Bhutan ICT HRD Master Plan and Strategies 2007 (BIHMPS)

Version 4.0

Royal Government of Bhutan

Department of Information Technology,

Ministry of Information and Communication

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Executive Summary

The objective of Bhutan ICT HRD Master Plan and Strategies (BIHMPS) is to enable Bhutan to become a knowledge-based information society. It is closely aligned with key strategy documents like the Bhutan ICT Policy and Strategies (BIPS), Good Governance Report and; targets to provide support on the Human Resource Development (HRD) aspects to the strategic intent and objectives set out in these strategy document.

The master plan, intended to be relevant for a period of five years, has been developed using a consultative approach with stakeholders taking into account the specific context and needs of the country. It, however, must evolve during implementation based on developments both internal and external to Bhutan.

This master plan document is divided into five chapters.

Chapter 1 presents a brief background on Bhutan and its milieu.

Bhutan has identified Information and Communications Technology (ICT) to be one of the key vehicles for its development and growth. Chapter 2 focuses on the key developments and initiatives in the field of ICT in Bhutan. It also emphasizes the role of ICT in delivering the objectives of good governance. ICT can play a role both as an enabler as well as revenue generating export and domestic industry. Development of ICT is closely linked to development of the private sector in Bhutan. The chapter concludes that ICT presents a key challenge as well as an opportunity for Bhutan and its development.

In chapter 3 is presented a study the different contextual HRD aspects for ICT in Bhutan including shortage of ICT professionals, its access to a large pool of ICT professionals and underutilization of the existing ICT professionals. The interesting co-existence of such factors also presents some pointers to HRD solutions. The chapter also focuses on the key role of school & tertiary education and professional trainings.

BIHMPS is developed around a set of core areas that can leverage the potential of existing ICT professionals as well as create new capabilities. It encompasses the government, semi-government and private sector institutions. The components of the master plan are presented in chapter 4. They vary in their scope from being immediate to long term; very specific to more of a strategic intent; obvious to innovative, incremental to game changing; and those leveraging the current structures to those demanding structural changes. But they all target the larger objective of developing Bhutan into a knowledge- based information society. In conclusion, the initiatives at the school level, tertiary education levels and pre-service & in-service training levels along with ensuring that the scarce ICT human resource in the country is leveraged in terms of its potential holds possible answers to Bhutan leveraging the ICT opportunity and overcoming the unemployment threat amongst others.

Chapter 5 presents the operational strategies based on the plans developed in the previous chapter. This chapter must be read in conjunction with a separate document 'BIHMPS Detailed Operational Strategies' which goes into further details of the operational strategies presented in chapter 5.

The annexures provide details and explanations on some of the issues taken up in this master plan document. Many of them also provide the essential links between the HRD master plan and strategies and the national strategies of Bhutan in ICT and other areas- the Bhutan ICT master plan and strategies (BIHMPS) isn't a set of suggested direction in isolation, but is coherently tied to the key national strategies and their realization.

Abbreviations

BCCI	Bhutan Chambers of Commerce & Industry
BICMA	Bhutan Information, Communication and Media Authority
BIPS	Bhutan ICT Policy and Strategies
BIHMPS	The Bhutan ICT Master Plan and Strategies
BPO	Business Process Outsourcing
DIT	Department of Information and Communications Technology
FDI	Foreign Direct Investment
FYP	Five Year Plan
GRAB	Gewog Rural Amitshu Bank
GNH	Gross National Happiness
HC	Human Capital
HRD	Human Resource Development
ICT	Information and Communications Technology
IHCD	ICT Human Capability Division
JD	Job Description
KM	Knowledge Management
KPO	Knowledge Process Outsourcing
KRA	Key Result Area
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoEA	Ministry of Economic Affairs
MoIC	Ministry of Information and Communications
MoF	Ministry of Finance
MoFA	Ministry of Foreign Affairs
MoH	Ministry of Health
MoHCA	Ministry of Home and Cultural Affairs
MoLHR	Ministry of Labour and Human Resources
MoWHS	Ministry of Works and Human Settlement
NASSCOM	National Association of Software and Services Companies
PCS	Position Classification System
PMS	Performance Management System
RCSC	Royal Civil Service Commission
RGoB	Royal Government of Bhutan
RUB	Royal University of Bhutan
TNA	Training Needs Analysis

Chapter 1: Introduction

1.1 Background

Documents like the Bhutan ICT Policy and Strategies (BIPS), Good Governance Report, and Bhutan as an IT destination strategic paper provide a very comprehensive analysis of the socio-cultural-economics of the country in their context-building sections.

Bhutan is a country that is small, isolated, landlocked and with rugged mountain terrain with altitude varying from plains to over 7000 meters. The 6,72,425 population[1] lives mainly in valleys with sparse distribution in mountains. The travel between places is difficult and time consuming. 69% of the population lives in rural areas and is dependent on the Renewable Natural Resources (RNR) sector. The country embarked on a rapid process of modernization with the first Five Year Plan (FYP) in 1961.

A Buddhist kingdom with rich and unique cultural heritage, under the leadership of His Majesty King Jigme Singye Wangchuk, Bhutan has pursued a unique development philosophy of 'Gross National Happiness' (GNH). The unifying concept of development in Bhutan is this distinctive philosophy of maximizing GNH with the individual at the centre of development. The concept of GNH gives direction to development policies and has four objectives (The four pillars of GNH are the promotion of equitable and sustainable socio-economic development, preservation and promotion of cultural values, conservation of the natural environment, and establishment of good governance).

Natural growth of population is about 1.3% per annum.

Currently, Bhutan is at the end of the 9th FYP (2002-2007) and preparations for the 10th FYP (2008-2013) are in full swing with primary focus on infrastructure development and employment generation. According to the Bhutan NHRD Report 2007, Forty years of planned development has witnessed very impressive performance. Macro economic fundamentals are very strong and overall development is positive. GDP growth has been 7.8% per annum during 2000-2004. Per capita GDP in the year 2005 at year 2000 prices was Ngultrum 45,937 (or about USD 1020 USD although in PPP terms it should be about USD 2520).

While the country has witnessed improvement in quality of life parameters including increased access to health and educational services, better communication and electricity services, declining natural rate of growth of population and increased life expectancy, the economy is still in infancy. Only a minority of Gewogs is connected by road and the economy is not yet fully monetized. RGoB has been the main driving force behind the nation's economic development. Private sector's presence is yet to be felt significantly. Employment generation and overall development will have to rely heavily on micro level interventions.

The challenges faced in undertaking these micro level interventions are skill shortage, over-supply of literate but unskilled labour force, rural urban drift, few understaffed Vocational Training Institutes (VTIs), aspirations for white collar jobs along with availability of cheap labour from across the border.

[1] Population & Housing Census of Bhutan 2005, www.bhutancensus.gov.bt

Developing not just technical skills but also the behavioral ones is one of the challenges in addressing issues of unemployment.

Realizing that the private sector may not be in a position to make investment in HRD, RGoB has been establishing a range of institutions. Labour Force Participation Rates (LFPR) is .4885 and .3212 for males and females respectively. Open unemployment is low at 2.5% but under employment is very high.[2]

1.2 Overall Objective and Purpose of the Project

The objective of this project is to develop the Bhutan National ICT HRD Master plan.

The National ICT HRD Master plan will address the issue of ICT Human Resource requirements of Bhutan in aspiring towards becoming a knowledge-based information society taking into account the needs of the country comprehensively including the government and the semi-government organizations, the private sector, research & educational institutions, and general public at large. This project on developing the Bhutan National ICT HRD Master plan is an initiative that both emerges from and will contribute to implementing the Bhutan ICT Policy and Strategies (BIPS) and national development program of Royal Government of Bhutan successfully.

The implementation strategies are designed with the following specific objectives in mind:

a) To address issues of lack of qualified people and the limitations in ICT education in the country,
b) To accelerate the number of IT graduates with Bachelors & Diploma programs,
c) To fast track the ongoing development through in-service training and educational opportunities by leveraging special courses with the appropriate universities and special firms in the region and elsewhere.

1.3 Project Process and Activities

This project followed a 4-stage process.

Note: * The second and third steps were iterative.

The detailed process steps are included in annexure 1.

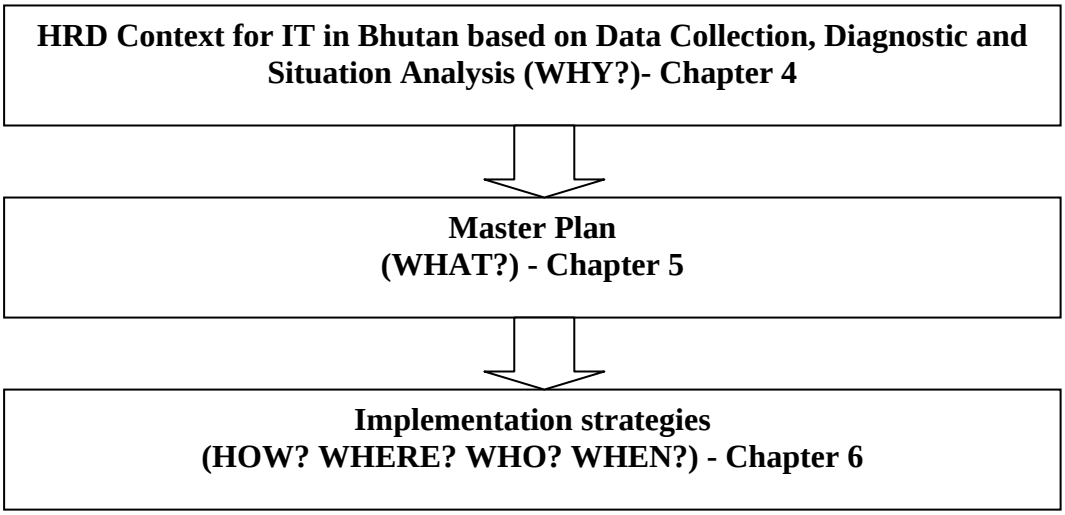
Based on the process outlined here, the following activities were undertaken:

[2] Bhutan National Human Resource development Report 2007,

- Holding a series of meeting with representatives from different stakeholders organisations and institutions. The list of stakeholder organisations interacted with and invited to the participatory processes is included in annexure 3.
- Reviewing the relevant documents and information on related aspects. The list of documents and reports referred to is included in annexure 4.
- Organising two stakeholder workshops (including a finalisation workshop) and an Inter-ministerial HR workshop.
- Analysis of skill development needs by skill areas, by level and duration of course for requirements in the area of ICT as an enabler and ICT as an industry. The skill needs list is included in annexure 5.
- Discussions with IT training companies in neighbouring India to arrive at a list of key ICT skills required for building a strong competence in the ICT domain. Analysis was also carried out using the course curriculum of some of the major regional training companies.
- Analysis of the ICT curricula currently being used at IIT Delhi for graduate level course with an objective to make value adding recommendations for curricula in IT graduate level courses in Bhutan.

1.4 Outputs and Structure of this document

The output of this initiative on ICT HRD Master Plan development is presented in the form of answers to 6 questions Why, What, Who, When, Where and How (5W + 1H)-structured along the format given below:



1.5 Duration and work Schedule

The project began on June 10, 2007 and was completed on Dec 3, 2007. The detailed work schedule is included in annexure 2.

Chapter 2: Bhutan and Information & Communications Technology (ICT)

This chapter focuses on the key developments and initiatives in the field of ICT in Bhutan. It also emphasizes the role of ICT in delivering the objectives of good governance. It brings out the challenges of developing ICT as an industry in the present national context. It concludes by reiterating some pointers for addressing the key HRD challenges in the area of ICT in Bhutan.

The key aspects presented are as follows:

- Major ICT Initiatives in Bhutan in the last few years
- ICT - a key component of Bhutan's growth journey
- ICT and Good governance
- ICT as an enabler or ICT as an industry
- ICT and private sector in Bhutan

Based on the above, some key pointers for HRD in the ICT domain in Bhutan are presented.

Major ICT Initiatives in Bhutan in the last few years

Although Bhutan was a relatively late entrant to the ICT world, it has made rapid progress in the last few years. Ministry of Information and Communications (MoIC) was established in 2003 as the lead agency for development and coordination of sector policies, plans and programmes. Department of Information Technology (DIT) within MoIC leads this effort.

The following table based on Druknet data, provides a overview of ICT activity in the country

Internet users	25000
Druk e-mail account holders	13000
.bt websites	139
.bt domain names	247
PCs	10000 (35% on internet)

Bhutan Telecom Limited had a subscription based of 30,000 land line, 110,000 mobile and 5000 internet subscribers by July, 2007.

Annexure 14 (ICT Projects in Bhutan) lists some of the ICT projects being planned and taken up in Bhutan up as on July 1st, 2007.

ICT is seen as a key component of Bhutan's growth journey

In the foreword to Bhutan ICT Policy and Strategies (BIPS), July 2004, The Prime Minister emphasizes the potential of ICT for farmers, operations of government institutions and their services, political evolution, decentralization, private sector development and children.

The Minister for Information and Communications makes a specific mention of, in his message, the role of ICT in balanced sustainable development and enhancement of Gross National Happiness for Bhutan and its citizens in the same strategy document. He describes the impact ICT could create for rural communities and different sectors.

It is planned to have 10 telephones per Gewog by 9th Five Year Plan i.e. at least 1 telephone per village (Bhutan has approximately 2000 villages).

According to BIPS, by 2010, 75% of all services must be provided online.

ICT can play a critical role in Bhutan's growth journey.

ICT and Good governance

The good governance aspirations of the country have been expressed through the Good Governance Report, 2005. The focus is on transparency, accountability, efficiency and professionalism.

ICT has been recognized as an important vehicle for implementing good governance practices.

Annexure 15 (Good Governance Report 2005: Implications and directions for ICT in Bhutan) lists some of the key aspects of the report that have a direct implication for ICT development.

ICT as an enabler or ICT as an industry

Number of enrolments in Bhutan in Schools in 2005 was 1,60,000.[3]

According to Ministry of Education (MoE) presentation to the Council of Cabinet Ministers (CCM) on May 9, 2006 on Quality of Education (Standards), the number of students enrolling into XII standard in the year 2005 was 3687 and in the 10FYP, the number of students in secondary school will increase (from 45332 in 2007) by 32% in 2012.

Enrolment Details, 2005												
PP	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
15518	16455	15633	14415	13750	12635	11052	10686	8961	7732	6451	3997	3687

In the year 2012, less than 8,000 students will enroll for class XII. Even in the year 2017, less than 15,000 students will enroll into Standard XII.

[3] Schooling in Bhutan by Tenzin Choeda, *Going to School in South Asia*, Amita Gupta, Chapter 4, The Global School Forum

Thus, the number of students being available for tertiary education will be small compared to what would be required to make a sizable presence in any business in the ICT domain at even a regional level. Therefore, ICT as a revenue generating industry for Bhutan has disadvantages of lack of scales- this is particularly so in the scale-critical low value IT/ITES services like Call Center based Business Process Outsourcing (BPO). The scale disadvantage, however, may not be so acute in other ICT services like software development and high-end ITES services like Knowledge Process Outsourcing (KPO) where the focus is on specialized skills and delivery of high value outputs even with organisation sizes comparatively smaller than call center like BPOs.

The call center BPO sub-sector, however, has been recognized as an immediate to near term solution in dealing with the problems of unemployment for the educated youth (numbering around 60000 in 2007). The good Governance report 2005 emphasizes the role of BPOs, 'Govt shall create conducive environments for Call centers and BPO businesses through FDI or local entrepreneurs.'

In the longer term, a balance could be created between focusing on lower-end streams (the likes of BPO segments) of the ICT value chain and the higher-end streams (e.g. software development) even if the latter may not provide immediate returns.

By comparison to ICT as an industry, ICT as an enabler presents a major opportunity for Bhutan in leapfrogging to a knowledge-based information society. Developing IT as an enabler can overcome the difficulties posed by terrain, distances and times in delivery of citizen services and conduct of businesses.

ICT and the private sector in Bhutan

ICT sector in Bhutan is plagued by absence of a strong private sector.

According to Bhutan Private Sector Survey, June 14 2002; while the following factors provide advantages for the private sector – relatively free access to Indian market and Indian labour; extremely stable labour relations and flexible labour regulations including on wage and hiring/ firing; low electricity prices; and friendly business environment- less time to clear customs, transparent taxation; disciplined English speaking work force, there are some key aspects that hinder the growth of the private sector. The same survey report also quotes that rapid development of the IT sector holds enormous promise for improving productivity and increasing competitiveness in existing private sector industries.[4]

Following factors could be listed as the major disadvantages for the private sector- lack of entrepreneurial talent; remoteness and landlocked nature; small domestic market; lack of skilled manpower and unwillingness of locals to undertake menial or unskilled jobs; evolving financial system; and outside links being limited mainly to India and little Foreign Direct Investment (FDI).

[4] Page 74, Chapter 6, Information technology

ICT and Bhutan: some pointers

Following paragraphs present some of the key pointers, which draw from, among others, a private sector survey carried out a few years back.[5]

Opportunities in other developing countries include small niche firms selling services (like software development, programming, web site design or specialized applications) and large firms operating data entry/ call centers and digital encoding centers. The focus must be on increasing the use of IT as a business tool in private and public sectors (example e-business internet activity by tour operators and hotels), developing skilled IT professionals, introducing appropriate systems and regulations (e.g. online business), establishing an environment where services to IT sector can develop, and on improving the ICT infrastructure.

The wage differential (with respect to wages in India) that Indian IT professionals will demand for employment in Bhutan will be high- preventing Bhutan from entering the programming market unless it can establish a reputation for very high quality or unique work. The Bhutanese do have a native design talent, but it will take time to convert this to saleable IT talent.

In the programming segment, firms seeking services will continue to approach established IT clusters- that are competitive because of talent availability, and provide other advantages like sharing of technology, and access to inexpensive support services from surrounding firms.

In the call center/ BPO arena, the major cost heads are connectivity and wages. Availability of high-speed telecommunications network has been a major constraint[6], which RGOB, however, is working on improving. High Internet access cost and high telecom tariffs have been identified by the ICT Broadband master Plan among the key challenges faced by the Bhutanese Information and Communications Industry.[7] As far as the wages are concerned, it has been observed that, access to relatively low-cost and highly skilled Indian workers provides Bhutan with an advantage, which it should seek to leverage.[8] However, this advantage gets eroded when a majority of the employees at the BPO companies in Bhutan are Indians who are to be compensated for relocation to Bhutan. Therefore, on both the major cost heads in the call center/ BPO arena i.e. connectivity and wages, Bhutan does not enjoy a regional advantage.

It may be concluded from the foregoing paragraphs that the access to skilled ICT professionals from the region is best leveraged when they are deployed as technical experts, trainers, mentors and for establishing organisations, systems and processes rather than as majority of employees in ICT organisations in Bhutan.

On the aspect of skilled labour, the challenge is to create employment in semi-skilled and skilled areas of economic activity that meet the qualifications of school leavers while adjusting the school systems and vocational training to better match the private sector skills demands.

[5] Bhutan private Sector Survey, 2002
[6] Page 16, Bhutan as Information technology Destination- A strategy for employment generation, 2006
[7] Page 18, part A Detailed Project Report, ICT Broadband Master Plan
[8] Page 95, Bhutan private Sector Survey, 2002

The goal should be to increase the productivity of working personnel through management training, worker training and technology transfer. Training emerged as an area of considerable weakness in the survey. It is important to ensure that a correct set of incentives is put in place to encourage firms to undertake more trainings.

One of the ways to develop a supply of talented indigenous workers is to bring in experienced guest workers to train and work with locals over extended period of time. The firms must be confident that they can easily bring and keep (ease and certainty in getting work permits and their renewal) the skilled IT workers to support their investment.

Management capabilities are weak, most managers are unqualified and inexperienced- about half come from the civil services, only a few have experience with a foreign firm (that too mainly Indian).

Its necessary to attract FDI to improve the IT service sector, the foreign partners will bring (along with capital, professionals capable of training others) their contacts- the biggest challenge faced in developing export markets, according to the survey.

The same survey also concludes that in view of challenges to establishing an IT export industry, it is more feasible to focus initially on developing IT services to support the domestic private sector (and the government and public sector). More extensive use of IT could increase competitiveness in many ways including improving productivity in different sectors. Building the infrastructure, training the workers, and creating the institutional structure necessary to support the domestic private sector (and public sector) would also set the stage for possible future export of IT services. Government has already started this process by concentrating on expansion of IT services within government agencies. However, the government is also monopolizing all the available skilled labour.

In conclusion, ICT presents both key challenge as well as an opportunity for Bhutan and its development. And, as discussed in the foregoing paragraphs, many of the challenges are on the human resource aspects.

Chapter 3: HRD Context for ICT in Bhutan

At the outset, any HRD Master Plan for a country with or less than 700,000 (Population & Housing Census of Bhutan, 2005) is a difficult task because of scale and critical mass issues. It will, therefore, remain a challenge to ensure that the scarce human resource is provided the right focused direction.

Bhutan ICT Policy and Strategies (BIPS) spells out key strategies and plans for the ICT sector over the next 5 years. Three overall policy objectives underpin the initiatives in the BIPS report i.e. to use ICT for Good Governance; to create Bhutanese Information Culture, and to create a High-Tech Habitat.The ICT HRD master plan needs to be closely aligned to these plans.

Annexure 6 presents a comprehensive list of HRD master plan implications emerging from BIPS (Bhutan ICT Policy and Strategies, July 2004 – key implications for the ICT HRD Master Plan).

This chapter studies the different contextual HRD aspects for ICT in Bhutan:

- Shortage of ICT professionals in Bhutan
- Underutilization of ICT professionals in Bhutan
- Small base of school pass outs in Bhutan
- Tertiary Educational Facilities in Bhutan
- Estimate of availability of ICT professionals
- Focus on school education
- Focus on training
- ICT and employment generation

The subsequent chapters will be targeted towards addressing Human resource challenges on the above aspects.

Shortage of ICT professionals in Bhutan

From the table given below, in 2006-2007, the number of ICT graduates added to the system annually is less than 100 per year.

Turn out of graduates (Bhutan National HR Report, Ministry of Labour and Human resources, 2006)

	2008	**2010**	**2012**
ICT Graduates	70	80	100
BBA/MBA	50	65	75
General Graduates (BA, B Sc, B Com)	767	967	1167
Engineering Graduates	60	70	80
Diploma Holders	150	250	400

The above presents a gap with respect to what is required. This gap threatens to grow hugely in subsequent years.

The government and the public sector take most of the graduates from the Sherubtse College, the only institute providing degree level ICT course in the country. The graduates themselves would prefer the 'secure' government jobs compared to those in the private sector. It is a similar trend with the Royal Institute of Management (RIM) Diploma program in Information Management Systems (DIMS).

The BIPS report (2004) acknowledges Bhutan's limited capacity in building a critical mass of Telecommunication Engineers and other ICT professionals and its reliance on outside technical assistance. It notes that there are less than 400 ICT professionals (Pg. 13, Situation analysis- Infrastructure; Human capacity). The majority of these professionals are in the RGoB. The remaining could be in the public sector, private sector and semi-government organisation. Among the PSUs, telecom sector has the highest number of ICT personnel.

The draft 'Bhutan National Human Resource development report 2007' has noted that 'Employment generation and overall development will have to rely heavily on micro level interventions[9].' The challenges in those interventions are skill shortage. 'To meet some of the above challenges its pertinent to provide the youth with trainings on positive thinking, stress management, dignity of labour and openness to learning, besides skill training.'

[9] Page 3, Bhutan National Human Resource Development Report 2007

The situation emerging from a shortage of ICT professionals may appear somewhat eased out by Bhutan's access to large number of ICT professionals from the region. It will, however, continue to be a challenge to attract highly skilled personnel till Bhutan has embarked significantly up on a path to becoming an ICT destination.

Underutilization of ICT professionals in Bhutan

Ironic it may seem, but it is true that the shortage of ICT personnel in Bhutan co-exist with the issue of under utilization of existing ICT professionals. In the early years, the absence of a defined ICT body within the ministries and lack of proper terms of reference for ICT personnel led to underutilization and misuse of ICT personnel for non-ICT assignments.

It was hence decided by the RGoB to create ICT units in each of the ministries. According to the 'Guidelines on establishment of ICT units', the benefit of teamwork, which can be easily harnessed, for the symbiotic-betterment of all agencies involved, was virtually untapped. This lack of coordination and cooperation had led to duplication of efforts and redundant activities even within the same ministry.

After the creation of ICT units in ministries, the lack of coordination among ICT units in different ministries has led to most ICT units working in isolation. There have been instances of some govt. organization becoming over possessive of the ICT application products resulting in the development of similar products by different organizations.

In today's context, it may seem that similar type of bringing together of ICT professionals may be required at an inter-ministerial level.

Small base of school pass outs in Bhutan

The enrolment details for year 2005 presented below indicate that less than 3700 students potentially entered the tertiary education and another 3000 entered the employment market/ certificate level education (including drop outs after 10th and 11th) in 2005.[10]

Enrolment Details, 2005												
PP	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
15518	16455	15633	14415	13750	12635	11052	10686	8961	7732	6451	3997	3687

These figures are validated by the enrolment figures from different tertiary institutes and VTIs. It is noted that around 3000 of these students entered the tertiary institutions with another 300 entering VTIs and around 300 getting educated in neighboring countries.

According to Ministry of Education presentation to CCM on May 9, 2006, 'Quality of Education (Standards), in the 10FYP', the number of students in secondary school will increase from 45332 in 2007 by 32% in 2012.

Thus the number of students entering tertiary education or VTIs in Bhutan or getting educated in neighboring countries, although growing, is still numerically small (less than 3700 in 2005). The ICT HRD Master Plan needs to channelise a sub-section of this small

[10] According to Ministry of Education presentation to CCM on May 9, 2006, 'Quality of Education (Standards), in the 10FYP'

base (there will be competing demands from other emerging sectors as well for the same set of students) carefully. It may thus be advisable to enable the country's human resource to play in the arena of ICT sub-sectors where having large scale is not a key success factor and where value added per employee is high.

Tertiary Educational Facilities in Bhutan

Since the number, general quality, recognition and experience level of private sector ICT training institutes in Bhutan is low; the availability of ICT professionals is directly linked to the output of tertiary ICT educational institutions. (Annexure 12: Education system in Bhutan)

Tertiary education facilities in general and ICT education facilities in particular are limited in Bhutan. This, therefore, means that unless immediate steps are taken, the shortage of ICT professionals will continue in the years to come. The effect may be some what softened by students getting educated abroad and returning to work, but such numbers will remain less due to affordability issues.

The Sherubtse College offers a degree level course in IT and the Royal Institute of Management (RIM) offers a diploma level program and is a host for CISCO Networking academy. The Teacher Training Institutes (TTIs) at Paro and Samtse offer 1-year PG Diploma in Computer Applications.

Royal University of Bhutan (RUB) recognises the need to create private sector focussed, employment oriented courses. Quotes RUB 2006-2007 Strategic plan paper[11], 'The University has been established with the clear understanding that it must prepare its graduates for private sector employment, and that the Royal Government and the RCSC should not be seen as the probable employer or not even, for many, as a possible employer. This has influenced the proposed balance of degree to diploma programmes in the University's plan.'

The tertiary education in Bhutan can be summarised in terms of its small base that is being expanded under pressure of students wanting to take up higher education and weak linkages to employment generation.

Estimate of availability of ICT professionals

Based on the analysis in the section on School level education n Bhutan, the pool of graduate/diploma level human resources available for the ICT sector annually has to be a subset of 3700. In fact, at present it is about 1100 per annum (ICT graduates, Engg graduates, general graduates, diploma holders and BBAs/ MBAs). This number, at an optimistic level, is estimated to grow predominantly from increased number of students getting educated abroad unless the intake at existing tertiary ICT courses in the country is enhanced. Even the projected numbers for 2013 fall short of the expected demand for ICT professionals.

[11] http://www.rub.edu.bt - strategic plan

Focus on school education

The efforts to create a knowledge-based information society need to start at getting the basics right- i.e. depth and orientation to mathematics, sciences and logical/ analytical/ quantitative skills at schools.

Further, given that the tertiary education system is not geared to providing the increased opportunities for ICT education, the responsibility would fall on the secondary and higher education and on the capability of the prospective hiring organisations to train and develop educated youth in the ICT roles.

In fact, the need to align education with evolving demands of the work place has been recognized and emphasized by the ministry of education.

A major shift in secondary schools will be in bringing teaching/learning processes and the content of secondary education more in line with the future challenges of work. This is a major undertaking that will have to be carried out in stages over a number of years. To start with, secondary schools curriculum will be realigned to provide emphasis on mastery of key subjects such as language and mathematics, thinking and analytical skills, teamwork and project oriented multi-tasking, computer literacy and enhanced knowledge of global economic and communication systems. (4.16; 'Ministry of Education Sector Strategy: Realizing Vision 2020 Policy and Strategy')

Based on the interactions with different stakeholders in the country, it is inferred that the quality of education needs to be enhanced in aspects like English language education also. Further, IT needs to be introduced at early School level.

Focus on training

While changes at school level will begin to show results in generating the right human resources, for immediate term results, in-service and pre-service trainings would play a key role.

There will also be pressure from all sections of the society to create facilities for in-service people to upgrade their skills and qualifications. Quotes RUB strategic plan, 'With the introduction of Position Classification System in the Civil Service, there will be thousands of civil servants who will aspire to improve and upgrade their qualifications. So will be the case with the private sector.'

Further, given that the private sector is not in a position to carry the mantle of providing employment oriented trainings, a lead will have to be taken by the government machinery and its arms like MoLHR and DIT in this area. These trainings will have to be either delivered by the ICT professionals or by faculty brought from outside the country.

ICT and employment generation

ICT sector initiatives are being taken up at a time when unemployment is becoming a key concern for the government of Bhutan.

According to Bhutan Private Sector Survey, June 14 2002, the saturation of public sector employment has taken place at a time when the benefits from investment in education are increasingly bearing fruit. Over 2001-2010, approximately 90,000 graduates and school leavers (out of 90,000 about 75,000 will have no tertiary education) will present a

formidable challenge in terms of job creation. The formal job sector is 60,000 (including 30,000 non-nationals, mainly Indians, and 22,000 in the civil services/ public sector. In addition to the non-nationals mentioned here, app. 10000-20000 are day workers in the border areas and around 1900 are season winter workers in south Bhutan). Over the next 5 years alone, the report quoted in 2002, the number of school leavers will be over 50,000 and ICT promises to be a major answer in this regard.

According to an analysis in the strategy document, 'Bhutan as an IT destination- A Strategy for Employment Generation (Draft, Dec 2006)', likely employment generation for persons with different levels of education (in e- Zomsa and IT-enabled services) by 2013 (end of Tenth Plan) and 2018 (end of Eleventh Plan) is demonstrated to be of the following order:

Education Category	**2013**	**2018**
Below Lower Secondary School (LSS)	3,318	5,847
Lower/ Middle Secondary School (LSS/MSS)	3,108	5,115
Higher Secondary School (HSS)	3,966	10,394
Graduate and above (BCA/B.E -IT)	335	1,022

The Good governance report 2005 emphasizes the employment generation role of ICT (76-xi: …Promotion of ICT sector for generation of employment to the literate youth.)

'The tertiary education system is in dilemma', quotes RUB Strategy paper, 'There is conflicting evidence on the extent to which the country's economy and infrastructure will be able to take account of a large increase in graduate number, the private sector economy is not too eager to employ degree graduates whilst direct government employment is declining. There is a political pressure to expand the size of the University to overcome what is seen as growing social pressures arising from rising Class XII student numbers and the possibility of unemployment of Class XII graduates. Increasing the numbers of degree and diploma level of graduates beyond the capacity of the economy to absorb them will ease the identified problem but it will not solve it, rather raise potentially more difficult unemployment problems later.'

The possible solution lies in short term, employment oriented courses offered in flexible manner. Quotes the same document, 'More avenues will be needed to provide useful employment to the university's graduates and for this, a more flexible educational provision than currently provided is needed in terms of subject-matter, duration of programmes and mode of study. Graduates should not only be capable of being employed, but they should be capable of creating employment.'

Thus initiatives at the school level, tertiary education levels and pre-service and in-service training level along with ensuring that the scarce ICT human resource in the country is leveraged effectively in terms of its potential holds likely/ potential answers to Bhutan leveraging the ICT opportunity and overcoming the unemployment challenges.

Chapter 4: Components of the Bhutan ICT HRD Master Plan

Overview

The following are the core focus areas on which Bhutan ICT HRD Master Plan and strategies (BHIMPS) is modeled. Also included are the corresponding plans, which are components of the Bhutan ICT HRD Master Plan:

S No.	Core Focus Areas	Plans (Components of the Bhutan ICT HRD Master Plan)
1	Leveraging the existing ICT human resource in the RGoB	P1, P2, P3, P10
2	Leveraging the existing ICT Human Resource in the country (outside RGoB)	P4, P8
3	Universal ICT literacy in the RGoB	P5, P20
4	Developing entrepreneurial Human Capacity in the Private sector	P6
5	Enhancing ICT Human Capacity in the country (including in RGoB)	P7, P12, P13, P14, P19, P22
6	Meeting immediate and Short-term needs for ICT professionals	P9, P11, P18
7	Meeting medium and long –term needs for ICT professionals	P15, P16, P17
8	Creating an institution of higher learning in the field of ICT	P21
9	Creating a strong ICT association in the country	P23

Plans (Ps), the components of master plan

P1- leveraging the existing ICT Human resource in the RGoB- through enabled ICT units in Ministries

There is a clear need to leverage the competence of (scarce) existing ICT professionals including through enhancing their competence and enabling their roles. Among other things it would include ensuring that ICT Units in ministries

have the right manpower and competence strength apart from the right mandate and right organisational positioning.

According to P1.6 (BIPS)- ICT Units must be established in each ministry and autonomous agency (and constitutional agency). It must be also emphasized that position of ICT units must be as per the Good Governance(GG) Plus guidelines i.e. reporting to the secretary in the case of ministry and by extension, reporting to the MDs/ organisational head in case of agencies. Further, the ICT Unit must have the requisite number of personnel (and more importantly the skill sets mentioned in the guidelines). This, however, needs to be appropriately implemented with flexibility in ministries that are very small as exceptions.

As per the guidelines for the establishment of ICT Units in the ministries following the approval of ICT unit by the Council of Ministers dated 30th December 2003, the ICT unit can be placed anywhere within the ministerial secretariat or as a unit within an existing department or division. However, it is also clearly mentioned that the guiding principle should be that the ICT unit should be able to exert its professional influence over the whole ministry, including its departments, authorities and divisions. According to the GG Plus report, which came later, a specific position for ICT unit has been mentioned (that of reporting to the secretary of the ministry.)

The Annexure 3 (Detailed job description of the personnel under ICT unit) of the above mentioned guidelines (for the establishment of ICT units in the ministries) needs to be reviewed to ensure that the roles that the ICT unit members shall play are correctly mandated.

Sometimes, ICT staff is used to maintain computers, support the Internet and mail system etc., which are only a part of their job. There may be a case for outsourcing these services and enabling the ICT units to undertake system analysis, networking and project management roles.

The formation of ICT units in terms of bringing together ICT personnel in the ministry under one team is a critical requirement for all the ministries. Departments, under which the ICT professionals are deployed, need to be encouraged to release them for the ICT units. The advantages from pooling together (functional grouping) far outweigh those for not doing it (like departments and units being physically and locationally scattered, risk of not getting support for initiatives by departments and dedicated resource requirement for departments).

It is important to avoid the management of the departments within the ministries as if they were silo 'territories' each with their own plans, initiatives, budgets and ICT personnel.

The roles the ICT units play need to be in accordance with and to leverage their competence based on their qualifications, skills and competence. There needs to be a strict discipline by ministries towards not deploying the ICT personnel for unrelated roles.

It is also important to ensure that the ICT units do get to play a strategic role in formulation of FYPs. This would enable them to formulate ICT HRD master plans

and other plans with respect to recruitment and training for the respective ministries.

In the ministries where the ICT units are appropriately positioned, the benefits are likely to be high. At present, in such few cases, it is observed, that the ICT Unit have got the ICT professionals functionally together in spite of geographical spread. It is observed that in such cases, the ministry has been able to make progress in the ICT arena and the ICT unit has achieved much and has clarity in terms of ICT plans, ICT HRD plans including those on recruitment, trainings and skills upgradation. It is observed that in such ministries, the ICT training needs and career management aspects of ICT professionals are better managed.

The plan to leverage the existing ICT personnel in the ministries is based on strengthening the ICT units in terms of right manpower and competence strength apart from the right mandate and right organisational positioning.

P2- leveraging the existing ICT Human Resource in the RGoB- right ICT nomenclature for ICT institutions in RGoB

There is a need to ensure that the ICT institutions and units across the RGoB at different levels use the appropriate names to capture the full essence of the role envisaged for them. Thus, they must be referred to as 'Information and Communications Technology, (ICT) units/personnel and not in terms of IT, Information units/ officers or personnel etc.

This already exists under the Position Classification System (PCS)- where the nomenclature is in terms of ICT. However, in practice, other less comprehensive designations (IT officer/ Information officers) are also being used interchangeably with ICT officers.

This plan, though, only a matter of nomenclature, would assist in the objectives of P1 and other plans by communicating a common language and providing a correct connotation to what the concerned personnel/units are to focus on leveraging- Information and Communications Technology.

P3- Leveraging the existing ICT human resource in the RGoB- through partially realigned ICT units in the ministries – restructuring as matrix ICT units and through greater involvement of DIT in coordinating ICT initiatives across the RGoB ministries

Even when ICT units are set up in each of the ministries with the right strength, mandate and positioning, there is a risk of the ministries working on ICT initiatives in isolation. There could be duplication of efforts across ministries in initiatives like Personnel Information System, Budgeting Planning and Monitoring System, Management Information System, Office management systems and e-procurement systems.

Some of these have been identified as challenges in the BIPS, 'Challenges abound in the area of updating web pages, different ministries developing non-compatible systems, or duplicating efforts… (Pg. 14, Situation analysis- Content and application)'

Further, in case of ministries that are small in terms of number of employees, to have more than a few personnel in the ICT units will not be viable, and therefore, the team will be handicapped without the full range of skill-sets.

Also, while each of the ministries may have training requirements in different areas, it may not be viable for them to do these trainings given the small number of likely participants for each of the trainings.

Moreover, it is highly likely that each of the ministries may have periods of peaks and troughs in terms of ICT project activities for the ICT units apart from their ICT O&M activities. By itself, each ministry's ICT unit may not have the critical mass to take up ICT projects or the complimentary skill-sets to manage all aspects of the projects. All of this will lead to the ministries not being able to carry out ICT projects successfully. To achieve the desired objectives of the ICT units and to ensure that the ICT personnel get opportunities to apply and update their skill-sets in different areas and to interact with their peers from ICT units in other ministries, it is better that the ICT units of each ministry, through their head, have a dotted (functional) reporting line to the DIT, MoIC.

Thus, leveraging the competence of scarce existing ICT professionals requires a partial functional pooling together of all ICT professionals under a central agency like DIT.

The functional level partial pooling together across ministries will create a win-win situation for all ministries.

This initiative strengthens the spirit behind the creation of ICT units. In the terms of reference for ICT unit (Guidelines for the Establishment of ICT Units in the Ministries following the approval of ICT unit by the Council of Ministers on 30th December, 2003) it is mentioned that the ICT unit will also function as the focal point for the DIT (MoIC) which has the overall mandate to ensure a coordinated ICT development within the government.

In fact, most of the reasons that are listed as rationale for creation of the ICT units in the same document (Guidelines for the Establishment of ICT Units) viz. underutilization and misuse of ICT personnel, ICT personnel working in isolation, government not reaping the benefit of teamwork, duplication of efforts in the field of ICT, need for human resource development for ICT personnel or to make efficient use of their skills, system not deriving benefits from specialization, stagnation and demoralizing of a large number of skilled ICT workers are all reasons for this next level of partial pooling /rationalization for ICT professionals also.

A division reporting to Director, DIT needs to be created- it can be called 'ICT Human Capability Division' (IHCD) with appropriately defined role and authorities for its head to whom all the ICT unit heads from all the RGoB may functionally report.

Head, ICT Human Capability Division (IHCD) must include among his/her mandate an ability to recommend movement of ICT professionals across organisations to RCSC with an objective to creating career paths for them and leveraging their competence where its best utilized.

It must also be ensured that no major ICT initiative is taken up by the ministries without validation from DIT to avoid duplication across ministries.

When the ICT professionals are put on matrix teams to carry out projects for any ministry, the IHCD Head will do so in consultation with the solid line (direct, administrative) reporting officers of the ICT professionals in the ministries and in a way that it does not hamper the operation and maintenance activities of the ministry/agency in the ICT area.

ICT Human Capability Division (IHCD) head will have the following mandates and Key Result Areas (KRAs):

a. Implementation of the Bhutan ICT HRD master plan,

b. Coordinate projects across ministries,

c. Complete performance evaluation as per the PMS system and provide it to the concerned reporting officer of the ICT Head in ministries,

d. Providing growth, talent/ competence development and knowledge management opportunities for all ICT personnel in the ICT units including through initiatives like mentoring (refer to P4),

e. Coordinating and assisting on projects by different ministries by associating the appropriate ICT personnel from different ministries, thereby creating matrix teams,

f. Providing inputs on movement of personnel in ICT units of different ministries to RCSC so that competent ICT units are available to all ministries and scarce ICT pool is appropriately distributed, and

g. Competence development and knowledge management for all other ICT personnel in the country.

At present, Head IHCD position may be at Sr. ICT Officer / Deputy Chief ICT Officer level. In future, this position holder may be required to be at a higher position level and may require more personnel in the team. In cases where the ICT Heads in the ministries are at a position level equal or higher than Head, IHCD position, the dotted line reporting may be to Director, DIT or in exceptional cases, to Secretary, MoIC. The Head, IHCD position holder will also complete performance evaluation as per the Performance Management System (PMS) and provide it to the concerned reporting officer of the ICT Head in ministries, which the later will incorporate/ consider and attach along with his/her evaluation.

Some of the key aspects of the IHCD position's Job Description (JD) will be-graduation in ICT with experience on project management and training.

This concept of centralized coordination through DIT may also be extended to include ICT professionals of Dzongkhags and the other semi-government agencies in due course.

This initiative is likely to contribute towards meeting the requirements of BIPS policies P4.2, E1.3, E1.4.

P4- leveraging the existing ICT Human Resource in the country (outside RGoB)- enhancing ICT awareness among general public, extending ICT opportunities to people with disabilities, Competence development and Knowledge Management

While the ICT Human Capability Division (IHCD) will undertake the competence development (trainings, role rotations, mentoring etc) and knowledge management initiatives (creating forums for sharing, discussions and communities of interest etc.) for ICT personnel in the RGoB ministries, there is a wider set of ICT personnel in the country (say those from the private sector and semi-government sectors and those involved in teaching, training and research), who would have similar requirements as the ICT personnel in the RGoB.

The creation and maintenance of Knowledge Management (KM) and interaction forums for ICT professionals in the country needs to be done in close coordination with all the stakeholders including the recognized private sector associations like the inter-sectoral ones like Bhutan Chambers of Commerce & Industry (BCCI) as well as ICT sectoral ones. The KM and interactions forums would be both the traditional types as well as the virtual types.

The virtual forums could be created as separate Human Capital (HC) portals like www.bhutan-ict-hc.bt which will include different ICT forums, chat rooms, topical discussions, data base, events, trainings on it or it could be hosted on the official websites (say as www.dit.gov.bt/ict-hc). They could also be structured on the lines of solution exchanges.

This initiative would also extend to include mentoring program and other initiatives like the 'Each one-teach one' program for the ICT professionals.

There is also a need to create a database of all ICT professionals in the country that must be updated at least once a year and must include among other things name, qualifications, experience, competencies, current roles, trainings undergone, contact details etc.

No ICT competence development will be complete without a robust system of technical (ICT) and associated behavioral trainings – based on a thorough training needs analysis carried out every year. This will lead to creation of a national ICT training calendar. These calendarised training will supplement the efforts of the private and government teaching and training institutions and ensure that core skill areas are addressed.

Strategy paper, 'Bhutan as IT destination - A Strategy for Employment Generation (Draft, Dec 2006)' mentions that during the 9th Five Year Plan (2002-2007), several initiatives have been taken to impart computer education to students at school level. 'Many school leavers are taking (only) basic ICT Courses but then find no willing employer'. There is, thus, a need for a central coordination body for certification/ accreditation of training institutes, training programmes or output of these institutes/programmes. Services of reputed regional/ international agencies, not engaged in training in Bhutan- so as to avoid clash of interest, may be engaged for carrying out the certification/ accreditation.

Its important to note that ICT literacy among the public, and appreciation among them about the potential of ICT is of very high significance. Literacy should include on areas like information security, protections etc. It is, thus, one of the key responsibilities of the IHCD head to ensure that media channels like TV (BBS), Radio (including FM channels) as well as print media are used for this purpose.

Personnel in DIT, including IHCD could be made accountable for the above-mentioned roles.

Head, IHCD must also be responsible for developing and implementing initiatives to provide and extending ICT opportunities for children and other persons with disabilities.

P5- universal ICT literacy in the RGoB- ICT competence for non-ICT professionals

It is pertinent that the job description of ICT unit heads includes ICT trainings and capability building for ICT teams as well as ICT capability development for all the employees of the ministry/agency. They will create plans for ensuring that their respective organisations (ministries) are IT literate and certified for the same in a time bound manner on Functional Information Technology (FIT) skills. The leadership role holders may have requirements for training and certification in managing ICT and ICT professionals and leveraging ICT. Thus a certification at a level higher than "FIT" skill level (say at FITM-Functional IT Management- level) would be required.

DIT would play a lead role in defining FIT and FITM levels and coordinating the implementation of this initiative. The task of certification at FIT and FITM level could be outsourced to independent agencies.

This plan must be supported by the plan on institutional and systemic arrangements (P20).

P6- developing entrepreneurial Human Capacity in the Private sector

It is widely realized that the RGoB and corporations have majority of the ICT professionals in the country (and as a corollary to this, very few exist in the private sector). The government (and semi government organisations in recent years) has been the preferred employers for the small number of Bhutanese ICT graduates from the colleges in Bhutan as well as outside. Some of the factors responsible for this situation are perceived government job-security, opportunities for further education and absence of a strong private sector.

Any effort in the present context towards developing the private sector in the ICT area (BIPS IN 1.2, E1, E2, E3, E4) is faced with, among others, the challenges in terms of unavailability of competent human capital with ICT skills.

As a measure to overcome this bottleneck and to also provide an opportunity to the ICT professionals in the RGoB and to transform them from employees to employment providers, a policy of "Entrepreneurship Sabbatical" or "Private Sector Sabbatical" could be initiated.

All ICT professionals (ICT Graduates whose experience in the Govt has been predominantly in the ICT arena) with more than say, 5 years of experience could be entitled to proceed on a 2-year sabbatical, at the end of which they are entitled to come back and rejoin RGoB.

During this period, they may either join the private sector or start entrepreneurship initiatives (for which the government may provide loans up to, say, 2-years salary to be paid back in up to, say, 24 equal installments on rejoining/ resigning at the end of sabbatical period). That is, if they do not join back, they would be considered to have resigned from the RGoB services.

It must be made very clear that during the period of sabbatical, they are bound by a certain set of rules and regulations (say, the Entrepreneurial Sabbatical Regulations).

Effort could be made by RGoB organisations to provide these organisations (started by those on entrepreneurial sabbaticals) work opportunities including through outsourcing of ICT services.

They could also be given preferential treatment in allocation of seats at DIT initiated short-term crash courses (P9)

All applications during a pre-defined period could be subject to case-by-case approval by the secretaries of the respective ministries. It will, however, be expected that the secretaries will generally grant the requisite sabbaticals. They may spread out the starting dates to ensure that the ministries are not adversely affected and continue to function smoothly.

It is pertinent to note that as the initiatives put forward under this master plan are implemented, the existing entrepreneurs may feel that their interests may be affected adversely because of new competitors to them. This will be further accentuated if contracts are awarded explicitly favoring the employees-turned-entrepreneurs vis-à-vis existing players. It is recommended that the following norms may followed:

1. At the time of award of contract, the bids from different players will be evaluated purely on their techno-commercial aspects.

2. The same objective approach will be applied when evaluating performance of different players on project completion.

Over a period of time, this initiative will help in establishing a strong private ICT sector, which will benefit all the players. As the outsourcing from the government would increase, the increase in size of business opportunities for the private sector pie will accompany the increase in number of players. In any case, these initiatives are taken up because the set of existing entrepreneurs do not, at present, comprise a viable private sector in the area of ICT.

P7- Enhancing ICT Human Capacity in the country –ICT HRD task force for implementing BHIMPS in the RGoB and agencies and mainstreaming ICT HRD

An ICT task force could be created in all govt, autonomous bodies and constitutional bodies comprising of organisational head/ ICT head/ HRD head and Policy and Planning Division (PPD) head. This task force will be responsible for implementing BIHMPS in the respective organisations.

Among others, this task force will also be accountable for creating and implementing 5 year rolling ICT HRD master plan for the respective govt, autonomous bodies and constitutional bodies in the next one year which will be revised every year.

There is a provision of quarterly reviews and preparation of progress report for the cabinet every six months by inter-ministerial working group on BIPS that comprises of Director DIT, ICT unit Heads, MoIC's PPD officers and other ministries' PPD officers. It is proposed to include implementation review of the ministerial ICT HRD master plan as one of the key agenda items for these reviews.

By extension, creation of an ICT HRD task force at the national level with representation from all ministries, government agencies and autonomous bodies, public sector organisations, private sector organisations and private sector associations would go a long way in mainstreaming the ICT HR development. To be more effective, this national ICT task force could be made to report directly to the Prime Minister.

P8- Enhancing ICT Human Capacity in the country – FDI in Training and Development (T&D)Activities

BIPS has a clear focus, among other things, on FDI in ICT related businesses (IN1.3, E3.1, E3.3) – the scope must be extended to include training and development businesses (in the list of ICT related businesses). This must be particularly encouraged- as it has the highest skill development potential, which enhances employability of citizens and skill transfer, some of the core reasons for RGoB initiatives on FDI.

P9- Meeting immediate and Short-term needs for ICT professionals - DIT coordinated Crash courses

Based on a detailed ICT Training needs Analysis (TNA) for different ICT professional employer sections (hiring organisations) in the country, there is an immediate requirement for enhancing skill sets for in-service ICT professionals and unemployed youth. These training/skill requirements are scattered across different organisation. Each of the organisations may not find it viable to fund and organise these initiatives. With the private sector not being able to deliver such programmes at the desired excellence level, the mantle may best be taken up by DIT.

These must be focussed, short term, skill-based courses initiated and coordinated by DIT over the next two years in a systematic manner. It is expected that these will be self-funding based on fee per nomination from the sponsoring organisations/individuals.

This plan would be broadly under the plan P4 but needs a specific separate mention as it is important to note the immediate shortage of competent and employable ICT professionals is a major concern in Bhutan realizing its objective of becoming a knowledge-based information society. The success of and support for any other initiatives in the future would depend on how this issue is managed. This plan, P9 along with P11 targets this problem.

A list of suggestive training areas is included in Annexure 8. The training courses are from technical, professional, managerial and entrepreneurial areas. This list may act as a starting point/hypothesis for conducting the TNA mentioned under P4. It may also provide some of the inputs (especially on short duration courses in the next two years, 2008-2009) in the national training calendar developed under P4.

The first step in implementing this plan, P9, would be to create a list of required short duration courses, plan their details including- objectives, number of participants, timing, funding arrangement, implementing team, budgetary/ kick off support, faculty, frequency, logistics arrangement etc.

P10- leveraging the existing ICT Human resources in RGoB- enhancing their competence and enabling their roles- Role Competence Audit at RGoB

DIT must conduct an audit every 2 years starting with one immediately to ensure that ICT positions in RGoB are occupied by appropriate ICT professionals and that ICT professionals have meaningful and gainful ICT roles.

This would be a key part of IHCD roles and responsibilities under P3. But it is being mentioned here separately as this must not be dependent on acceptance and approval of P3 recommendation. It is an immediate requirement to ensure that the ICT units are staffed by the right ICT people so that ICT needs of different ministries are served and that the right ICT people have a meaningful role to play so that they are not wasted.

P11- Meeting immediate and Short-term needs for ICT professionals - Skilled Expatriates

Many of the BIHMPS initiatives (with exception of those like P9) will only begin to show results in medium (2-4 years) and long term (5 years and beyond).

On the other hand, the most acute requirement for qualified, skilled and experienced ICT professionals is being felt in the immediate/ short term.

To meet the immediate/ short term. Requirements, the entry of (only) highly skilled ICT professionals (say, graduate degree in ICT with at least 5 years experience) must be allowed for a period of about 2 years (say, all contracts close on certain date). This could be through an automatic approval for requirements in the RGoB, agencies and the private sector to avoid procedural delays.

The Good Governance report, 2005 emphasizes on consideration of foreign workers. (76-x: HRD and Labour related issues…could include firm commitment of the HRD for private sector and review of ceiling for foreign workers in the country)

This initiative must be seen from a perspective that, according to 2005 Census, there are already 1,35,000 expatriates in Bhutan in different areas. Thus, automatic

approval for highly skilled ICT professionals will not change the expatriate numbers drastically in % terms.

Even presently, a sizable number of ICT professionals are providing their services in Bhutan indirectly through local firms. If the systems are formalized in the specific skill level (professionals with high end ICT skills and experience), where it is most desired, expatriate professionals could work openly and better professionals could be attracted to work in Bhutan.

Furthermore, personal income tax rebate provisions may be added to attract ICT professionals to work in Bhutan. Initiatives like putting up advertisements (by DIT in partnerships with ICT associations in countries from where the ICT professionals are likely to come to Bhutan) promoting Bhutan as an ICT professional employment destination need to be taken up. Further, plans like P12 could further enable the success of this plan.

P12- Developing Human Capacity in the country- mentoring and peer-to-peer learning 'Each One Teach One'

To really leverage the benefits of P11, the expatriates must be provided with a direct incentive to transfer knowledge and skills to locals.

Towards this end, a policy of 'Each one- teach one' may be deployed with the foregoing stipulations. All expatriates who are on contracts of 1 year and longer duration could be provided a 'mentoring incentive' equivalent to certain % (say 20) of their remuneration during the contract period (say, with 10% in case of the private sector being subsidized by the government and the respective employer meeting the remaining part of the mentoring incentive as training investment). After 3-months from end of contract if the concerned 'mentee' and his/her supervisor/ reporting officer certify and validate that the mentor during his contract period has created a 'competence mirror image' of himself/herself in the mentee in terms of knowledge, skills and attitude and that the 'mentee' after the departure of the mentor has been able to take over the role ably, the mentor would be entitled to mentoring incentive.

It is expected that the mentee, their supervisors and their organisations will be fair is rewarding the efforts of guest mentors.

Officials in DIT (say IHCD Head) could be the coordinating and certifying agency for this initiative.

P13- Developing Human Capacity in the country- mentoring and peer-to-peer learning 'Each One Mentor Two'

Each ICT personnel in RGoB/ agency could be made a mentor in the area of ICT for two colleagues for a year. This mentoring program will be taken up by formally documenting the plan, its scope, training for the mentors and mentees, mechanism, identification of the mentor-mentee pairs and results achieved. An element of incentive, recognition and awards could also be instituted for the best efforts from the ICT mentors. ICT heads in the corresponding ministry and agency could be designated to monitor this initiative.

P 14- Developing Human Capacity in the country- mentoring and peer-to-peer learning- 'Each One Train Some'

Each ICT personnel in RGoB/ agency- including those in the ICT units and those outside identified as ICT resources by DIT (say by IHCD Head), could impart at least 10 mandatory person days of training in a year at RGoB or outside (say, up to 3 training days at private organisations per year out of the total training days). This program will be taken up by formally documenting the plan, identification of the training areas and trainee groups and results achieved. A formal report will be sent annually to DIT and the latter will be the focal agency for implementing this initiative along with ICT heads in the corresponding ministries and agencies. An element of incentive, recognition and awards could also be instituted for the best efforts from the trainers.

P 15- Meeting medium and long-term needs for ICT professionals - Enhancing offerings from tertiary institutes

Over the next 5 years there would be a need for expanding the tertiary education facilities in the area of ICT in the country. This could be in the form of the following:

1. Enhancing the intake on the courses being offered currently
2. Including basic ICT content in the curricula for non-ICT courses (While the non-ICT courses are not expected to impart application systems design and development capability- they must prepare students who understand, appreciate and can leverage the power of ICT.)
3. Offering new courses from the existing institutions
4. Setting up new institutions

It is envisaged that the tertiary institutes would be geographically placed so as to have presence in the key areas of economic development i.e. Thimphu region, Phuentsholing region and Southern Bhutan, Eastern Bhutan and Central Bhutan.

There is a need to create a comprehensive plan to look into a well-coordinated and gradual expansion incorporating all the above types of ICT tertiary education expansion types. A committee comprising of representatives from DIT, Royal University of Bhutan, RCSC and private sector associations/ private sector organisations/ government ministries and agencies/ constitutional bodies/ semi government organisations could be instituted to oversee the expansion planning.

Two particular areas of specific attention are developing human resource for operating and maintaining tele-centres/ Community information centres and developing human resources for operating and maintaining communication and connectivity links/systems.

A number of agencies in Bhutan are working towards creating these tele-centres/ Community information centres(CICs). Once these pilots are complete and the initiatives are scaled up, a large of trained people will be required to operate and maintain them. A diploma/certificate level course on O&M (operation and maintenance) of tele-centres/ Community information centres would be a key

contributor towards leveraging the power of these centres in delivering e-governance, offering services to the citizens at their door step and overcoming the challenges posed by distance and terrain.

Similarly, Bhutan has taken up multiple initiatives to connect different parts of the country including governments and ministerial offices, a strong backbone, providing international connectivity and connectivity to Dzongkhags and Gewogs. Also, there are multiple technologies being deployed for different applications. The telecom network would increasingly become dense. A diploma/certificate level course on O&M (operation and maintenance) of communication and interconnectivity systems would be a key contributor towards leveraging the power of interconnectedness.

Interactions with key personnel developing and deploying the broadband master plan for Bhutan suggests that the installation would take most of the 10th FYP and the 11th FYP. This will lead to O&M requirements during both the plan periods but with an upwardly increasing trend.

Another area of focus could be introduction of ICT subjects in non-ICT degree/ diploma education. This will enable the ICT sector to tap into a much wider base for ICT professionals.

A detailed listing of suggestive initiatives is included at annexure 9, which must be validated.

P16- Meeting medium and long-term needs for ICT professionals - Modifications to the course curricula at Sherubtse College B Sc –Computer Science (Honors) Course; NIE ICT course and DIMS course at RIM; ICT education and training through non-traditional channels

There is a repeated feedback from the industry that the quality of ICT graduates from the tertiary ICT institutions in Bhutan needs improvement.

The representation from the industry (RGoB, DIT, corporations including Bhutan Telecom and private sector) in institutes' academic and curriculum committees could ensure that the curriculum gets constant feedback and input.

Royal University of Bhutan (RUB) in its strategy 2006-2007 document[12] makes a mention of Standing Committees of the Academic Board- Academic Planning and Resources Committee; Programmes and Quality Committee; Research and Innovation Committee and that these university-wide bodies would have suitable representations from institutes and members external to the university.

Based on the analysis of the current curricula at Sherubtse College B Sc Computer Science (Honors) Course; study of the curricula at some of the institutions in the region (like IIT Delhi); a Focus group Discussion (FGD) with some of the ICT professionals in the country (that included graduates of the Sherubtse College and other colleges in the region), recommendations are included in annexure 10 (Review of Sherubtse Course Curriculum- Recommendations), which could serve

[12] http://www.rub.edu.bt - Strategic Plan

as a starting point and must be validated. This could lead to an action plan, which could then be implemented.

The recommendations also include some aspects other than the curriculum.

A review is also carried out for the ICT curriculum currently adopted for NIE, Paro for developing teachers to teach ICT subjects and for the Diploma in Information Management Systems (DIMS) course offered by Royal Institute of Management (RIM). A set of recommendations is included in annexure 7 (The Curriculum at NIE, Paro) as a starting point for curriculum review.

One of the key aspects that need to be addressed is regarding capacity building for ICT teaching through Non-formal education (NFE) and through Community Information Centres (CICs).

P17- Meeting Long-term needs for ICT professionals - ICT education and ICT education platforms in Schools

It is recommended that school education be reviewed from the context of its role in contributing to ICT education, training and employment.

There is a case for starting with the computer applications subject at schools earlier than the current structure (say from VII instead of IX). Computer Science and applications could continue to be, as is the current structure, taken up in XI and XII standards. It may also be decided to call the ICT education in schools starting at Standard VII- 'ICT' (rather than IT or Computer Science to include in letter and spirit all aspects of Information and Communication Technology) with focus shifting from applications to science and higher-level applications as students move from standard VII through to standard XII.

It is believed that scientific and logical thinking in early years of education creates a mindset fertile for ICT appreciation and education in later years. The same was validated through interactions with teachers and heads of schools and educational institutions in Bhutan. It is thus proposed to consider taking up mathematics and science subjects (PCMB i.e. Physics, Chemistry, Mathematics and Biology) from standard VII. These could be the successors to the "Science" subject taken up to standard VI. This is likely to also help Bhutanese students who go abroad for tertiary education as it is widely known that some of the students suffer from an 'inferiority complex' as their classmates have undertaken more quantum of curriculum in the science subjects than them as the former have specific science subjects (PCMB) in their curricula starting years earlier.

Further, to quote Royal University of Bhutan (RUB) Strategy document, 'There is a particular weakness in mathematics in Class XII graduates. This is having a detrimental effect on the ability of Class XII graduates to enter programmes in external universities in Science and Engineering and in their admission to and performance in the analytically based programmes of the RUB such as Computer Science, Economics, Engineering and Physical Science'.

It is noted that the curriculum development work for mathematics for class IV-X is in progress (The presentation by MoE to Committee of Cabinet Ministers in May

2006) and anticipated that some of the aspects above will be addressed in the scope of curriculum development work.

It is further recommended to include a subject on analytical thinking/ logical thinking and problem solving from MSS/HSS. This aspect on providing emphasis on thinking and analytical thinking at secondary school level has been emphasized by the Ministry of Education.[13]

It is also proposed to include a subject on entrepreneurship training/ entrepreneurial skills in schools[14] from standard X onwards so that the students develop a mindset of employment- providers rather than that of employment-seekers.

It is also important to note that in a gradual manner all schools at all levels need to be ICT enabled. The project on 'ICTization of Schools' targets that by 2010; ICT will be available in all levels of education.

Annexure 11 (Key aspects in school education for country's ICT development- inculcating it early) lists some of the key aspects that could be reviewed with regards to school education seen from the context of its role in contributing to ICT education, training and employment.

P18- Meeting immediate to medium-term needs for ICT professionals - leveraging the power of distance learning and e-learning to overcome the challenges posed by physical reach and access

Distance learning (which includes correspondence courses and e-learning. E-learning itself could be, simply put, in the form of off-line computer based learning or on-line web-based learning) in general and on-line web-based E-learning in particular could provide Bhutan a major opportunity to overcome the challenges posed by physical reach and access in ICT education and training.

To leverage the e-learning medium, a comprehensive approach needs to be developed including identifying learning areas, acquisition of e-learning content (through the route of development, procurement and customization or licensing), mechanism of making it available closer to learners, identifying points of delivery (community information centres, schools, post offices, government offices, Non-formal education centers etc.), providing periodic face-to-face learning opportunities (to complement e-learning as well as overcome challenges emerging from e-learning as a medium), providing supporting infrastructure (electricity, internet connectivity, point of delivery centres, computers etc.), supporting and monitoring mechanism (a body that monitors, supports, evaluates the delivery with wherewithal to make changes wherever required), and integrating e-learning to other learning/ qualification systems (examinations, degrees/diplomas, recognition) as well as employment systems (employment exchanges, ministry of labour, hiring organisations etc).

This plan must be read in conjunction with plan P16 that emphasizes capacity building for ICT teaching through non-formal education (NFE) and through Community Information Centres (CICs). The only difference is that while P16

[13] Education Sector Strategy: Realizing Vision 2020 Policy and Strategy, Ministry of Education, 4.16 –Pg 22
[14] The Info Age primer- pg 24 UNDP

focuses on leveraging the reach of NFE system and CICs for their reach in ICT education and training of both face-to-face and e-learning kind, P18 is based on delivering ICT education and training using e-learning media deployed at NFE centers, CICs, schools, post offices, government offices etc.

With or without deployment of e-learning systems, it will be pertinent to connect up the educational institutions. Feb 2005 report 'Information and Communications Technology at the Royal University of Bhutan'[15] has emphasized the need for a University Information Systems Service. This could act as knowledge and resource sharing platform across educational institutions and possibly an e-learning system across institutes.

P19- Enhancing ICT Human Capacity in the country– Making T&D initiatives more effective by changing the modus operandi and by launching 'finishing schools'

It is a worldwide experience that, sometimes, long trainings are taken as only a reward for good work done, perks that come with working for the government and therefore is in the league of joy rides, paid-holidays and jamborees. The learning in some cases could become a secondary objective. Even if it does not, in most cases, for the cost of carrying out long ex-country training (which may also be low on customization to meet specific needs of each of the learners/ groups of learners) for a few participants, a customized in country training may be conducted for many times that number of participants by the same/similar training faculty. Thus, in general, trainings done in country by the appropriate local/ international faculty provide a better return on investment (ROI) and meet the objectives better.

Royal University of Bhutan (RUB) strategy paper quotes, 'Ex-country training: Although it is the policy of the Government to strengthen the in-country training programs, many of the administrative and managerial training programs are being conducted outside the country in an un-coordinated manner. Institutional strengthening has to be given top priority to develop in-country training capacity.'

It is envisaged that this change, in general (except for cases where it may not be viable/possible to do so, say, in case of highly specialized training where only a few options exist or project –tied trainings with strict requirements on where they can be availed from or where the cost benefit analysis favors the ex-country training approach), from the ex-country model to the import of training expertise model and from generic courses to customized design of courses approach would make the trainings more effective.

Whether this policy change is implemented or not, it is imperative that before any training sponsored by the ministries (or where ministerial employees are deployed) is taken up, a proper case including the purpose, and intended benefit is prepared and approved. By extension, it is also necessary that post the training, an impact analysis is conducted.

Another corollary of above policy change could be a reduced emphasis on study leave for any courses that are, longer than 3 months in duration, unless a case can

[15] commissioned by the University of WBL Consultants

be made out to establish that the proposal presents the only and best option for competency development for the employee under question.

The same may also be said whenever the government carries out the in-country trainings for job seekers with an objective to enabling them to acquire skills and making them more employable. It may so happen that it becomes too much of a one-sided initiative, especially when students are provided with stipends and other freebies for attending a training. It is proposed that while the trainings for the unemployed may continue to be subsidized by the government, there may be an effort made by the organizers to ensure that there is something at stake for the participants also- a fee, however, nominal, could be charged from the participants. It may, however, be decided to refund the fee for those candidates who successfully complete the training at a certain proficiency level. It may also be, on a case-to-case basis, decided to make boarding and lodging arrangements- however the stipends could be replaced with nominal fee that the participants will be charged. These initiatives are likely to transform the current training programmes for job-seekers into opportunities where both parties- training participants as well as the government departments stand to gain or lose from the success or failure of the training programmes respectively.

This plan is targeted towards reviewing the government approach (to training and development in the area of ICT) on long-duration, ex-country trainings and study leave policy for government employees and free, invitational, in-country, luring trainings for job-seekers.

Annexure 16 (HRD plan - trainings/ higher education plan for some RGoB ministries /agencies for 10FYP) provides a consolidated list of proposed trainings and education requirements in the ICT arena for the personnel of agencies like Ministry of Economic Affairs (MoEA), MoLHR, RUB, MoIC, Judiciary, Royal Audit Authority (RAA), Election Commission and Bhutan Broadcasting Service. The annexure details the trainings with their duration, location which could be in country, South Asia, South East Asia or developed country.

Another high impact initiative could be launch of ‘Finishing Schools’- education-cum-training institutions that transform literate unemployable undergraduates/ graduates into employment ready personnel in short duration. Quotes the strategy paper ‘Bhutan as an IT destination’, ‘As the IT culture spreads to rural areas through e-Zomsa and GRAB, rural hinterland would badly need schools which could transform fresh entrants into industry ready professionals.… should design curriculum and course material, and train teachers to cater to at least one such school in each Dzongkhag.’

P20- Universal ICT literacy in the RGoB –Enhancing ICT literacy and proficiency- Institutional and systemic arrangements

An effort could be made to ensure that, in a gradual manner, ICT skills become hygiene factors in RGoB Ministries and RGoB agencies. Initiatives mentioned here envisage achieving this- mandatory FIT (Functional IT) and FITM (Functional IT Management) qualification for all promotions to certain position levels and above (say, as per the structure given below). A detailed plan (to create institutional mechanism to enhance universal ICT literacy in the RGoB) needs to be developed.

This could be implemented after a few years (say, from 2009 onwards) and this will provide the RGoB personnel time and opportunities to acquire the FIT and FITM qualifications (mentioned in Plan P5). It may also be mandated that those already in these position levels would be expected to complete the qualifications by a certain date (say, one year from launch of this initiative).

Position Categories	**Position Levels**	**Level- a promotion to which would require FIT skills qualification**	**Level- a promotion to which would require FITM skills qualification**
Executives (Min qualification- Bachelors/Masters) Experts (Min qualification- PhD/Masters)	EX 1/2/3 ES 1/2/3	All	EX2 and above ES2 and above
Professional and Management (Min qualification- Bachelors/Masters)	P 1/2/3/4/5	All	P3 and above
Supervisory (Min qualification- Diploma/certificate)	S 1/2/3/4/5	S2 and above	-
Operations (Min qualification- 10th)	O 1/2/3/4	O3 and above	-

The table above presents level linkage to FIT and FITM level ICT skills qualification based on the PCS (Position Classification system) initiated by the Royal Civil Services Commission (RCSC). PCS lays down a clear career path for ICT personnel. (Annexure 13: Career paths for ICT professionals in the RGoB).

An extension of this plan is to ensure that ICT personnel joining the ministries must be certified in skills through recognised programmes like MCSE/ CCNA etc. Further, the induction training in the probation period must make it mandatory for them to obtain these skills certifications.

P 21: Creating an institution of higher learning in the field of ICT- Centre of Excellence (CoE)

CoE, a world-class institution with focus on education and training, research, entrepreneurship and innovation & ICT sector consultancy could enable Bhutan to play a key role in the global IT scenario.

Strategy paper, 'Bhutan as IT destination – A Strategy for Employment Generation (Draft, Dec 2006)' mentions that during the 9th Five Year Plan (2002-2007), several initiatives have been taken to impart computer education to students at school level. 'Many school leavers are taking (only) basic ICT Courses but then find no willing employer'. There is thus a need for a central coordination body for certification/ accreditation of training institutes, training programmes or output of these institutes/programmes. Services of reputed regional/ international agencies, not engaged in training in Bhutan- so as to avoid clash of interest, may be engaged for carrying out the certification/ accreditation.

Over a period of time, CoE's role would be expanded to include training accreditation and standardisation. It could be a body under the aegis of DIT with a strategic and academic alignment with Royal University of Bhutan.

CoE will have multiple objectives to improve Bhutan's IT capability (many of which are also major mandates for DIT)

- Expand the base of persons with basic IT skills
- Ensure continuous and rapid up-gradation of skills
- Launch a concerted effort to improve Bhutan's value and credibility as a workplace of choice so that it attracts and retains trained Bhutanese professionals.
- Training accreditation and standardisation using either the 'institute accreditation' approach or 'outcome accreditation' approach. While in the former, the focus is on ensuring that the input and throughput aspects are quality controlled (institute, training program, curriculum, faculty accreditation), the latter approach focuses on the output/outcome quality assurance (common certifying/qualifying examination). A beginning has been made by Department of Occupational standards, Ministry of labour and Human Resource towards creating curriculum for programs like PC Technician; Hardware Technician and Network Technician. This however, must develop into a comprehensive system of validation and evaluation, training accreditation and institute accreditation or alternately outcome certification. Accreditation with regional and international bodies could also be another options.
- Encouraging and bringing out innovative ideas in the field of ICT and their application in the Bhutan context- creating a facility where innovative ideas could be generated, incubated and developed upon. Among other things, this innovation cell could launch competitive events that bring out the most innovative ICT ideas from among the people. It could also provide incubation services for ICT related business venture including setting-up services, technical advisory services, marketing and business development services, funding, platform for discussions, loans and mentoring.

- CoE could provide business related courses based on contemporary requirement- where it could be better placed than the education intuitions. An example of such courses could be a Post-gradate diploma level course on management of BPOs.

ICT CoE could emerge as the hub of Bhutan's ICT plans feeding it with trained manpower, developed technical ideas, start up businesses among other supports.

It is also pertinent to note that research must also be a key focus area at the university (Royal University of Bhutan) level. And that CoE must be linked to the RUB research. RUB in their strategy document have listed the research focus prominently, 'There is very little research or scholarly activity and in its absence, the curriculum is predominantly textbook-based.'

CoE will also be the nodal agency for leveraging special courses through tie-ups with universities and special firms in the region and elsewhere.

P 22: Enhancing ICT Human Capacity in the country – encouraging T&D and other initiatives towards making Bhutan knowledge-based information society

Annual national awards for the companies in the private sector and those in the public sector making the greatest contribution for making Bhutan knowledge-based information society could create a recognition forum for sharing best practices in the ICT capacity development arena.

It could be made mandatory for all organisations to provide a certain minimum number of person days training in the area of ICT in their respective organisations.

It may also be made mandatory for all organisations to invest back a certain % of their profits or revenues into ICT training with certain proportionate income exemption in tax calculation.

P 23: Creating a strong ICT association in the country

In the neighboring India, NASSCOM has played a key role in the growth of the ICT sector, including mainstreaming its issues, advocacy, impacting government decisions and creating a forum for the entire ICT sector.

A similar industry association could be established in Bhutan. For example, ITAB (IT association of Bhutan) could be provided the necessary assistance and seed-support by RGoB and its machinery.

Grouping of the components of the master Plan

The 23 plans presented here are the components of the master plan that target to create an impact in the 9 core areas identified at the beginning of this chapter.

The plans can also be grouped by the time period in which they are likely to make their first impact i.e. immediate and near term (6 months- 2 years), short term (3 years- 4 years), long terms (5 years and above).

This grouping is given below:

S No.	Time period of first Impact	Plans (Components of the Bhutan ICT HRD Master Plan)
1	**Immediate to near term**	P1, P2, P3, P7, P9, P11, P14
2	**Short term**	P4, P5, P6, P8, P10, P12, P13, P18, P19, P23
3	**Long terms**	P15, P16, P17, P20, P21, P22

Chapter 5: Bhutan ICT HRD Master Plans and Strategies (BIHMPS)

This chapter brings out the operational strategies based on the master plans developed in the previous chapter.

P1- leveraging the existing ICT Human resource in the RGoB- through enabled ICT units in Ministries

S No.	Strategy	Responsibility	Time
1.1	Ensure that formation of ICT units is complete and all ICT professionals are brought within the ICT unit and that ICT professionals are deployed on appropriate roles and responsibility. If the ICT units are already established, particularly after the 2007 organisational development exercise- the strategy could focus on ensuing that these units work in letter and spirit of the reasons for their creation and fulfill their objectives.	Each Ministry	Three months, On-going
1.2	ICT unit heads report to the secretary. If this reporting already exists, particularly after the 2007 organisational development exercise- the strategy could focus on ensuing that every effort is made to maintain this system.	Secretary and HR Head, Each Ministry	Three months, On-going
1.3	Involvement of ICT unit Heads in preparation of ministry's FYP plans, annual plans and annual ICT plans.	Secretary and Head PPD, Each Ministry	Twelve months, on-going
1.4	Create a 5-year rolling ministerial ICT HRD Master Plan, annual ICT HRD plans including recruitment and training plans with budgetary provisions and monitor its implementation.	ICT Head and HR Heads Each Ministry	Twelve months, on-going
1.5	Review of detailed Job Description of the personnel under ICT units every two years to make the descriptions comprehensive and updated.	DIT	Three months, on-going

P2- leveraging the existing ICT Human Resource in the RGoB- right ICT nomenclature for ICT institutions in RGoB

S No.	Strategy	Responsibility	Time
2.1	Refer ICT units and ICT personnel as such. The unit needs to be referred to as 'ICT' unit rather than other improvisations like 'IT' unit to ensure that its role is unambiguous and complete. (If the units are already referred to as ICT units/divisions and personnel as ICT officers according to the PCS, this strategy could be targeted at keeping it that way- the ICT units being the key ministerial focal points for all ICT work in the respective ministries)	DIT and all ministries	Three months, On-going
2.2	When the ICT units are set up in Dzongkhags, make their nomenclature consistent with what it is at the ministry level ICT units- the professionals are designated as "ICT" profiles and not "IT" or "Information" profiles as these have a different connotation. (If the positions/units are already referred in 'ICT' terms, this strategy could be targeted at keeping at that way- the ICT units being the key focal points for all ICT work at the respective Dzongkhags)	DIT and Head, Dzongkhags	Three months, On-going
2.3	Continuing the same reasoning as in the strategies at 2.1 and 2.3 above, DIT to be rechristened as DICT. (It is noted that the organisation development exercise carried out while this ICT HRD master plan was being developed has already recommended the change of nomenclature of the department to Dept of Telecommunications & Information Technology, DTIT. This is an alternative to DICT.)	Secretary, MoIC	Three months

P3- Leveraging the existing ICT human resource in the RGoB- through partially realigned ICT units in the ministries – restructuring as matrix ICT units and through greater involvement of DIT in coordinating ICT initiatives across the RGoB ministries

S No.	Strategy	Responsibility	Time
3.1	A position reporting to Director, DIT created- ICT Human Capability Division (IHCD) with appropriately defined role and responsibilities; mandate and KRAs.	DIT	Three months
3.2	Functional partial realignment of ICT units in ministries with DIT, MoIC towards optimal utilization of scarce ICT professionals and towards improving coordination among ICT projects across ministries and focusing on competence and career development of ICT personnel. ICT Heads functionally report to the DIT along with administrative reporting to respective Secretaries.	DIT and Secretary, Each Ministry	Six months
3.3	The concept of centralized coordination through DIT extended to include ICT professionals of Dzongkhags and the other semi-government agencies.	All ministries and semi-government agencies; All Dzongkhags	Two years
3.4	Major ICT initiatives taken by the ministries after validation from DIT to avoid duplication across ministries. This must include initiatives at the Dzongkhags level and the other semi-government agencies also.	All ministries and semi-government agencies, DIT.	On-going

P4- leveraging the existing ICT Human Resource in the country (outside RGoB)- enhancing ICT awareness among general public, extending ICT opportunities to people with disabilities, Competence development and Knowledge Management

S No.	Strategy	Responsibility	Time
4.1	Creating and maintaining traditional and virtual Knowledge Management and interaction forums for ICT professionals. The forums would play a key role in mentoring and mutual learning for ICT professionals in the country.	DIT	Six months, ongoing

4.2	Creating and maintaining a database of ICT professionals.	DIT	Six months, ongoing
4.3	Training conceptualization and implementation for the ICT professionals and aspiring ICT professionals in the country- carrying out Training Needs Analysis (TNA), developing annual training calendar and monitoring its implementation.	DIT, MoLHR (In collaboration with RCSC for government employees)*	Six months, ongoing
4.4	Developing and implementing plan for ICT awareness among general public	DIT	Six months, ongoing
4.5	Developing and implementing plan for extending ICT opportunities for people with disabilities	DIT	Six months, ongoing

* Note- all trainings targeted at government employees will have RCSC as one of the co-conceptualizing and co-implementing agencies along with DIT.

P5- Universal ICT literacy in the RGoB- ICT competence for non-ICT professionals

S No.	**Strategy**	**Responsibility**	**Time**
5.1	Formulation and implementation of FIT and higher level ICT certificate trainings and qualification in a staged manner for non-ICT professionals in RGoB.	DIT, RCSC, Heads of all RGoB ministries and agencies.	Six months, ongoing

P6- developing entrepreneurial Human Capacity in the Private sector

S No.	**Strategy**	**Responsibility**	**Time**
6.1	Formulation, administrative and financial approval for the Entrepreurship Sabbatical initiative including Entrepreurship Sabbatical Regulations.	RGoB, DIT, RCSC	Twelve months
6.2	Launch and monitoring of the Entrepreurship Sabbatical initiative.	DIT, Heads of RGoB ministries and agencies.	Ongoing

P7- Enhancing ICT Human Capacity in the country –ICT HRD task force for implementing BHIMPS in the RGoB and agencies and mainstreaming ICT HRD

S No.	Strategy	Responsibility	Time
7.1	Creation of ICT task force in all RGoB ministries, autonomous bodies and constitutional bodies	All ministries, autonomous bodies and constitutional bodies, DIT	Three months
7.2	Creating 5 year rolling ICT HRD master plan for the respective RGoB ministries, autonomous bodies and constitutional bodies that will be revised every year and implementing the same.	All ministries, autonomous bodies and constitutional bodies, DIT	Six months, ongoing
7.3	Review on the status of Ministerial ICT HRD master plan implementation for each ministry at the quarterly BIPS Inter-ministerial meet.	All ministries, DIT	Every quarter.
7.4	Creation of a National ICT HRD task force with its working and reporting structure and coordinating its periodic activities.	All ministries, autonomous bodies and constitutional bodies, private sector association, DIT	Six months, ongoing

P8- Enhancing ICT Human Capacity in the country – FDI in Training and Development (T&D) Activities

S No.	Strategy	Responsibility	Time
8.1	Creation, approval, launch, successful implementation and periodic review of a policy on FDI in ICT related T&D businesses.	DIT, Ministry of Economic Affairs	Six months, ongoing

P9- Meeting immediate and Short-term needs for ICT professionals - DIT coordinated Crash courses

S No.	Strategy	Responsibility	Time
9.1	Development of a complete plan for next two years for delivering courses.	DIT, MoLHR	Six months
9.2	Implementation of the same with effectiveness measurement in terms of extent of implementation, number of beneficiaries and competence enhancement achieved.	DIT, MoLHR, RGoB ministries, Private Sector associations	Two years

P10- leveraging the existing ICT Human resources in RGoB- enhancing their competence and enabling their roles- Role Competence Audit at RGoB

S No.	Strategy	Responsibility	Time
10.1	Creation of a comprehensive Role-Competence Audit plan for RGoB ministries complete with criteria, formats and responsibilities.	DIT, Heads of ICT units and heads of all RGoB ministries	Six months
10.2	Periodic implementation of Role-Competence Audit plan and taking up of follow up actions.	DIT, RGoB ministries	On-going

P11- Meeting immediate and Short-term needs for ICT professionals - Skilled Expatriates

S No.	Strategy	Responsibility	Time
11.1	Creation of a single window, hassle free, fast and automatic work permit process for highly skilled ICT expatriate professionals. Furthermore, personal income tax rebate provisions may be added. (Since the Labour Net set up and managed by MoLHR already exists for labour permits for all professions – the same system may be appropriately modified, made more user friendly and deployed for the ICT expatriate professionals)	DIT, Ministry of Home, MoLHR, MoF	Six months

11.2	Annual monitoring of the impact created by such move not just in terms of number of permits issued but also, as noted in the subsequent plan, on enabling local competence development in he country.	DIT, MoLHR	On-going for policy years

P12- Developing Human Capacity in the country- mentoring and peer-to-peer learning 'Each one- teach one'

S No.	**Strategy**	**Responsibility**	**Time**
12.1	Formulation of the 'Each one-teach one' scheme for highly skilled ICT expatriates professionals including budgetary approval and appropriate communication to hiring organisations.	DIT, Ministry of Finance (MoF)	Six months
12.2	Annual monitoring of the scheme.	DIT	On-going for two years

P13- Developing Human Capacity in the country- mentoring and peer-to-peer learning 'Each One Mentor Two'

S No.	**Strategy**	**Responsibility**	**Time**
13.1	Formulation of the 'Each one-mentor two' mentoring program including the plan, its scope, training for the mentors and mentees, mechanism, identification of the mentor-mentee pairs and results achieved, incentives, recognition and awards.	ICT heads in the RGoB ministries and agencies, DIT	Three months
13.2	Annual monitoring of the scheme.	ICT heads in the RGoB ministries and agencies, DIT	On-going

P 14- Developing Human Capacity in the country- mentoring and peer-to-peer learning- 'Each One Train Some'

S No.	Strategy	Responsibility	Time
14.1	Formulation of the 'Each one-Train some' scheme for ICT professionals in the RGoB.	ICT heads in the RGoB ministries and agencies, DIT	Three months
14.2	Annual monitoring of the scheme.	ICT heads in the RGoB ministries and agencies, DIT	On-going

P 15- Meeting medium and long-term needs for ICT professionals - Enhancing offerings from tertiary institutes

S No.	Strategy	Responsibility	Time
15.1	Formation of ICT tertiary education expansion committee.	DIT, RUB	One month
15.2	Formulation and approval of the tertiary education expansion plans and ICT education for the non-ICT courses plan.	DIT, RUB	Three months
15.3	Conceptualization, detailing and implementation of diploma/degree level programs on operation and maintenance of Community information/e-governance centres and operation and maintenance of communication and interconnectivity systems.	DIT, RUB, MoEA, Bhutan telecom Limited (BTL), Bhutan Power Corporation Limited (BPCL), MoLHR	Six months
15.4	Implementation of the ICT education for the non-ICT courses plan.	DIT, RUB	1 year
15.5	Implementation of the tertiary education expansion plans.	DIT, RUB	5 years
15.6	Annual monitoring of the plan targets.	DIT, RUB	On-going

P16- Meeting medium and long-term needs for ICT professionals - Modifications to the course curricula at Sherubtse College B Sc –Computer Science (Honors) Course; NIE ICT course and DIMS course at RIM; ICT education and training through non-traditional channels

S No.	Strategy	Responsibility	Time
16.1	Review of the constitution of the academic and curriculum committee of Sherubtse College; and of RIM for the DIMS course and formulation of a system to incorporate industry and end user inputs.	DIT, RUB, MoEA	Three month
16.2	Review of the current ICT curricula and listing of modifications if any for the ICT curriculum and implementation of the same at ▪ NIE Paro and Samtse ▪ RIM ▪ Sherubtse College	DIT, RUB, MoE	Twelve months, On-going
16.3	Formulating a system for ICT teaching through Non-formal education (NFE) and through Community Information Centres (CICs).	DIT, MoE	Twelve months
16.4	Implementing ICT teaching through Non-formal education (NFE) and through Community Information Centres (CICs).	DIT, MoE	On-going

P17- Meeting Long-term needs for ICT professionals - ICT education and ICT education platforms in Schools

S No.	Strategy	Responsibility	Time
17.1	Review of the current ICT curricula at schools and listing of modifications if any including earlier introduction of ICT courses and renaming of the courses with appropriate changes to 'ICT'.	DIT, MoE	Six months
17.2	Review of the mathematics and Science teaching in schools from the context of their role in contributing to ICT education, training and employment.	DIT, MoE	Six months

17.3	Formulation of plans to introduce subjects like logical/ analytical thinking and problem solving at schools.	DIT, MoE	Six months
17.4	Develop a plan for including entrepreneurial skills in school education curriculum.	DIT, MoE	Six months
17.5	Review the 'ICTisation of schools' plan for its pace and impact.	DIT, MoE	Six months
17.6	Implementation of the recommendations from the above annually.	DIT, MoE	On-going

P18- Meeting immediate to medium-term needs for ICT professionals - leveraging the power of distance learning and e-learning to overcome the challenges posed by physical reach and access

S No.	**Strategy**	**Responsibility**	**Time**
18.1	Formulation of a comprehensive plan to deploy distance learning and e-learning in the area of ICT education and training by leveraging different channels.	DIT, MoE, MoEA, MoLHR	Six months
18.2	Review of the implementation status annually.	DIT, MoE, MoEA, MoLHR	2 years, On-going
18.3	Commissioning and updating of University Information Systems Service as a knowledge and resource sharing platform across educational institutions and an e-learning system across institutes.	RUB, MoE, DIT	Twelve months, On-going

P19- Enhancing ICT Human Capacity in the country– Making T&D initiatives more effective by changing the modus operandi and by launching 'finishing schools'

S No.	**Strategy**	**Responsibility**	**Time**
19.1	Formulation of new ICT training guidelines for RGoB funded initiatives with a predominant emphasis on in-country, focussed, short-term courses for employees in the RGoB.	DIT, RCSC, Ministries	Six months

19.2	Formulation of new ICT education guidelines for RGoB funded initiatives with a reduced emphasis on courses longer than 3 months, in general for employees in the RGoB.	DIT, RCSC, Ministries	Six months
19.3	Formulation of new ICT education and training guidelines for RGoB funded initiatives with a predominant emphasis on nominal fee based trainings and refunds based on attaining proficiency for unemployed youth.	DIT, MoLHR, MoEA	Six months
19.4	Formulation of a policy on and launch of the 'finishing schools.'	DIT, MoLHR, MoE, MoEA	Twelve months
19.5	Implementation and Review of the implementation status annually.	DIT, MoLHR, MoE, MoEA	On-going

P20- Universal ICT literacy in the RGoB –Enhancing ICT literacy and proficiency- Institutional and systemic arrangements

S No.	**Strategy**	**Responsibility**	**Time**
20.1	Formulation and implementation/ review of the plan to ensure that skills qualifications are mandatory at entry level for ICT personnel or that these qualifications are acquired during the probation period.	DIT, RCSC	Six months, ongoing
20.2	Formulation of institutional mechanism and plan to enhance universal ICT literacy in the RGoB including policies on mandatory FIT and FITM trainings; certifications in RGoB and linkages to promotions.	DIT, RCSC	Six months
20.3	Implementation of the above plan including its linkages to promotions for all RGoB personnel.	DIT, RCSC	After two years of the launch
20.4	Review of the implementation status annually.	DIT, RCSC	On-going

P21: Creating an institution of higher learning in the field of ICT- Centre of Excellence (CoE)

S No.	Strategy	Responsibility	Time
21.1	Formulation of project plan on creation of CoE	MoE, RUB, DIT	Twelve months
21.2	Implementation and review of the implementation Status annually.	MoE, RUB, DIT	Three years

P 22: Enhancing ICT Human Capacity in the country – Encouraging training and development (T&D) and other initiatives towards making Bhutan knowledge-based information society

S No.	Strategy	Responsibility	Time
22.1	Formulation of Annual national awards schemes for companies for contributions towards development of the ICT sector	DIT	Six months
22.2	Formulation of policy on encouraging investment in T&D and provision of government assistance on the same.	DIT, MoF	Six months
22.3	Review of the implementation status annually.	DIT, MoF	On-going

P 23: Creating a strong ICT association in the country

S No.	Strategy	Responsibility	Time
23.1	Assistance in setting up a strong ICT association in Bhutan.	DIT	Three months
23.2	Review of the role-played by the association and on-going support.	DIT	On-going

Annexure

- Annexure 1: Project process
- Annexure 2: Project Plan and work schedule
- Annexure 3: List of stakeholder organisations interacted with
- Annexure 4: List of relevant documents and information referred to
- Annexure 5: Skill development needs list
- Annexure 6: BIPS Strategies with direct implications for ICT HRD master plan
- Annexure 7: ICT Curriculum at NIE, Paro
- Annexure 8: DIT Coordinated short courses in Technical; Professional; Managerial and Entrepreneurial areas.
- Annexure 9: Recommendations for enhancing the offerings of the tertiary institutes
- Annexure 10: Review of Sherubtse Course Curriculum- Recommendations
- Annexure 11: Key aspects in School education for country's ICT development- inculcating it early
- Annexure 12: Education system in Bhutan
- Annexure 13: Career paths for ICT professionals in the RGoB
- Annexure 14: ICT projects in Bhutan
- Annexure 15: Good Governance Report 2005: Implications and directions for ICT in Bhutan
- Annexure 16: HRD plan - trainings/ higher education plan for some RGoB ministries /agencies for 10FYP

Annexure1: Project process

1. **Understand objectives, collect data & information: Why are we creating these plans and sub-plans? What is the expected outcome? What critical information, data, view points and facts are required for the analysis to meet the objectives?**

S No.	Input	Process	Output
1	Stated objective of the initiative. Inputs from different stakeholders.	Understanding the vision, mission, strategies, current challenges, environment, key success factors affecting the initiative. Interviews and discussions with different agencies associated with the project. Collecting data including the skill sets to be focussed on, scale of capacity development effort required, existing resources, training facilities, courses, opportunities and their current challenges. Critical analysis of the current training and educational systems including the width, depth, methodology and approaches.	Statement on the program objectives with a direct and tangible link towards making Bhutan a knowledge-based information society, compilation of key data and information sets, stakeholder analysis and key success factors.
2	Contributions the different stakeholders and key resource personnel are expected to make towards the success of the initiative.	Understanding the role and position of stakeholders and key resource personnel.	Statement on roles of stakeholders and key resource personnel towards implementing the Bhutan ICT Policy and strategies (BIPS) and national development program of Royal Government of Bhutan.
3	Discussions with the committee members,	Understanding the competencies implications	A table of knowledge skills

	program leaders and subject matter experts.	of the role and context realities.	and attitudes required by the talent pool for the mission to be successful.

2. Design draft master plan and sub-plans: What will be our master plan? What specific steps will we take? Who will be responsible for it? What are the time frames?

S No.	Input	Process	Output
1	Scenario analysis and information, data and knowledge bank from the previous step.	Creating a detailed master plan based on the initiatives' vision, mission and objectives. The master plan will be based on detailed analysis, facts and data, consensus on ends and means among different stakeholders.	Draft Master Plan. Draft Sub plans on competence development, Facilities development, Investments, private Sector and ministerial role, employment opportunities and business enabling roles, education initiatives etc.

3. Discuss, and validate the drafts: What are stakeholder views on the draft plans and sub plans? What is the acceptability? What could be specific concerns and challenges? What modifications are required?

S No.	Input	Process	Output
1	Draft master plans and sub-plans	Focus group discussion with different stakeholders on different aspects of the plan and action steps. Revisit to the design and development step.	Issue and Concerns logs. Options on resolution; Selected approaches; Conclusion on approaches; Documentation and detailing on each of the concerns and

			incorporating them in the main master plans and sub-plans.

4 Provide Implementation Strategies: How will the plans and sub-plans be implemented?

S No.	Input	Process	Output
1	Mutually arrived at Plans and Sub-plans	Detailing out sub-plans with clearly identified work steps, accountability and responsibility identification, time lines, milestones evaluation and monitoring etc. Trainings to various stakeholders on roles to be executed by them. Plan clarification and action planning workshops.	Revalidation mechanism with respect to the basic objective of enhancing the ICT potential of the country and transforming Bhutan into a knowledge-based information society.

Annexure 2: Project Plan and work schedule

S No.	Work Step	Project Schedule					
	Month	**1**	**2**	**3**	**4**	**5**	**6-7**
1	Understand objectives, collect data & information	June 10- July 18					
2	Design draft master plan and sub-plans		July 18- Nov 5				
3	Debate, discuss, and validate the drafts- Presentations & discussions				Nov 19- 30		
4	Provide Implementation Strategies					Nov 22-Dec 4	

Annexure 3: List of stakeholder organisations interacted with/ invited for consultative processes

- RGoB Ministries
    - Ministry of Economic Affairs
    - Ministry of Education
    - Ministry of Finance
    - Ministry of Agriculture
    - Ministry of Works and Human Settlement
    - Ministry of Health
    - Ministry of Labour and Human Resources (DOS, DHR)
    - Ministry of Home and Cultural Affairs
    - Ministry of Foreign Affairs
- Public Sector Organisations
    - Bhutan Telecom
    - Bhutan Power Corporation
    - Bhutan Post
    - Bhutan National Bank
    - Bank of Bhutan
- Royal Civil Service Commission (RCSC)
- Constitutional agencies
    - Royal Monetary Authority
    - Planning Commission
- Educational Institutions
    - Royal University of Bhutan (RUB)
    - Royal Institute of Management (RIM)
    - Private Training Institutes
    - Sherubtse College
    - College of Science and Technology, Rinchending
    - Higher secondary Schools

- Private Sector Organisations
    - IT Association of Bhutan (ITAB)
    - Training Centers
    - Call centers and medical transcription companies
    - Bhutan Chambers of Commerce and Industry(BCCI)
    - Tashi Infocom Ltd
    - Bhutan Business Solutions (BBS)
    - Druk-on-net
    - Rigsum Institute of Information Technology(RIIT)
    - CMI, Phuentsholing
    - Bhutan Centre of Excellence
    - Kuenphen Institute of Technology
- Consulting Service providers to MoIC
    - Japan telecommunications Engineering and Consulting Service
- Development agencies and Donors
    - UNDP
    - Embassy of India
    - S&V (Dutch Agency) and Dutch Consulate
    - Helvetas
    - ADB
    - JICA & Japan Fund for ICT
    - Liaison office of Denmark

Annexure 4: List of relevant documents and information referred to

S No.	Document
1	Bhutan Vision 2020
2	Bhutan ICT Policy and Strategies (BIPS)
3	Bhutan National HRD Report 2007(Jan 2007, Draft)
4	Media Impact Study, Survey Booklet, Baseline Survey
5	Background Paper on supply of HR in Bhutan (Policy Planning division, MoLHR)
6	Background Paper on "Bhutan as a IT destination"
7	"e-Readiness Report, 2003" GMCT I&C Technologies Thimphu
8	National ICT HRD Plan: A conceptual framework
9	Concept paper on e-Zomsa
10	HRD master plan for Pvt Sector and Corporate Sectors (2002-2007)
11	Department of Occupational standards- profile for IT skills areas
12	Ministry of Education (MoE) Education Sector Strategy: Realizing Vision 2020 Policy and Strategy
13	Detailed project Report- ICT Broadband master Plan
14	RCSC HRD Master Plan 2002-2007
15	RUB Strategic Report
16	Sherubtse prospectus and intake
17	RIM Courses
18	ICT Master Plan 1999
19	Schooling in Bhutan by Tenzin Choeda, Going to School in South Asia, Amita Gupta, Chapter 4, The Global School Forum
20	Bhutan private Sector Survey, 2002
21	Civil Service HRD master Plan
22	Brochures from RBIT, RIM, CST- Sherubtse, RIIT, CMI
23	ICT in Education- e-primers for the Information, economy, Society and Polity

24	E-business and e-commerce- e-primers for the Information, economy, Society and Polity
25	E-governance- e-primers for the Information, economy, Society and Polity
26	Review of Virtual Extensions and Research Communication Network (VERCON) Bhutan Sept 2006 report
27	General statistics 2006- Ministry of Education
28	ICT at Royal University of Bhutan- A report by WBL Consultants Feb 2005
29	National Stakeholders meeting Report- Empowering Rural Areas through Community E-centers, 30-31 Jan 2007
30	Bhutan IT park and distance Learning centre Feasibility Revised Ph II Report
31	SASEC Presentation- ADB
32	Computerization Master Plan 1994-1998
33	National Stakeholder Meeting- Empowering Rural Areas through Community E-centers, 30-31 Jan (and ADB technical assistance Consultant's Report- Final Report Jan 2007)
34	Quality of Education (Standards), MoE presentation to CCM May 9, 2006
35	ICT White Paper Oct 2003

Annexure 5: Skill development needs list

Skill development needs list by skill areas

S No.	Competency area	Skill sets
1	ICT courses	▪ Academic course in IT, Computer applications and Computer Science ▪ MCSE, Java, C++ applications ▪ CCNA ▪ Project Management skills ▪ Open source certification ▪ Security and protection systems (Cyber crimes and protections) ▪ System administration ▪ Database administration ▪ Hard ware and Computer Architecture ▪ Computer Networking and network administration ▪ Web-development ▪ Web Enabled Applications ▪ Software Engineering ▪ Data Communications ▪ Multi Media/Computer Graphics ▪ Natural Language Processing ▪ Telecommunication/WAP ▪ Real Time Computing ▪ Project Management ▪ IT and Organisation management ▪ Production Process Management ▪ Revenue Accounting and Financial Management ▪ E-commerce and e-business applications ▪ Application of IT in specific sectors like Tourism and hospitality ▪ Application of ICT in IT in improving healthcare delivery ▪ Content development
2	Courses in Teaching Information Systems	▪ PG Certificate
3	Telecommunication-Communication and Information Management System	▪ WLAN, wireless technology ▪ WAN, Intranet and LAN ▪ VSAT/ Radio Link / Satellite connectivity ▪ Switching & routing technology - Path Terminal equipment; Add/Drop Multiplexer; Digital Cross Connects;

		Regenerator or optical amplifier; Core router; Edge router; Switches; Microwave equipment ▪ Online encoders Degree level course on Electronics and telecommunication (curriculum includes Microwave, BTS, BSC, MSC; Networking; Network administration)
4	International BPO/ Call center courses	▪ Medical Transcription ▪ Insurance Claim Processing ▪ Revenue Accounting and Book keeping ▪ Back Office Operations ▪ Content Development/Animation ▪ Office Management ▪ Data warehousing ▪ Communication skills (voice and accent neutralization) Degree level course on Management of BPOs
5	Tele-centres/ Community Information Centre courses	Diploma/ Certificate level courses on O&M of Tele-centres/ Community information centres
6	E-governance courses	▪ Digital Signature (These technologies pave way for E-Governance, E-Commerce and all related Technologies where authentication and application security has to be given high priority.) ▪ Data Interoperability Standards (There is a need to follow standards and Bhutan must be aware of the standards followed elsewhere so that we in long run become interoperable with other countries wherever the information exchange need arises) ▪ IT Security (Also there is a need to come up with a general IT Security policy for the Government.. ▪ E-Procurement
7	Entrepreneurial skills	Post graduate certificate level courses on Management of ICT business

8	Management of ICT business	Post graduate certificate level courses on entrepreneurship in ICT business
9	Behavioral courses for prospective agent/technician level employees to the ICT sector	Course on employeeship (Positive thinking, Stress management, Working with pride- dignity of labour; openness to learning)
10	Free and open source Software (FOSS) Localization using Linux	Courses on Linux skills; Translation skills Developments of Applications in Open Source platforms.
11	Digital Library and National Language processing (NLP) projects of DIT	Courses on XML, Web applications, Graphic designing, 3-D animation, GIS, Linguists and Computational language Techniques, Speech Techniques, Image Techniques Multimedia including Video streaming, podcasts etc.
12	Behavioral skills	▪ Leadership skills ▪ Communication skills ▪ Stress management ▪ Positive thinking and Openness to learning ▪ Responsibility and accountability ▪ Taking pride in one's work (dignity for all labour) ▪ Analytical thinking and problem Solving

Skill development needs list by level and course duration of course

List of different areas of education and training in the ICT domain by level and course duration		
Level	**Broad Field of Study/training**	**Normal Duration (months)**
Ph D (1)	Specialisation with Computer Science/Information technology/Communications Engg.	36.00
Masters (2)	Computer Science & Engg	24.00
	Information Technology	
	E-Commerce and IT	
	Database Management	
	Communications Technology	
	Software Development	
	Multimedia Applications	
	Network and System Administration	
	Software Engineering	
	Information Systems and Management	
	Computer Applications	
PG Diploma (3)	Web service and information management	12 to 18
	IT	
	Database Management	
	Multimedia Applications	
	Network and System Administration	
	Computer Applications	
	E-Commerce	
	Software Development	
PG Certificate (4)	IT	1 to 6
	E-Commerce	
	Multimedia Applications	
	Web applications	
	Office Applications	
	Web designing	
	Computer Hardware	
Bachelors (5)	Information Technology	36 to 48
	Electronics and Communications	
	Computer Science	
	Computer Applications	
Diploma (6)	Information Technology	6 to 18
	E-Commerce	
	Office Applications	
	Web designing	
	Computer Hardware	
	CAD	
	Web applications	
	Cabling	

	Multimedia Applications	
	Networking	
Short Term/ Certificate (7)	Computer operations and data management	0.5 to 12
	Data base design, analysis & MIS	
	Office Management & Computer Operations	
	System Operation Standards	
	Web Designing	
	Database Administration	
	Computer Networking	
	Database management & Web Designing	
	CAD	
	Communication Engg	
	Digital Signal Processing	
	SQL Server, Oracle, Java	
	LAN & Wireless Networking	
	Computer hardware and Maintenance	
	AutoCAD	
	SPSS	
	Dot net and E-learning	
	PHP Mysql, Java Script	
	Network trouble shooting	
	CWNA Course and CCNA	
	Cyber Security	
	Knowledge management	
	Information retrieval	
	Computer Layout and /Design	
	LAN & WAN	
	Red Hat Enterprise Linux (RHEL) Training (Regular Track Training program) targeted for RHCE (Red hat Certified Engineer) certifications	
	Advanced Java Application development	
	Enterprise Systems (SAP)	
	Cisco CCNA	
	Adobe Certified Experts or professionals	
	Fibre Optics Splicing Course (TS LAN 201)	
	Cabling System Design Class for Optical Sungle Mode Access networks used in Fiber-to-the-home(FTTH) and Fiber-to-the-business (FTTB) deployments, collectively FTTx (TS AND 500)	
Special training arrangements (Mentoring, On-the-job-training, Attachments)	All areas	1 to 6

Deployment of ICT skill sets: ICT as an enabler

S No.	Area/Project
1	Bhutan as IT destination (including e-zomsa IT connectivity)
2	Telecommunication sectors- mobile telephony, LAN, WAN, VAN, International FO connectivity, Satellite connectivity, Dzongkhags and Gewok connectivity
3	ICT unit in the 10 Ministries (Ministry of Works and Human settlement, Labour & Human Resources, Trade and Industry, I&C, Home & Culture Affairs, Health, Foreign Affairs, Agriculture, Education and Finance.)
4	**ICT function in Constitutional bodies** Anticorruption unit, Election commission, Royal Audit Authority, RCSC **Autonomous bodies** Office of Attorney General and Administrative tribunal; Centre for Bhutan Studies, National Statistical bureau, National Environment Commission, Royal University of Bhutan, Board of Corporate Affairs.
5	ICT function in RCSC
6	ICT function in Corporations
7	ICT function in non IT Private sector companies
8	Teaching at Schools and IT colleges
9	Companies in the area of Hard ware maintenance; Software customization and application for domestic companies; companies in the Enabling e-business/ web site design and maintenance
10	Initiatives like GRAB, E governance initiatives, Community information centers, tele-centers
11	IT Training Institutes
12	Application of ICT in promoting other Bhutan offerings online (crafts, artifacts, carpets)
13	Application of ICT in Preserving religious and cultural wealth of Bhutan
14	Application of ICT in IT in improving healthcare delivery
15	Application of IT in specific sectors like Tourism and hospitality
16	Increasing and encouraging use of ICT among the public by initiatives like Free and open source Software (FOSS) Localization using Linux

Deployment of ICT skill sets: ICT as an industry

S No.	Area/Project
1	Soft ware development for international markets
2	BPO for international markets- call centers and data warehousing operations
3	Support and maintenance services
4	Products and packages, Professional ICT Services, Serving e-business/ web site design and maintenance needs of international companies

Annexure 6: BIPS Strategies with direct implications for ICT HRD master plan

The following is the listing of those BIPS strategies in the five areas, which have direct implications on the ICT HRD master plan

Area	Strategy	Sub-Strategies	ICT HRD Implications
Policy	▪ P1 ▪ P2 ▪ P3 ▪ P4	▪ P1.6 ▪ P1.7 ▪ P1.8 ▪ P2.4 ▪ P2.5 ▪ P3.1 ▪ P4.2	▪ 4 member ICT units in each ministry and similar units in the 5 constitutional and 7 autonomous agencies. ▪ ICT units in each of 20 Dzongkhags ▪ ICT personnel, skills and training required in development, O&M of digitized on-line content and service delivery on-line ▪ ICT personnel required for new organisations ▪ Aggregate training and capacity development initiatives across government and across private and public sectors
Infrastructure	▪ IN1 ▪ IN2	▪ IN1.1 ▪ IN1.2 ▪ IN1.3 ▪ IN2.1 ▪ IN2.2 ▪ IN2.3 ▪ IN2.4 ▪ IN2.5 ▪ IN2.6 ▪ IN2.8	▪ ICT HR required for operators, service providers, ICT businesses and ICT infrastructure companies ▪ Opportunities for developing local ICT HR from FDI players ▪ ICT infrastructure across Bhutan would require appropriate ICT HR for installation, O&M. ▪ Tele-centres in each Geog require HR for O&M ▪ Advanced technologies will require ICT HR personnel, training and educations institutions
Human Capacity	▪ HC1	▪ HC1.1	▪ RGoB and private sector training

	▪ HC2 ▪ HC3 ▪ HC4 ▪ HC5	▪ HC1.2 ▪ HC1.3 ▪ HC1.4 ▪ HC2.1 ▪ HC2.2 ▪ HC2.3 ▪ HC2.4 ▪ HC3.2 ▪ HC4.1 ▪ HC4.2 ▪ HC4.3 ▪ HC4.4 ▪ HC5.2	needs assessments (provide employment related ICT training courses to School leavers) ▪ ICT occupational profiles for RGoB profiles ▪ Career Paths for RGoB ICT professionals ▪ In-country trainings and External training programmes for RGoB, semi govt. and corporations, pvt. Sector in the area of technical skills, managerial and professional skills and entrepreneurial skills. The ICT unit heads would require trainings in the area of Project management. The decision makers will benefit from awareness campaigns to reduce risk aversion. ▪ Local ICT capacity building MOUs with / incentives to Pvt sector ▪ Framework for COE-educational partners in Bhutan, linkages with international institutions, ICT R&D areas personnel and facilities. COE will accredit, certify ICT curricula and institutes. ▪ Standardized curriculum for skills required in the job market ▪ Plans for regional training / ICT institutes ▪ ICT personnel required for O&M of ICT infrastructure in all MHS and HS schools (around 40) and around 15 Pvt schools ▪ ICT component in Teacher Training programmes including OSS ▪ Developing Basic ‘ICT literacy

			curriculum' for Schools and other training centres including OSS ▪ Incorporating ICT skills at the Community Learning centers and NFE programs will require appropriate ICT staff
Content and applications	▪ CA1 ▪ CA2 ▪ CA3 ▪ CA4 ▪ CA6	▪ CA1.3 ▪ CA2.1 ▪ CA2.2 ▪ CA2.3 ▪ CA2.4 ▪ CA2.5 ▪ CA3.2 ▪ CA3.3 ▪ CA4.2 ▪ CA4.3 ▪ CA6.1 ▪ CA6.6 ▪ CA6.7 ▪ CA6.8	▪ Provide avenues for trainings on setting up and operating e-business initiatives including online payment systems and e-enabled postal system. ▪ ICT skilled personnel and training facilities required in incorporating Dzongkha computing to OS; developing digital text/ picture/sound archives, developing online content ▪ Training users in major computing platforms/ OS with Dzongkha ▪ ICT personnel for O&M of all tele-kiosks and tele-centres by 2010 ▪ ICT personnel for updating digital library ▪ ICT personnel for creating content for distance education, deliver distance education and O&M distance education centers ▪ ICT personnel, skills and trainings in O&M of real time telemedicine links among BHUs, district and referral hospitals and of Integrated health management system ▪ Training in use of common data standards ▪ ICT personnel, skills and trainings in implementing national GIS system

			▪ ICT personnel, skills and trainings in developing and updating web content, web portals for different institutions /agencies/bodies ▪ ICT personnel, skills and trainings in developing and updating automated systems for citizen complaints and enquiries by 2010
Enterprise	▪ E1 ▪ E2 ▪ E3 ▪ E4 ▪ E5	▪ E1.3 ▪ E1.4 ▪ E2.2 ▪ E2.3 ▪ E3.1 ▪ E3.3 ▪ E4.1 ▪ E4.2 ▪ E4.3 ▪ E5.1 ▪ E5.2 ▪ E5.3 ▪ E5.4	▪ Develop professional knowledge exchange forums for ICT professionals ▪ Demand aggregation for trainings ▪ ICT personnel, skills and trainings in taking up outsourced RGoB ICT work ▪ ICT personnel, skills and trainings in developing, O&M e-procurement system in RGoB ▪ Identify FDI areas that have high skills transfer components ▪ Create the right incentives for high skills transfers in FDIs ▪ Ensure that FDI/local investment in ICT trainings get priority sector treatment when creating the right tax environment for ICT businesses ▪ One of the factors identified for pvt sector is a culture of enterprise- here an orientation into entrepreneurship would be very useful. ▪ ICT personnel, skills and trainings for O&M of call center and data warehousing (for RGoB) centers and for executing the BPO (IT enabled staff) and ware house operations (Ware housing executives) and

			supervisory staff) ▪ ICT personnel, skills and trainings for developing software as an export services area. ▪ ICT personnel, skills and trainings for e-commerce applications including national e-commerce portal, for support by postal services and in film and music sectors and other non-ICT sectors.
Monitoring and Oversight			▪ Project Management trainings for Inter-ministerial Working group ▪ Selecting of appropriate software for progress monitoring and review ▪ Quarterly reviews and preparation of progress report for the cabinet every six months

Notes-

BIPS report clearly identifies “appropriate human capacity” as a critical requirement for successful implementation of the strategies.

ICT units in different ministries are to monitor progress with a bi-annual progress report to CCM.

ICT Master plans for schools, curriculum for vocational trainings, job oriented training courses and advanced vocation trainings are required. (Pg. 13-14, Situation analysis- Human capacity)

In the area of content and application, specific benefits could accrue in the area of sale of Bhutanese products online, preservation of cultural heritage, provision on educational services and health services.

The Bhutanese enterprises in the pvt sector are focussed in the area of hardware supply and maintenance and a large opportunity exists in the area of software products and services to leverage RGoB outsourcing policy, increasing ICT investment by harnessing skills of foreign workers within the national Labour policy, offering goods and services to the pvt sector and export industries like call centers and data warehousing. (Pg. 15, Situation analysis- Enterprise)

One of the factors identified is a culture of enterprise- here a orientation into entrepreneurship would be very useful. (Pg. 16, Policy Objectives and Guiding Principles)

Guiding principles in pursuit of objectives to achieve the ICT vision are Strong Govt leadership, Convergence of ICT technologies and markets enabled by integrated and coordinated approach, and PPP to enable the Pvt sector to leverage their businesses to realize the common goal of productivity and high value employment. (Pg. 17, Policy Objectives and Guiding Principles)

While in the medium-term, the pvt sector would be a driver of economic and employment growth, in the short-term, RGoB will take a lead in application of ICT. Some of the benefits to citizens will be public services available more conveniently nearer home and opportunity to access information, communication with public servants, representatives and others and participate in governance. (Pg. 18, Strategies and activities-Policy)

BIPS report quotes ICT White paper as the guiding light for Human Capacity, "Ensuring institutions and curricula to provide ICT skills at all levels, from technical, professional and entrepreneurial skills for Industry and government to basic literacy for all." (Pg. 23, Strategies and activities- Human capacity)

The report notes the critical importance of developing ICT human capacity. The emphasis includes enabling ICT usage; High-end skills, generating a critical mass of ICT professionals, strengthening the existing human capacity and on professional, managerial and entrepreneurial skills enhancement. At RGoB, clear career paths and appropriate roles are required for ICT professionals. Neither inadequate in-country trainings nor expensive external trainings meet the requirements. Trainings need to be job oriented to attract youth and businesses. (Pg. 23, Strategies and activities- Human Capacity)

It is noted that post 2007, post joining WTO, Bhutanese companies will face competition from international companies. (Pg. 31, Strategies and activities-Enterprise)

There is a clear policy direction towards financial support, FDI, progressive sales tax removal on ICT equipment, examination of tax environment including depreciation, and possible incentive for investment in ICT businesses. (Pg. 33, Strategies and activities- Enterprise)

The BIPS report identifies Human Capacity is a risk factor. The emphasis is as much on technical skills as on managerial, project management skills (particularly for ICT unit heads) and entrepreneurial skills. The awareness campaign among decision makers cannot be over emphasized. (Pg. 36, Risk analysis)

Progress of BIPS will be monitored by an Inter-ministerial Working group comprising of ICT unit Heads across Govt, MoIC PPD officers, and Director, DIT. In the respective ministry, ICT units will monitor the progress. The working group will meet quarterly for reviews and prepare a progress report for the Cabinet. Project management trainings may also be necessary for working group members. (Pg. 36, Monitoring and Oversight)

Annexure 7: ICT Curriculum at NIE, Paro

FIT components- 3 modules (compulsory for all trainees):

- FIT 1101- Computer Basics and MS Word (Operating Systems Fundamentals and Word processing)
- FIT 1102- MS Excel and MS power Point (Spread Sheets and PowerPoint)
- FIT 2103- LAN and Internet (LAN, Internet, Web-based email, Search Engines)

Specializing Subjects IV - IT components/Modules

The components include Computer Fundamentals (Word, Excel, PowerPoint, Internet), Advanced Word Processing and Desktop Publishing; Teaching Using Computers; Web Designing using HTML; Database using Access; Teaching IT; Web scripting using JavaScript; Instructional Design; Courseware Development using Flash; and Project/Portfolio. The modules are organized as below:

- EIT1501: Beginning IT for Teachers
- EIT1502: Teaching using Computers
- EIT1503: Developing resources using IT
- EIT1504: Creating Web-based Materials
- EIT2505: Understanding Database Concepts
- EIT2506: Strategies for Teaching IT
- EIT3507: Introduction to Programming
- EIT3508: Courseware Design
- EIT3509: Development tools (Authoring tools)
- EIT3510: Projects

Recommendations (Note- These are not final recommendations, but are meant to be pointers for considerations of an expert group on reviewing the current structures)

- It may be considered to give further emphasis on web content development, networking, teaching using e-learning tools and basics of e-business.
- It may be considered to include Communication technologies in FIT 2103.
- It may be considered to include fundamentals of computer science in FIT 1101.
- It may be considered to include a component on Open source/Linux in Specializing Subjects IV. The debate on whether learners are to be educated using Open source software or proprietary software must first be settled at the

national level before offering courses which communicate a de-facto decision in favour of one vs. the other.

- The curriculum needs to be modified to include components on ICT teaching through Non-formal education (NFE) and teaching ICT through community centres.

Annexure 8: DIT Coordinated short courses in Technical; Professional; Managerial and Entrepreneurial areas.

S No.	Area	Skill sets
1	Technical	▪ MCSE ▪ System administration ▪ Database administration ▪ Hard ware and Computer Architecture ▪ Computer Networking and network administration; CCNA ▪ Web-development and Web Enabled Applications ▪ Management of Communication technologies and networks (OPGW, VSAT, ADSL; Dial up; Wi-fi, Microwave) ▪ Linux Skills ▪ Data warehousing ▪ Communication skills (voice and accent neutralization)
2	Professional	▪ O&M of Tele-centres/ Community information centres ▪ Project management skills ▪ Communication kills
3	Managerial	▪ Management of BPOs
4	Entrepreneurial Skills	▪ Skills for an ICT entrepreneur

Annexure 9: Recommendations for enhancing the offerings of the tertiary institutes

(Note- These are not final recommendations, but are meant to be pointers for considerations of an expert group on reviewing the current structures)

Institute	Recommended Expansion
Sherubtse College*	▪ Expand Intake to 100 from the current 30 over the next 5 years (a standard 4-years degree course in ICT with options to specialize in Software Engineering) ▪ Offer degree level courses in Electronics and Telecommunication Engineering (minimum 20 seats in next three years)
RBIT**	▪ Offer 4-years degree level courses in ICT (minimum 30 seats in next three years) ▪ Expand Intake to the ICT diploma level courses to 200 over the next 5 years
CST (JN Polytechnic)	▪ Offer 4-years degree level courses in ICT in next three years (minimum 30 seats) ▪ Offer ICT diploma level courses to 200 over the next 5 years
RIM (offers a diploma course in Information management and other courses)***	▪ Offer 4-years degree level courses in ICT (minimum 30 seats) in next five years ▪ Offer 2-years post graduate level courses in management of ICT; BPO Management (minimum 20 seats in next three years) ▪ Offer 1-year post graduate level courses in Entrepreneurship in ICT sector (minimum 15 seats in next two years)
4 VTIs	▪ Offer ICT certificate level courses (3 years after XII or 1 years after graduation) – at least 500 seats over the next 5 years
ICT tertiary institute to be set-up in Central/ South Bhutan****	▪ Offer 4-years degree level courses in ICT in next five years (minimum 30 seats) ▪ Offer ICT diploma level courses (and scale up to 200 gradually over 5 from the launch)
NIE Paro; NIE Samtse	▪ Offer a PG diploma in Teaching IS to those aspiring to be ICT instructors at training institutes in the private sector

Pvt sector training institutes	▪ Include advanced vocational courses like Telecommunications, Communication Management and Info Mgmnt systems along with the currently offered basic courses like Network administration; Web developing, Graphics, Desktop Publishing ▪ Much higher number of institutes is needed than the current approximate number of 18 with the right infrastructure, faculty and certified quality training programs ▪ The output required will be 20000 student-programmes per year by 2010
All tertiary institutes	▪ Introduction of ICT subjects in non-ICT degree/ diploma education in a gradual manner over the next 3 years

*Currently, the college suffers from overcrowding and very less residential facilities for the students (RUB Strategy paper)

**The College of Science and Technology formerly known as the Jigme Namgyel Polytechnic was relocated from Dewathang to the Rinchending Campus in Phuentsholing in 2000 (RUB Strategy paper)

***RIM: The Institute offers programmes at post graduate and undergraduate diploma to about 250 students per year. (RUB Strategy paper)

****According to RUB Strategy paper, National Assembly during its 83rd Session has resolved to establish an additional degree college along the Sherubtse College model at the present Gedu (present THPA complex) on the Thimphu-Phuentsholing national highway to increase access to higher education in Bhutan. With the relocation of the Diploma Section from the CST in Phuentsholing to the former Polytechnic Campus in Dewathang in 2006, access to tertiary education will be further increased and will fulfill to a certain extent the demand for technically skilled human resources both in public and in private sectors.

Output at different levels (2010- 2020)

These initiatives would provide the following output at different levels from the tertiary institutions in the list above (does not include the private sector training institutes)

Level	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**
Degree level and above	45	45	85	145	235	245
Diploma Level	30	90	190	560	560	560
Certificate	100	200	300	400	500	500

Note:

a. NIE Paro currently offers

i. B Ed. (4 years) after XII leading to primary education teaching

ii. Diplomas in Leadership and management (In service program for the Heads of Community and Primary Schools

iii. M Ed. –part time (summer breaks) for heads of secondary schools.

iv. Diploma (L&M) and M Ed. Are offered in collaboration with Masters in St. Francis Xavier University in Canada.

b. NIE Samtse currently offers

i. B Ed. (4 years) after XII leading to primary education teaching

ii. PG certificate in Education after XII leading to secondary education teaching

Annexure 10: Review of Sherubtse Course Curriculum- Recommendations

(Note 1. - These are not final recommendations, but are meant to be pointers for considerations of an expert group on reviewing the current structures.

Note 2. Based on a focussed group discussion at Sherubtse College with about 10 ICT graduates from different institutes including 3 from Sherubtse College)

(It is believed that the curriculum being used from July 2006 has been arrived at by RUB in collaboration with University of New Brunswick, Canada)

- While what the course is called may not have much substantive meaning, its recommended to call the program a 4-years degree course in Engineering- B.E./ B. TECH (CS/ IT)

- Currently the B.Sc. Computer Science degree programme offered by the RUB leads to two different types of degrees. After six semesters the course can end with ordinary degree certificate in Computer Science. The capable students who show steady progress and have zeal to excel will stay for another two semesters and earn an Honours degree in Computer Science. Not more than 50% of the third year will proceed to the fourth year. It is recommended that only a uniform 4 years degree course in Engineering- BE/ B TECH (CS/ IT) be offered.

- There is, in general, a need to make the courses more aligned to needs of the industry and be made more skills oriented. This is also the feedback from the Industry.

- The curriculum is Mathematics Heavy- it has 8 courses on mathematics subjects. These courses need to be compressed and taken up in the first half of the programme only.

- Industry-academics interaction needs to be enhanced. Continuous industry feedback, guest lectures and alumni feedback is essential and needs to be incorporated in continual improvement.

- During the vacation after the 5th semester, the students who wish to pursue the 3-year degree programme are attached to an organization. The duration of the attachment is a month. For the Honours degree course, the institutes require a Semester VIII senior project. It is recommended that regular teaching based inputs be provided in the VIII semester and two internships at industry be mandated – one after the IV semester and the other after the VI- each of preferably 6-weeks duration. This will provide more opportunity for taking up some key subjects while retaining (in fact, enhancing) the internship- and project work. In the semesters following the internship periods (V and VII), there will be presentations and seminars on the work done by the students. These initiatives may reduce the period of mid-summer breaks/vacations.

- The intake must be enhanced from 30 to 50 with preparation for further enhancement later.

- In general, ensure that there is a fair coverage of Computer hardware courses including micro processors and embedded systems; Software; Networking; Database management; System Design, analysis and administration; Web technologies and e-business and Communication Technologies.

- The following could be other specific considerations:

    a. CS101 and CS201 programming Fundamentals and data Structures may be studied with C/ C++.

    b. Add Numerical Methods and programming in Semester III

    c. Compiler Design – High priority and probably best placed in Semester V.

    d. Unified Modelling language (as part of System Analysis, and design; or Software Engineering)

    e. The CCNA course must be made mandatory with all levels covered.

- Additionally, the following courses must also be accommodated in the curriculum:

    a. Real Time Systems (RTS)

    b. Communication technologies including VSAT, satellite, OPGW, ADSS, DSL etc.

    c. Neural networks and Artificial Intelligence (AI) (or may be included in CS 701- II)

    d. Microprocessor and Embedded systems

    e. Object oriented programming Languages(C, Java and C++)

    f. E-computing and Internet Technologies including e-governance, e-business and e-commerce- PHP, ASP and JSP.

    g. Multimedia (or may be included in CS601)

    h. Network security (or may be included in CS603)

Current curricula of B.Sc. (H)- CS course

B Sc. computer science course affiliated to Delhi University was introduced at Sherubtse College during the academic year 1999 – 2000. With the experience gained from running the first ever semester-based course in the college, the department of Mathematics and Computer Science was mandated to develop a new curriculum to be administered under the aegis of the Royal University of Bhutan. The first semester of B Sc. computer science under RUB began in July 06.

Semester	Course
I	Module I – CS 101 – Programming Fundamental Module II – CS 102 – Discrete Structures I Module III – CS 103 – General Physics Module IV – CS 104 – English Communications Module V – CS 105 – Dzongkha Communications
II	Module I – CS 201 – Data Structures Module II – CS202 – Computer Organization and Architecture Module III – CS 203 – Discrete Structures II Module IV – CS 204 – Calculus I Module V – CS 205 – Digital Electronics
III	Module I – CS 301 – Networks I Module II – CS 302 – Object Oriented Programming I Module III – CS 303 – Operating System Module IV – CS 304 – Calculus II Module V – CS 305 – General Management
IV	Module I – CS 401 – Advanced Data Structures Module II – CS 402 – Object Oriented Programming II Module III – CS 403 – Systems Software Module IV – CS 404 – Linear Algebra Module V – CS 405 – Elective/Breadth Paper i) Bhutan History or ii) Environmental Management or iii) Geography of Bhutan
V	Module I – CS 501 – Database System Module II – CS 502 – Algorithm Analysis Module III – CS 503 – System Analysis and Design Module IV – CS 504 – Differential Equations Module V – CS 505 – Elective/Breadth Paper i) Urbanization and Migration Or ii) Principles of Economics
VI	Module I – CS 601 – Internet development

	Module II – CS 602 – Software Engineering Module III – CS 603 – Networks II Module IV – CS 604 – Computer Graphics Module V – CS 605 – Statistics & Probability
VII	Module I – CS 701 – Specialization Paper i) Data Mining Or ii) Artificial Intelligence Module II – CS 702 – Specialization Paper i) Parallel Processing Or ii) Distributed System Or iii) Managing Information Technology Module III – CS 703 – Research and Experimental Methods Module IV – CS 704 – Operations Research Module V – CS 705 – Numerical Methods and Scientific Computing
VIII	Module I - Senior Project

Annexure 11: Key aspects in School education for country's ICT development- inculcating it early

(Based on discussions with principal, teachers and students at some of the schools during July 2007)

(Note- These are not final recommendations, but are meant to be pointers for considerations of an expert group on reviewing the current structures)

- Computer Applications is offered at IX and X standards and Computer Studies at XI and XII standards. Computer Applications syllabus and teaching is quite superfluous.

- The introduction to the filed of computers must be offered much earlier than IX standard- say Computer Applications could be started at VII standard (say, topics like Introduction to basic computing and Office applications, Directory structure and Internet could be introduced at that level). However, even at present, serious problems are faced with respect to Hardware resources, Internet speed, Computer maintenance services and availability of software. The syllabus describes the MS Office and other proprietary content, but software is, quite often, not provided. The debate on whether students are to be educated using Open source software or proprietary software must first be settled at the national level before offering courses which communicate a de-facto decision in favour of one vs. the other. The same applies to courses being offered at NIE Paro and Samtse.

- The Computer Applications course is offered to a small number of students in Xth and XIth standards. If there were no limitations, a larger number of students could have taken it in each class. The school has to resort to putting % marks in Maths as criteria. Thus the best of students end up availing the opportunities to learn Computer Applications. Even without the competition, the better student's seek to take this course. But the irony is that, many believe, that the Computer Applications course is meant for those students who will not be able to proceed beyond IX and X and where it could become a source of employment for school leavers. The objective of the Computer Applications must be clearly communicated.

- 'Science' should be segregated into its component subjects from VII and not IX.

- The process of approvals for ICT education related aspects must be made more school/principal friendly. Under the name of decentralization, there is more and more centralization and bureaucracy. Its difficult to get approvals (which are required for every thing) from the Dzongkhags office- it is learnt that 'computer' is not a equipment for purchase approvals, 'repair and maintenance' can not be system upgrades, stabilizer is not a computer etc.- and these are interpreted in a very narrow sense depriving the schools of vital resources even against approval budgets. While these may be only anecdotal evidences, they indicate a disturbing trend.

- For XI and XII standards, Java Script is in the syllabus before and without programming Fundamentals, C and C++ making it ‘jumping’ the logical steps, which prevents building of a sound base.

Annexure 12: Education system in Bhutan

Summary Statistics on Education in Bhutan, Ministry of Education, 2006

Institute	Pre Primary-Primary School	Secondary School			Tertiary
	PS	LSS	MSS	HSS	
	Up to VI Std	VII-VIII	IX-X	XI-XII	
Schools/ Colleges	349 (Including 5 day care, 245 community, 88 primary and 16 Pvt)	84	28	28 (Including 7 Pvt)	Tertiary education-9 Vocational-6 Special Institutes-3 Non-Formal Edu.-646
Students	46914	50576	21236	17798 (Plus 215 in India /abroad)	Tertiary education-3553 (Plus 2224 in India and 212 abroad) Vocational-813 Special Institutes-103 Non-Formal Edu.-18850
Teachers	1806	1643	748	766	Tertiary education-337 Vocational-98 Special Institutes-14 Non-Formal Edu.-669

Notes-

- Out of the 2200 students studying in India post XII: Engg has 165 (107 on Scholarship, 58 private) and Computer Science and IT related course has 69 (25 on Scholarship, 44 private)
- Out of the 212 students studying in abroad post XII: Engg has 16 (8 on Scholarship, 8 private) and Computer Science and IT related course has 4 (3 on Scholarship, 1 private)

Enrolments 2006

S No.	Types	Institute	Enrolments
1	Tertiary (3553)	Sherubtse College	1014
2		RIM	227
3		RBIT	446
4		NIE-Paro	744
5		NIE-Samtse	483
6		Royal Institute of Health Sciences	197
7		National Institute of Traditional Medicine	28
8		Natural Resource Training Institute	142
9		Institutive for Language and Cultural studies(ILCS)	272
10	Special Institutes (101)	National institute for the Disabled	41
11		Jigmecholling Sanskrit Pathshala	27
12		Dhoban Sanskrit Pathshala	33
13	VTIs (813) Post XII except ILCS	Construction	254
14		Samthang	81
15		Khuruthang	133
16		Rangjung	80
17		National Institute for Zorig Chusum	172
18		Trashiyangtse institute for Zorig Chusum	59
19	NFE (18550)	646	18550
		Total	22983

The following table from ‘Ministry of Education (MoE) Education Sector Strategy: Realizing Vision 2020 Policy and Strategy’ presents projections of students for general education.

Table 3: Enrolment Projection for General Education

Class/Level	2002	2007	2012	2017	2020
PP	15604	21908	24497	26344	27956
I	14828	20432	24029	25823	27403
II	14526	19032	23763	25378	26860
III	12957	16930	22793	24947	26328
IV	12594	15823	22137	24562	25810
V	10954	13829	20309	23987	25204
VI	9491	12651	18797	23573	24743
Primary	**90954**	**120604**	**156325**	**174614**	**184303**
VII	8859	13155	18129	24016	25337
VIII	7129	11239	16107	22757	24398
Junior Secondary	**15988**	**24394**	**34236**	**46774**	**49735**
IX	6613	10221	14306	21224	23461
X	4810	9546	13471	20429	23620
Middle Secondary	**11423**	**19767**	**27777**	**41653**	**47082**
XI	2794	5840	9819	15326	18367
XII	1683	5020	9335	14090	17496
Higher Secondary	**4477**	**10860**	**19154**	**29417**	**35863**
Total	**122842**	**175625**	**237492**	**292457**	**316984**

The tertiary education system, under the Royal University of Bhutan, recognises the need to enhance the intake capacity in the coming years.

Proposed Growth of the University by Institute. Total Student numbers in Full Time Equivalent (RUB Strategic plan)

Institute	2005	2006	2008	2010	2012	Focus
PCE	751	656	833	1183	1316	Teacher Education
SCE	594	782	869	925	1180	Teacher Education
CST	446	314	289	475	600	Engineering, Technology
RIM	172	241	348	385	373	Business and management
Sherubtse	1040	938	1027	1380	1775	Business & Management;

						Humanities & Social Sciences, Computing & IT
JNP	0	250	428	555	650	Engineering and Technology
Total	5008	5187	5802	6913	7906	

The tertiary education system also recognises the need for focus on ICT education and trainings. Quotes RUB Strategic paper, 'within the private sector, demand is heavily skewed towards the need for short courses, some at tertiary level. Full time tertiary level needs have been assessed in relation to six key sectors (services, production, construction, education, finance and IT). The IT and services represent by far the largest demand.'

Table below shows the number of 18-year olds, the number planned by the Ministry of Education to be admitted to Class XII, the expected number of applicants to higher education programmes, the number of students planned to be admitted by the University to tertiary education programmes and the number of students receiving bursaries to study abroad and an estimate of the number of students going abroad privately for each of the next eight years (2005-2012).

Demand for and Supply of tertiary education in Bhutan (RUB Strategic plan)

		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Expected No of 18 yr olds		15411	14663	15535	16039	15404	15498	16185	14789
Enter Class XII	(note 1)	3,687	4,071	4,606	5,237	5,854	6,541	6,850	7,474
Admitted to RUB tertiary	(note 2)	907	1135	1488	1560	1821	1985	2180	2477
% Of Class XII		30%	30%	32%	33%	31%	30%	29%	27%
% Of age group		5.9%	7.7%	9.5%	9.7%	11.8%	12.8%	13.4%	16.7%
Funded bursaries ext		115	110	110	110	110	110	110	110
% Of age group	(note 3)	0.8%	0.8%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Private students external	(note 4)	360	360	370	370	380	380	390	390
Total students entering tertiary ed		1,267	1,495	1,858	1,930	2,201	2,365	2,570	2,867
Total % of age group		8.2%	10.2%	11.9%	12.0%	14.3%	15.3%	15.9%	19.4%

Note 0 Population and Housing Census of Bhutan, 2005

Note 1 data from the Ministry of Education (CoS presentation: 9 June 2005)

Note 2 the number of Class XII students admitted to the first year of programmes at RUB

Note 3 Min Ed in June 2005 has 115 students on ex-country first year degree programmes overseas funded through RGoB or other countries or donors; most in Asia, and large majority in India. Succeeding figures are projected figures

Note 4 Min Ed figures June 2005 show 1400 privately funded students overseas registered with the Ministry. This correlates to 360 entering first year each year. This figure arises from students voluntarily registering and there may be significant under-reporting, The % is assumed to remain constant, but it could rise with more Bhutanese being able to afford external education or it could decline with the expansion of RUB.

Annexure 13: Career paths for ICT professionals in the RGoB

Royal Civil Services Commission (RCSC) has initiated a system of position classification (called Position Classification system). PCS lays down a clear career path for ICT personnel as follows, which continues into ICT Specialist and Sr. ICT Specialist:

Position Title	**Position Level**
Chief ICT Officer	P1
Dy. Chief ICT Officer	P2
Sr. ICT Officer	P3
ICT Officer	P4
Asstt. ICT Officer	P5

Position Title	**Position Level**
ICT Technician Associate I	S1
ICT Technician Associate II	S2
ICT Technician	S3
Data Asstt. I	S4
Data Asstt. II	S5

Asstt ICT officer is an entry position for select graduates (3 years course). For those with a 4 years course, the entry position is at ICT Officer level. And non-select graduates with XII education and DIMS or in service diploma) start at ICT Technical Asstt. II level.

Annexure 14: ICT Projects in Bhutan

In this annexure, different ICT projects being planned and undertaken in Bhutan are listed to bring out the extensiveness of ICT work being done so that the ICT HRD implications can be appreciated.

Helvetas project- PC lab assistance project for teacher training institutes

200 computers to be commissioned at each institute in a LAN (later connected to the RUB network) including in the lab and at the workstations.

Helvetas project-LAN for schools

To assist with switches to set up a LAN for the Schools. This is targeted for 100 community schools (those up to VI std.) At each school, 20 computers will be connected. 60-65 such schools in the HSS(XI-XII) and MSS(IX- X) have been covered.

Community Information centers (CIC)

It is planned to have a CIC in every Geog by 2013. Multiple projects- most of the projects are at pilot stage.

Project	**Key offering/purpose**
Microsoft Unlimited Potential (UP) project Network of Community Technology Learning centers in Rural Bhutan- CTLC	Training through CICs Software, Training curricula and Finance provided by MS; Hardware procurement, execution and community training program administered by DIT through Bhutan Post and Ministry of Agriculture
IDRC- Localized software (Dzongkhags localization in Linux); Rural information center for public awareness using wi-fi (VSAT) connectivity (Rural Access Connectivity- RAC)	Village Information centre E-learning, info on agriculture and Health, e-governance, education, telephones connections in house holds
Bhutan Health MIS (BHMIS)	Referral Services, telemedicine, Laboratory Information Service, Pharmacy Information services
E-post centres and V-SAT centres	ITU, Bhutan Telecom Ltd, UPU, Bhutan Post
UNDP Public Access Information and Services	Multi Community Centres (MCTs) Part of UNDP initiative on e-governance support, using ICT for Good Governance and institutionalizing capacity building.

CICs by Other agencies	Similar projects have also been initiated by other developmental and donor agencies
RICs (Regional Information centers), DIT	Back-up services for ICT applications, creation of awareness and potential of ICT in governance and support ICT development.

Infrastructural connectivity Projects in Bhutan

Project	**Key purpose**
National Digital telecom network	Upgrade to SDH of 34 Mbps digital link over 8 GHz radio band
OPGW network	To provide the backbone covering all centres
International connectivity	Links for international calls/ Internet/ Broadband traffic.
Government Wide Intranet (Thimphu WAN)	Linking all government offices and ministries
Dzongkhags network	Connecting districts
District network	Connectivity within each Dzongkhags
Geog Telecom services	Telecom services for Gewogs

IT park (Setting up Regional IT Habitats)

Create opportunities for ICT FDI and cluster growth in the high potential areas of Insurance Claims processing, Medical transcription, Call Centres and in the medium potential areas of GIS applications, Data base management, Archiving and telemarketing

Establishing Knowledge Corridors

To ensure, across corridor, high-density internet/telecom connectivity to e- Zomsa, GRAB, schools and training institutions in the rural hinterland.

Bhutan National Value Added Network (BNVAN)

To provide data, voice and video communication to the government offices, educational institutions, banks and private enterprises in the country.

Launching Bhutan Telemedicine Net

Ensuring health facilities to every needy person in the country overcoming the problems faced due to weather conditions, mountainous and rugged terrain, disruption of connectivity due to snowfall and land slides.

Virtual Extension and Research Communication network (VERCON)

Assistance to farmers in the areas of Livestock and Husbandry, agriculture and Forestry through extension agents utilizing the CIC set-up.

DIT Projects

DIT has taken up multiple projects including those on e-governance, Open source localization, digital Library and National Language processing (NLP)

MIS and GIS (Geographical Information Systems)

Supported by S&V (Dutch Agency) these are targeted at improving the efficiency of Department of local Governance (DoLG) by hosting the GIS at National Statistics Bureau (NSB).

INTAXX- Instantaneous Access to Exceptional Information

It is a project towards capacity building for ministry of Culture and Home Affairs by providing information by fax/ mail/phone/SMS ICT

Government wide e-procurement

Taken up by DIT with the World Bank assistance, this initiative is at a feasibility study stage.

Telecom connectivity

Projects on extending connectivity to gewogs and villages. It is planned to have 10 telephones per Gewok by 9th Five Year Plan i.e. at least 1 telephone per village (Bhutan has approximately 2000 villages).

Government services

According to BIPS, by 2010, 75% of all services must be provided online.

Annexure 15: Good Governance Report 2005- Implications and directions for ICT in Bhutan

Assessment of sectoral ICT systems capability, compatibility and connectivity to be carried out to facilitate and enhance information sharing and coordination.

One window service- Counter service of front line services where the public directly interacts with the govt. officers shall be provided through a "one window service" or at one centre. These services could include "one stop bill payment centers", " one stop licensing services", and " one stop investment centers".

Inter agency system integration to facilitate the exchange of data / information and for enhancing coordination particularly between the regulatory and the security agencies. Such integration among others would manifest a one-window check post that could carry out the documentation work for Royal Bhutan Police, Forest, Customs and Immigration.

Outsourcing of non-core functions of the government agencies within a competitive framework- government could outsource non-core functions in the field of design, maintenance, machinery, transport, IT services and office automation, basic training etc to the private sector.

Implementation Schedule

Area	**S No.**	**Action recommended**	**Agencies Responsible**
iii. Restructuring Govt at the central and local levels	55	Establish colleges and world class Vocational/ technical / trade institutions	MoE/ RUB/ MoLHR
	56	Liaison between Department of Adult and Higher education and RUB for policies on Higher education	MoE/ RUB
	57	Curriculum review and strategic plan to improve quality	MoE
	58	Encourage Private Schools	MoE
	88	Establish a high level body for coordinating e-governance development	MoIC
	89	Support capacity building of BBS (in particular radio)	MoIC
	93	Develop vocational educational and training Policy	MoLHR

iv. Policy Planning and Budgeting Systems	117	Explore sharing/linking of Gewok Development Centre Infrastructure	MoF/MoA/ MoHCA
	122	ICT system capability, compatibility and connectivity study	MoiC
v. GG and the democratic Constitutional Monarchy- Enhancing a culture of Professional excellence- HRD	127	Induction Programs	Include in PCS
	129	Continual In service Training	Include in PCS
	132	Institute a process of systematic grooming	Include in PCS
Professionalism	137	Institute award system for Innovation	RCSC/ agencies
Accountability	145	Decentralize non-academic short term trainings and workshops to the line ministries	RCSC
Service delivery	158	Establish one window service	All agencies
Promoting Private sector	170	Draw up a comprehensive policy for private sector development	MTI/ BCCI
	173	Policy directive for BCCI to establish 'Think Tank' for the private sector covering all sub-sectors	PSDC/BCCI and sector associations
	174	De-licensing of investment in Micro business activities for investment up to Nu. 1 million	MTI/ BCCI and sector associations
	181	The Govt and Pvt sector to share cost of OJT/ ATP programs	BCCI/MoLHR

	186	Encourage pvt sector participation in seminars and short courses outside the country.	BCCI/MoLHR
Role of ICT in good governance	209	Implementation of recommendations in BIPS in the specified time frame	All concerned
	210	DIT must develop ICT for GG through creation of RICs.	MoIC / RCSC
	211	ICT awareness among decision makers, politicians and senior officials	DIT
	212	BPC's Fiber Optic infrastructure must be leased and shared with relevant agencies	BPC/ BCCI/MTI/ MoIC
	213	Bhutan network Info centre (BNIC) shall be made independent of any service provider. MoIC to transfer its administered to DIT or Bhutan Information, Communication and Media Authority (BICMA)	BTL/ DIT/BICMA
	214	Support establishment of Call centers and BPOs	MTI, MoIC
	216	Setting up a Govt wide procurement system	DIT, MoF
Role of media in Good Governance	220	Enhance training and education of Media professionals.	BCCI/ BCS

Annexure 16: HRD plan - trainings/ higher education plan for some RGoB ministries /agencies for 10FYP

Ministry / RGoB agency	Level	Broad Field of Study	No. of slots to be conducted In-Country	No. of slots to be conducted Ex-Country			Duration (months)	Budget (Nu.)		Total Budget (Nu.)
				Developed Country	South-East Asia	South Asia		In-Country	Ex-Country	
D. Of Trade, MoEA	6	Information and Technology			1	1	2.00		207000	207000
DOE, M0EA		Computer operations and data management	1				0.75	27000		27000
DOE, M0EA		Training in Data base design, analysis & MIS			1		3.00		203000	203000
DOE, M0EA		Office Management & Computer Operations	2				1.00	54000		54000
DOE, M0EA		Training for System Operation Standards			2		0.50		945000	945000
DOE, M0EA		Office Management Course	4				1.00	108000		108000
D. of Tourism, MoEA	7	Web Designing			1		0.69		428000	428000
D. of Tourism, MoEA	7	Database Administration			1		0.69		428000	428000
D. of Tourism, MoEA	7	Computer Networking			1		0.69		428000	428000
PPD, MoEA	2	Masters in Information Technology		1			24.00		3132000	3132000
PPD, MoEA	7	IT & Software training for Business Planning			4		0.46		1500000	1500000
PPD, MoEA	7	Database management & Web Designing			1		0.46		380000	380000
Regl T &I Off, MoEA	7	IT Training				6	0.69		2565000	2565000
Regl T &I Off, MoEA	7	Office Management	6				0.69	122000		122000
AFD, MoLHR	7	ICT	4				0.70	80000		80000
AFD, MoLHR	7	ICT	2				1.00	50000		50000
ICTU, MOLHR	2	ICT		2			18.00		4500000	4500000
ICTU, MOLHR	3	ICT			2		12.00		1600000	1600000
ICTU, MOLHR	5	ICT		1			24.00		1600000	1600000
ICTU, MOLHR	7	ICT			2		1.00		900000	900000
ICTU, MOLHR	7	ICT				2	0.50	700000		700000
ICTU, MOLHR	7	ICT	3				1.00	800000		800000
ICTU, MOLHR	7	ICT	3				1.00	800000		800000
DHR, MOLHR	7	ICT			1		0.50		337500	337500
KVTI, MOLHR	7	ICT			2		1.00		945000	945000
CVTI, MOLHR	7	ICT			4		2.00		3780000	3780000
Ser VTI, MOLHR	7	ICT			1				472500	472500
MoE		Not avialable by field of study								
RIM		Not avialable by field of study								
RUB	2	Database Management			1		24.00	0	1620000	1620000

RUB	2	Software Development			2		24.00	0	3240000	3240000
RUB	2	Multimedia Application			2		24.00	0	3240000	3240000
RUB	2	Web Designing			1		24.00	0	1620000	1620000
RUB	1	PhD in Computer Science		1			36.00	0	4698000	4698000
RUB	2	Network and System Administration			1		24.00	0	1620000	1620000
RUB	7	Short courses in IT	4		5	4	1.50	162000	722250	884250
RUB	2	Masters in E-Commerce and IT			2		24.00	0	3240000	3240000
RUB	7	CAD		1	1	2	1.50	0	405000	405000
RUB	7	Communication Engg			2	2	1.50	0	310500	310500
RUB	7	Digital Signal Processing			1	1	1.50	0	155250	155250
RUB	1	Computer Science & Engg		1			36.00	0	4698000	4698000
RUB	2	Computer Science & Engg			1		24.00	0	1620000	1620000
RUB	2	Software Engineering			1		24.00	0	1620000	1620000
RUB	2	Networking and Database Management			1		24.00	0	1620000	1620000
RUB	2	Information Systems and Management			1		24.00	0	1620000	1620000
RUB	2	MCA			1		24.00	0	1620000	1620000
RUB	7	SQL Server, Oracle, Java			1	1	1.50	0	155250	155250
RUB	7	LAN & Wireless Networking			2	2	1.50	0	310500	310500
RUB	7	Computer hardware and Maintenance				7	1.50	0	378000	378000
RUB	7	Quality Assuarance Programme			2	2	1.50	0	310500	310500
RUB	7	Web Designing Course				3	1.50	0	162000	162000
RUB	7	Technicians Course				3	1.50	0	162000	162000
RUB	7	AutoCAD	1				1.00	27000	0	27000
RUB	7	AutoCAD	1				1.00	27000	0	27000
RUB	7	SPSS	1				1.00	27000	0	27000

RUB	7	AutoCAD	1				1.50	40500	0	40500
RUB	7	SPSS	1				1.50	40500	0	40500
RUB	2	Information Technology			2		24.00	0	3240000	3240000
RUB	5	Information Technology				1	36.00	0	1296000	1296000
RUB	6	Information Technology				1	24.00	0	864000	864000
RUB	7	Red Hat Training			1		1.50	0	101250	101250
RUB	7	Dot net and E-learning				1	1.50	0	54000	54000
RUB	7	PHP Mysql, Java Script			1		1.50	0	101250	101250
RUB	7	Network trouble shooting				1	1.50	0	54000	54000
RUB	7	CWNA Course and CCNA				1	1.50	0	54000	54000
RUB	7	Cyber Security				1	1.50	0	54000	54000
RUB	7	Data base management	1				1.00	27000	0	27000
RUB	7	Knowledge management			1		1.50	0	101250	101250
RUB	7	Information retrieval	1				1.00	27000	0	27000
RUB	2	Computer Science			1		24.00	0	1620000	1620000
RUB	7	Database Management				1	1.50	0	54000	54000
RUB	7	Computer/IT Training			1	1	1.50	0	155250	155250
RUB	7	Computer Lab Assistant				2	1.50	0	108000	108000
RUB	7	Computer Layout and /Design				1	1.50	0	54000	54000
RUB	2	IT			1		24.00	0	1620000	1620000
RUB	7	LAN and IT Courses				4	1.50	0	216000	216000
RUB	7	LAN and IT Courses				4	1.50	0	216000	216000
RUB	2	IT			1		24.00	0	1620000	1620000
RUB	2	IT			1		24.00	0	1620000	1620000
RUB	2	Masters in Information Technology			1		24.00	0	1620000	1620000

RUB	7	WAN			6		1.00	0	405000	405000
MoIC- PPD	7	ICT and media development and planning			1		6.00			810000
MoIC- PPD	7	e-governance policy and Planning			1		1.00			310000
MoIC- AFD	3	ICT			1	1	12.00			1080000
MoIC- AFD	7	ICT/Office management	6				1.00			140000
MoIC- DIT	2	IT		1			18.00		2350000	2350000
MoIC- DIT	2	Computer Science		4			18.00		11050000	11050000
MoIC- DIT	2	IT		1			30.00		4000000	4000000
MoIC- DIT	3	Web service and information manaagement			1		24.00		1900000	1900000
MoIC- DIT	3	IT			1		12.00		810000	810000
MoIC- DIT	Dip	Networking				1	12.00		150000	150000
MoIC- DIT	Certficate	Red Hat Enterprise Linux (RHEL) Training (Regular Track Training program) targetted for RHCE (Red hat Certified Engineer) certifications				3	1.00		600000	600000
MoIC- DIT	Certficate	Advanced Java Application development				4			680000	680000
MoIC- DIT	Certficate	Enterprise Systems (SAP)				1	2.00		300000	300000
MoIC- DIT	Certficate	Cisco CCNA				4	1.00		400000	400000
MoIC- DIT	Certficate	Adobe Certified Experts or professionals				1	1.00		100000	100000
MoIC- DIT	7	Office Automation Course				3	1.00		250000	250000
MoIC- DIT	7	Fibre Optics Splicing Course (TS LAN 201)			1		1.00		75000	75000
MoIC- DIT	7	Cabling System Design Calass for Optical Sungle Mode Access networks used in Fiber-to-the-home(FTTH) and Fiber-to-the-business (FTTB) deployments, collectively FTTx (TS AND 500)			2		1.00		250000	250000
MoIC- DoI&M	7	Data management/ Information Sharing			2	1	6.00			3000000
MoIC- RSTA	2	ICT (Computer Science)		1			12.00		1600000	1600000
MoIC- RSTA	7	basic Computing and Networking (data base management)				8	1.00		294000	294000

Judiciary	2	ICT(M IT, MSc.comp)			1		18.00		1215000	1215000
Judiciary	7 or 8	For the judiciary support staff, ICT trainings at level 7/8 are not separtely identified.								
RAA	2	Information Management System			1		12.00		810000	810000
RAA	3	Bachelors in Information technology				1	24.00		864000	864000
RAA	7	IT Networking			1		1		472,500.00	472,500.00
RAA	7	For the support staff, ICT trainings at level 7 are not separtely identified.								
Election Commision	2	ICT			1		24		1440000	
Election Commision	7	IT Application			1		0.69		380000	
Election Commision	7	Web Designing			1		0.69		380000	
Election Commision	7	Basic Computer Course	22				1	528000		
BBS		Masters in Electronic Communication			2		24		1600000	1600000
BBS		Masters in Statlite Communication			2		24		1600000	1600000
BBS		BE in Electrical and Electronics			2		24		1600000	1600000
BBS		Diploma in electrical and Electronics			2		24		1600000	1600000
BBS		Course on networking administrator			3		1		10500000	10500000
BBS		Course on Linux system			3		1		10500000	10500000
BBS		Training on CISCO Certificate/CCWA			4		1		1400000	1400000
BBS		Course on satellite earth Station			5		1		1700000	1700000
BBS		Maintaining and Servicing of VTRs	10				0.46	38000		38000
BBS		Theory on new SM transmitter	10				0.46	38000		38000
BBS		Digital Broadcasting Basics	10				0.46	38000		38000
BBS		Graphic Design			3		0.69		1050000	1050000
			94	14	111	83	1,027	3,761,000	136,646,750	143,019,750