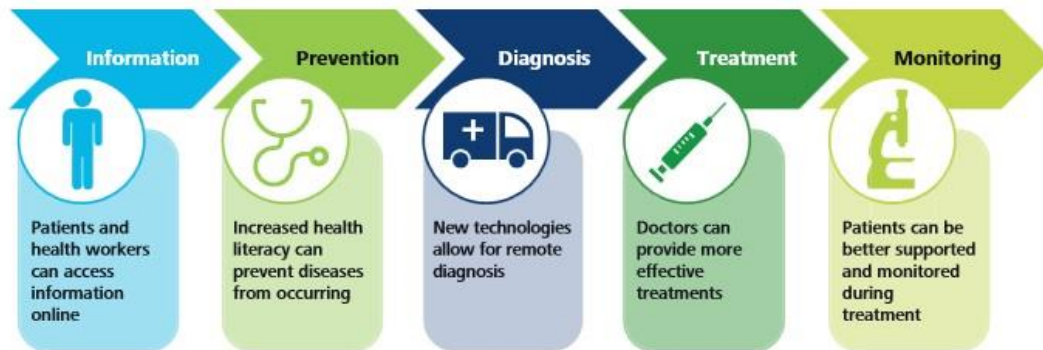
Figure 5.12: How internet and technology enables Health Care System [65]
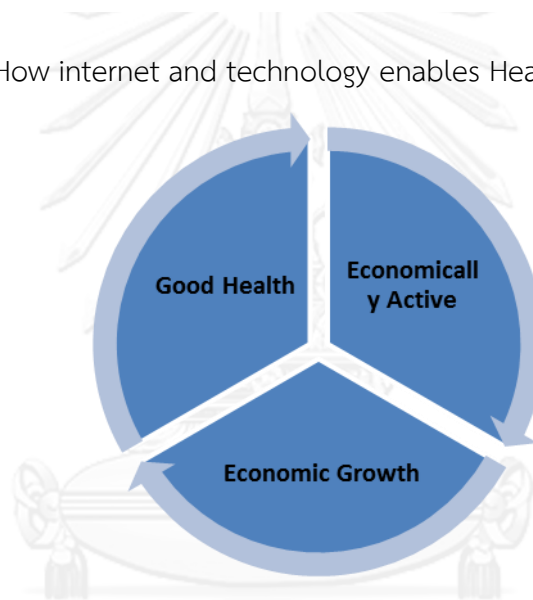
Figure 5.13: ICT in Health Sector [72]

The Figure 5.11 shows how Internet technology plays a part in health care system. When the population of a country enjoys a good health, they are bound to be more economically active and thus contribute more to the growth of the economy. Figure 5.12 shows the cycle of it.

5.9. Discussion on ICT in Agriculture Sector

In the recent summit titled "Better Business Summit", agriculture was given more importance. It is already one of the major providers of livelihood to more than half of the country's population. With the vision to achieve food security and self-sufficiency by 2020, government has already started to focus in achieving this vision. ICT plays a role in enabling this sector by helping provide information to farmers

such as the better and latest market rates for their produces thus removing the need for intermediate people, provide better quality hybrid seeds through researches [54] [55] as well as timely weather reports.

Figure 5.14: Farmer using a mobile phone

5.10. Global Impacts
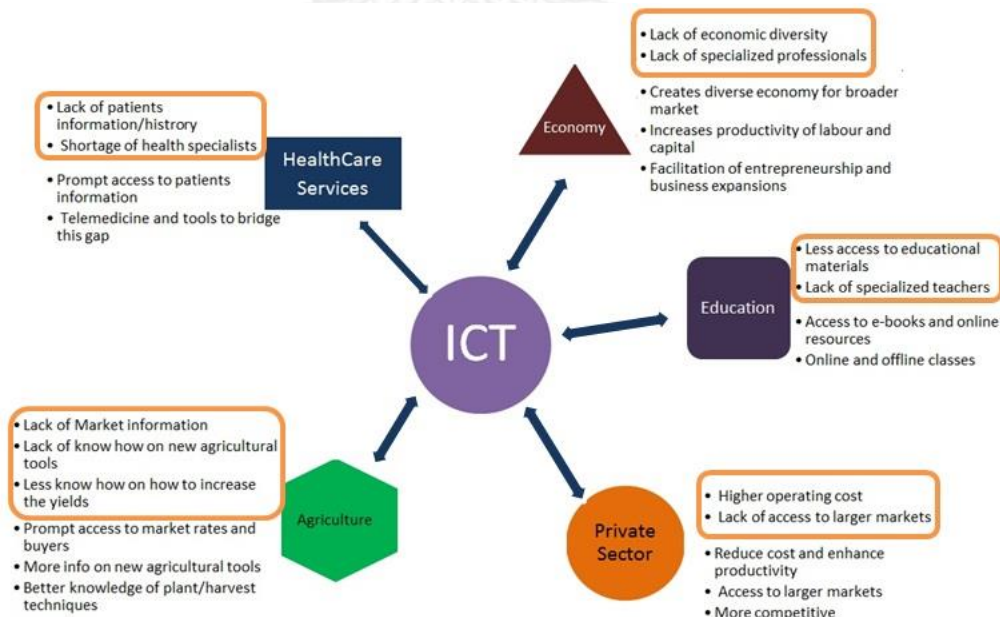
Figure 5.15: Positive impacts of ICT in Significant Areas of Bhutan

Note: The highlighted points in the box shows the problems and positive impacts of possible are drawn followed by it.

The Economy of Bhutan is dependent on the grants given by donor countries, of which India is a major contributor. Apart from this, the country's main revenue generation comes from hydro power projects and tourism with other sectors contributing quiet little to it. The challenge the government is facing at the moment is the lack of economic diversity unlike other countries with a limited outlet of generating revenues. Other reason was the lack of specialized professionals in various sectors. Upon seeing ICT being an engine of growth in this century, Bhutan in consultation with the World Bank, initiated a project called Thimphu Tech Park in the hope of diversifying the economy and creating more channels for fund generation. ICT as a tool is believed to enhance the productivity of the labour and capital. This can also facilitate better entrepreneurship and business expansion through economic diversity.

As a part of an economy, the private sector also faces problems such as high operating costs and less access to larger markets. ICT tools enable the company to reduce operating costs through efficient use of resources and increasing the worker productivity. Hence the company is able to have access to larger markets and become more competitive which is possible through more economic diversity.

The Education sector plays a big role as the better literacy rate of the population creates more employable people. Currently, Bhutan lacks proper access to educational materials as such as textbooks and other materials (based on traditional teaching method) as Government has to print new one annually due to various reasons. It takes a toll on the limited government's budget. Moreover, apart from these teaching materials, the students tend to leave schools due to lack of subject specialized teachers. ICT Technology bridges this gap by providing the easy availability of e-books and online resources. It also solves the problem of shortage of specialized teachers up to some extent as ICT tools enable the students have online classes as well as offline classes through access to prerecorded videos of the lessons taught in other schools.

Since 2004, the number of people engaged in agricultural sector has been dropping down. As of 2011 more than 60% of the Bhutanese population are engaged in

agricultural sector and it has become one key area where gainful employment is seen a good option. Since the youths are migrating to urban areas in the hope of finding a better job, these problems can be associated with lack of proper market information as youths believe that working in the farm does have enough gain. Other possible could be that they think farming takes a lot of efforts and also they don't have sufficient know how. The use of ICT in this case can help change this perception. In the past, the farmers lost a significant chunk of money to the middleman to whom they sold their products. Now with all the technologies in place, the farmers can easily gain access to the best market prices as well find the right buyers without having to lose money. Moreover, with the improvement in the development of new agricultural tools, the amount of efforts required is quite reduced. The access to online information can also help the farmers to find ways to increase their yields and also find weather reports so that they are able to make the best decision as to which crop to plant/harvest.

Apart from all these sectors, the health care sector also plays a crucial role in the development of the country. More and more ICT tools are being engaged in medical technology and employed in service delivery as well. As the health of an individual is important for him/her to enable to work at the optimum level, ICT plays a good role in better service delivery. Currently in Bhutan, there is no Patient Information Management System in place and as the medical history of the patient is quite vital, the use of traditional method of using paperwork's proves cumbersome for both the patient as well as the health personals. And to add up on this problem, the shortage of health personals doesn't quite make it better. ICT tools can enhance faster service delivery using Patient Information Management System by letting through online access to patient's history by concerned health personals working across Bhutan. This will not only save resources but provide fast and accurate information on the patient's medical history which is vital information for the doctors who is diagnosing the patient. Bhutan with its already depleted health personals can make use of ICT tools such as telemedicine and provide remote consultation services or help to other junior medical staffs posted in various pockets of Bhutan. This will again save time and resources as the doctors can be virtually present in multiple locations and share his expertise.

Bhutan has just started implementing ICT and the future looks bright, just as the Minister of Information and Communication stated that "ICT is the future". Having said that, the guiding ICT policy of the country needs to be strengthened, its

loopholes checked and covered periodically. On top of this the study on ground reality on how this policy is functioning needs to be done as well.

CHAPTER 6

CONCLUSION

Since ICT becomes an important tool worldwide for every sector, billions of dollars are being invested in this sector in the world. Bhutan is another country in Asia that just started implementing ICT to support the economic growth and as well as become competitive along with the rest of the world. Although many countries in Asia are moving to mobile business, Bhutan just begun to move towards the implementation of ICT in private sector, education, health care, agricultural and government as well. Thus, it is at early stage and not every sector in Bhutan has implemented ICT tools to support their services and activities optimally. Nevertheless, the ICT growth rate in the country is rapidly stepping up since the government realizes the significance of ICT tools towards the development of the country [73]. Tobgay and Sonam [16] had also pointed out for the need of ICT infrastructure development.

The government being the pioneer in formulating the policies have come up with a new E-government Masterplan with a vision of achieving "An ICT-Enabled, Knowledge-Based Society as a Foundation for Gross National Happiness" [21]. The Minister for Information and Communications Ministry, Lyonpo D. N Dhungyel stated that "ICT is the future". He further stated that ICT will empower the people. Believing in the potential of ICT, the government has already started various projects, Chiphen Rigphel, Thimphu Tech Park and other ambitious government projects [74] aimed to promote ICT as an enabler towards knowledge economy. The government has already set up fibre optic cables throughout the country [75] to improve connectivity and provide services such as G2C (government to community), G2B (government to business) etc. through CEC (Community E-Centre). Whole 20 dzongkhags (districts) of Bhutan are connected to cellular mobile services [76, 77].

The private sectors in Bhutan are at an early growing stage and rely heavily on the government. The studies have shown that people are more aware of the ICT policy in place and that 39% of the companies have developed their own ICT strategic plans in line with the government. Another 18.9% are in the process of drafting it. The company with ICT strategy tend to spend more on ICT equipment's. The private sectors realize the importance of ICT and have more staffs using computers and the internet at the workplace daily. In addition, people in business organizations have higher chances of using ICT tools to enhance their working skill, increase their working

capacity, and provide chances for global contact with other countries. 83.6% of the companies already have websites.

The study also shows that the group with better ICT skills are able to benefit more from using ICT tools as compared to others. It also shows that the 39% of the companies with ICT strategic documents are able to analyse, plan, and implement better ICT tools and equipment than others who do not have one. As IT is new phenomenon in Bhutan, former MoIC (Ministry of Information and communication) Minister of Bhutan, Nandalal Rai [17, 78] said that both the government and private sector lack required IT professionals to exploit the benefits optimally given that ICT can help create diverse economy. This can create more employment opportunities. Economic diversity was one of the main agenda during the Better Business Summit held in Bhutan [79].

The study also reveals that Bhutanese teachers are more enthusiastic about using ICT as a tool in their teaching and methodology (47.9% agreeing and 19.7% strongly agreeing to it). 54.5% agree and 25.8% strongly agreeing that these ICT tools can make teachings more informative. There have been several initiatives from the government like training the teachers in ICT, to equip the teachers with ICT knowledge and iSchool, connecting schools etc. As Bhutan is geographically isolated with a rugged terrain, technology can help bridge the shortages of teachers through the initiatives or replace the teachers (36.7% agree and 17% strongly agree) through of the use of technology such as iSchool. Nonetheless, the school lack the required fund as pointed out by majority of the teachers (31.5% disagree and 22.3% strongly disagree that schools get adequate funds) though the teachers (54.5% agree and 25.8% strongly agree) that it is the most suitable technique. Countries like Estonia have already integrated ICT in the education system [70].

The Health ICT Masterplan has several projects lined up for the future to make health care services online. For a country like Bhutan with a shortage of doctors already, technology can play a huge role. As of now some of the BHU's (Basic Health Unit) and few hospitals are connected with Telemedicine facilities. The access to the right information is vital in health care services as time is of utmost importance. Technology can help save lives or give timely health care services in the absence of health personnel as in the case of Ghana [80]. Bangladesh, the neighbouring country of Bhutan also successfully integrated ICT in Health care services [71].

Agriculture being a major livelihood support of most people is being given more importance lately. It was a major contributor to GDP in the past. The need for

developing an information system for agriculture has been noted in the e-government masterplan. ICT tools such as mobile phone connectivity can help the farmers get better rates for their product, make online payments without having to travel etc. as well as get weather reports [81].

So far the policy that had been in place until now seems to point to an impact on sectors such as Private and Education sector. Though the agricultural sector has been performing well in terms of productions targeted towards food security and sufficiency [82], there isn't enough evidence of ICT playing enough role in it. Also not much progress has been noted in case of Health care service in the implementation of ICT. Nonetheless, with the new e-government in place for the 11th Five-Year Plan (11FYP), much importance has been given to the development and implementation of ICT [83] [74].

To see the proper impact of ICT policy on the development of the country, more studies need to be conducted later. Wangwe [6] and Cerquera et al. [7] stated that time should be given for the investments on ICT to payoff and also that other factors should be favourable as well.

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APPENDIX

SURVEY QUESTIONNAIRE

1. Gender:

- Male
- Female

2. Age:

- 18-30
- 41-59
- 31-40
- 60 and above

3. Qualification:

- High School
- Ph.D.
- Bachelor's Degree
- Others _____
- Master's Degree

4. Do you have access to ICT tools at the Organization? (You can select more than one option).

- Telephony
- Computers
- Cable
- Internet
- Satellite
- Software Applications
- TV and Radio
- Others _____

5. Proficiency in level in using ICT Tools:

- Unfamiliar (I have no experience in using ICT Tools)
- Beginner (I am able to perform basic functions in a limited way)
- Average (I demonstrate general competency in using ICT Tools)
- Advanced (I have acquired the ability to competently use ICT Tools)

6. Access to High speed Internet?

- Yes
- No

7. How long have you been using ICT tools (Tools as mentioned above)?

- < 1 year
- 1-3 years
- 3-5 years
- > 5 years

8. ICT Tools helps improves the quality of work in my Organization?

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

9. Please select the most appropriate answer for each question.

Question	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
I would recommend others to use ICT Tools to accomplish their tasks?					
I know about the currently adopted ICT policy?					
I know which agency is responsible for the formulation of ICT Policy in our country?					

10. Considering the benefits of your use of ICT, to what extent do you agree with the following? (Please tick the appropriate option that best expresses your view).

No.		Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
1	It is helping us to access new sales opportunities					
2	It is helping us to access markets outside Bhutan					
3	It is helping us to improve the way we interact with					

	customers					
4	It is helping to improve customers' perceptions of our business					
5	It is helping us to improve the products/services delivered to customers					
6	It is helping us to improve the way we interact with suppliers /partners					
7	It is helping to make our staff more productive					
8	It is enabling us to reduce the number of staff we need					
9	It is helping us to keep better control of our finances					
10	If we had invested significantly less effort and money in ICT, our competitive position would have suffered					
11	We could do more to exploit the ICT investment we've already made					
12	If we were better at exploiting ICT, our profits would be higher					

11. Does your firm have a website?

- Yes
- No
- In the process of developing it
- Others (Please specify_____)

12. Which of the following information technology applications does your firm use at the site? (You can choose more than one option but please provide the number of importance... Let 1 be the most important item for you)

- Email
- The internet [the worldwide web]
- Voice over IP [which allows you to use an internet connection for cheap or free telephone calls]
- Specialist software such as CAD/CAM [Computer Aided Design/Manufacture] applications, project management software or geographic mapping software]
- Remotely hosted applications and software
- Online ordering of products or services from suppliers
- An intranet [internal websites for firm's own use]
- Computerized accounting systems [systems for recording and monitoring your firm's finances]
- Systems for sharing documents [for example, on a shared drive or on an intranet]
- Systems for sharing customer information [for example customer relationship management or contact management systems]
- Systems to handle order processing [systems for recording and monitoring customer orders]
- Computerized stock control systems [systems for recording and monitoring stock levels]
- Supply chain management system [systems controlling the flow of products, information and finances between you and your suppliers or between you and your customers]

- Human resource management systems [including in-house payroll systems]

- Enterprise Resource Planning systems [integrated software packages with various modules for managing activities such as customer service, stock control, supply chain management etc.]

- Remote access to your internal systems [e.g. allowing staff to access systems from home]

13. Approximately what percentage of people at your site use computers every day as a routine part of their job?

- <10%,
- 10-30%
- 40-60%

- 70-90%
- 100%
- Don't know

14. Approximately what percentage of people at this site use the internet [that is the web or email] everyday, as a routine part of their job?

- <10%,
- 10-30%
- 40-60%

- 70-90%
- 100%
- Don't know

15. Who provides your IT support.at your work place? (You can select more than one option).

- Internal IT professionals
- An internal IT enthusiast
- An external service provider
- Equipment provider(s)

- No-one
- We don't have any IT support
- Others_____

16. Approximately how much has your firm spent on ICT equipment, software, support and services at this site over the last 12 months? (Investment in Nu...)

- < 1 million
- 1 million – 2 million
- < 2 million

- Not disclosed
- Don't know

17. Does your firm have a documented ICT strategy?

- Yes
- No
- In the process.
- Don't know

18. Overall, how important do you consider Information Technology to be to your business, on a scale of 1 to 10 (where 1 is not at all important, and 10 is critically important)?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

19. Which of the following tend to inform or influence your investment decisions on ICT? Just to remind you: "ICT" includes computers, software, IT support, internet access connectivity (including broadband), websites and fixed and mobile telephony. (You can select more than one option).

- Advertising or direct mail
- Articles in the press
- Views of new recruits
- Consultants
- Discussions with customers
- Discussions with competitors
- Discussions with suppliers
- Discussions with firms in other sectors
- Discussions with friends or relatives

- Government websites

- Research on the internet

20. Which of the following tend to deter you from making investments in ICT, or delay your ICT investment decisions? (You can select more than one option).

- Lack of up-to-date information on what is available

- Low levels of IT awareness/understanding of managers

- Lack of time to assess what the firm should invest in

- Difficulty getting advice

- Uncertainty over the benefits to the business

- Uncertainty over which supplier, product or service to use

- Difficulties getting agreement within the firm

- Concern over the costs

- Concerns on security (hackers, viruses etc.)

- Concern over the integration with existing systems

- Concern over implementing changes to business processes

- Concern over staff skills

- Concerns over the need for training current staff

- A high turnover of staff, with concerns over training new staff

- Concerns over ongoing technical support

- ICT not seen as important for our business

21. What sort of support do you think government agencies could provide that would help firms like yours get the most out of ICT? (You can select more than one option).

- Information on the web about ICT

- A telephone helpline

- Workshops, seminars or other events about ICT

- Demonstration facilities

- Free reviews/audits of businesses' ICT systems

- Impartial help in identifying suppliers

- Support in training staff

- Free or subsidized consultancy

- Grants for equipment or software

- Tax breaks for ICT equipment or software

- Don't know

- Other (please specify)_____

22. What could the ICT industry do better to help itself? (You can select more than one option).

- Better understanding of business needs

- Better trained sales staff

- Better information on the web

- More appropriate software products for our sort of Business

- More appropriate hardware products for our sort of business

- Lower prices for ICT products and services

- High bandwidth affordable broadband services

- Free reviews/audits of businesses' ICT systems

- Other (please specify) _____

- Don't know

23. Please share your comments and suggestions on the ICT Policy that is currently adopted in Bhutan

VITA

Jeevan Gurung was born in Chukhha, Bhutan. He holds a Bachelor's Degree in Computer Application.

He has working in the College of Science and Technology for the past three years and has served in the capacity of an Assistant Lecturer in Information Technology Department in the past and now serves as the ICT focal person.