

ICT in Bhutanese Education

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Information and Communication Technology (ICT) has brought significant changes in almost all aspects of our lives — more so in recent years — and its pace of development shows no sign of slowing down; it is indeed developing faster than ever before.

During the 14th Convocation of the Royal University of Bhutan in May, 2019, His Majesty The King shared his concerns about the dramatic changes brought about by the emerging technology — its scale of growth and scope, and the consequences of lagging behind. If we are not able to embrace and leverage technology, we will be invariably left behind.

Technology has a huge potential to enhance quality and access to education, create jobs, ensure good governance with effective and efficient delivery of services, develop and grow the private sector, and enhance accountability and transparency. It is driven by new developments, such as Artificial Intelligence, Quantum Computing, Blockchain, Machine Learning, Big Data, IOT (the Internet of Things), Virtual Reality and Augmented Reality, etc..

Realising the huge opportunity that technology brings, and guided by His Majesty's vision, the Ministry of Education (MoE) has been working to enhance ICT in the Bhutanese education system.

ICT in Bhutanese School Education — the Journey

ICT in the Bhutanese education system was introduced in the late 1990's with ICSE Computer studies offered in a few high schools. In early 2000, the then Ministry of Health and Education started working to introduce ICT education. In 2002, computer application was introduced as an optional subject in class IX in eight high schools, and was gradually expanded to other high schools that had computer labs.

One of the biggest developments in ICT education came with the Chiphen Rigpel Project, run by the Ministry of Information and Communications

and NIIT India. The project established computer labs in 168 schools, introduced ICT literacy curriculum for all students from class VII and above, and trained more than 5,000 teachers in basic ICT skills.

As recommended in the e-Gov Masterplan 2012, the Ministry of Education (MoE) initiated the development of the Education Sector ICT Master Plan iSherig (2014-2018) to harness ICT as an enabling tool in teaching and learning, as well as to rationalise and streamline ICT activities, systems, and projects under the MoE and across the education sector. As part of iSherig implementation, the MoE reviewed the ICT literacy curriculum of the Chiphpen Rigphel Project and introduced literacy with ICT from class IV, from the 2017 academic session, with some component of coding education.

The Bhutan Education Blueprint 2014-2020 recommended upscaling the ICT ecosystem to raise the quality of education. Further, to maintain continuity on the ICT project, iSherig-1, the MoE has now developed iSherig-2 — 2019-2023 (ICT Masterplan-2).

The government's education flagship programme on enhancing ICT in education will be reinforced in the plans and programmes recommended in iSherig-2. Through the flagship project, the MoE is looking at providing access to ICT for all primary school children. It will introduce coding education to bridge the gap between the existing education system and the demands of the 21st century and integrate ICT in other disciplines, especially science and mathematics.

This scaling-up of the scope and efforts of ICT education will not only accelerate the use of ICT, but also prepare our children to be able to create systems and products using ICT, in line with the Fourth Industrial Revolution (IR4).

iSherig-1

Bhutan adopted the vision of becoming a knowledge-based society. To achieve this, the education system plays a pivotal role in addressing the needs of a rapidly changing world driven by a dramatic technological revolution. To lay the foundation and create an enabling environment for future ICT initiatives in education — and as recommended by the

2012 eGov Masterplan — the Ministry of Education adopted a five-year comprehensive master-planning process, through the development of the first iSherig (Education ICT Master Plan) in 2013, with the support of Ministry of Information and Communications, International Development Agency and Temasek Foundation, Singapore and the Swiss Development Corporation.

The iSherig provides a roadmap to ensure that all our children have equitable access to quality education, and that school leaders and educators, through the use of ICT, will help children to achieve the desired learning outcomes. The iSherig-1 (2014-2018) was envisioned to enhance quality of education by ICT for a knowledge society. To achieve this, the iSherig-1 identified three broad strategic thrust areas of investment:

- **iAble:** Capacity of educators, learners, and learning support
- **iBuild:** Integration of ICT in the curriculum
- **iConnect:** ICT infrastructure and systems development

These thrust areas are supported by nine programmes and 27 projects and implemented by various agencies, viz, MoE, Royal Education Council (REC), Royal University of Bhutan and Ministry of Information and Communication, with the aim to achieve the following outcomes:

- Effective teaching and learning environment
- Efficient educational administrative system
- Motivated life-long learning for the 21st century

Towards the end of 2017, with the support of UNESCO Bangkok, the MoE carried out a review of the progress and impact of iSherig-1. The review found that most of the projects identified were relevant to the desired outcome. However, from the effectiveness and efficiency perspective, just half of the target results and objectives were attained. This was attributed to the lack of oversight and monitoring of implementation, organisational changes, and lack of budget, lack of capacities and human resources, and proper co-ordination mechanism among stakeholders.

Nonetheless, the review found that management of education has improved with the introduction of web-based EMIS. Communication between stakeholders and schools, and within schools, has also improved by connecting most schools to Internet leased lines and saving teachers' time in planning lessons and analysing students' performances. The review also found that both teachers and students exhibit greater interest in learning when the subjects are taught using some elements of ICT. However, a growing concern was reported, about students being exposed to inappropriate content online with increased exposure to ICT in school or at home.

Since most projects identified in iSherig-1 are still relevant, the review recommended that it should be taken forward through the development of iSherig-2. Accordingly, with technical and financial support from UNESCO, Bangkok, the MoE — in collaboration with relevant stakeholders — developed iSherig-2 (2019-2023), in 2018.

iSherig-2

iSherig-2, built on key findings and recommendations of the iSherig-1 review, maintained the linkages with the three thrust areas of iAble, iBuilt and iConnect, and the outcomes of iSherig-1, and is well aligned with the 12th FYP plans and programmes of the MoE, i.e, in achieving the National Key Result Area – Quality of Education and skills enhanced. However, iSherig-2 emphasises the pervasive use of ICT in teaching and learning, in its vision to make our learners become “nationally rooted and globally competent citizens, through equitable and pervasive use of emerging and relevant technology”.

This vision of iSherig-2 is aligned with that of the Qingdao Declaration on ICT in Education, which is also a reaffirmation of the Incheon Declaration of Education 2030, adopted in May, 2015. As a first global declaration on ICT in Education, the Qingdao Declaration recognised that the ability to leverage ICT for learning is no longer a specialised skill, but a foundational skill for success in today's societies.

iSherig-2 attempts the seamless integration and pervasive use of ICT in curriculum, pedagogy and assessment for engaging and meaningful learning through three strategic thrust areas, six programmes and 21 projects.

The thrusts, programmes, and projects are tabled below:

Thrust 1: iAble: Enhance ICT Competency of Educators, Learners and Support Staff	
Programme 1.1 ICT Capacity Development of Educators	Project 1.1.1 ICT competency standards for teachers Project 1.1.2 Digital pedagogy in colleges of education Project 1.1.3 Digital pedagogy for in-service teachers
Programme 1.2 ICT Capacity Development of Learners	Project 1.2.1 ICT competencies of students Project 1.2.2 Digital citizenship for students Project 1.2.3 TVET-based ICT competencies of students Project 1.2.4 Digital literacy for NFE and CLC learners
Programme 1.3 ICT Capacity Development for Learning Support	Project 1.3.1 ICT competencies of educational leaders Project 1.3.2 ICT competencies of library and laboratory assistants

Thrust 2: iBuild Enhance use of ICT-integrated Teaching and Learning Resources by Learners, Teachers, NFE Instructors and CLC Managers	
Programme 2.1 Pervasive Use of Digital Educational Resources	Project 2.1.1 Digital interactive textbooks Project 2.1.2 Content adaptation for special needs Project 2.1.3 Digital educational resources for schools Project 2.1.4 Digital educational resources for NFE

Thrust 3: iConnect Strengthen ICT Infrastructure and Connectivity for Better Learning and Educational Services	
Programme 3.1 ICT Infrastructure Development	Project 3.1.1 ICT standards and guidelines for schools, TRCs and CLCs Project 3.1.2 Digital devices for schools and TRCs Project 3.1.3 Internet connectivity for schools Project 3.1.4 Multimedia studio Project 3.1.5 Digital devices and Internet connectivity for CLCs
Programme 3.2 Administration and Learning Systems Development	Project 3.2.1 E-learning platform Project 3.2.2 Education Management Information System Project 3.2.3 NFE Management Information System

The key feature of iSherig-2 is a holistic approach to integrating ICT in education, which is visible in the programmes and projects above. Through the implementation of iSherig-2, the MoE aims to achieve the following outcomes:

Motivation for Life-long Learning: Equipping learners with knowledge, skills, and competencies in ICT, that enable learners to participate meaningfully, productively, and responsively in the 21st Century and beyond, and leading them to life-long learning.

Effective Teaching and Learning: The ICT-integrated curricula and instructions facilitate collaboration among educators and learners, and enrich learning experiences through the use of varied digital resources.

Efficient Administration System: A comprehensive integrated information management system that streamlines the collection and provision of data for informed decision making and evidence-based planning, monitoring and evaluation.

Education ICT Flagship Project

Globally, the technological evolution is rapidly shifting job frontiers. Experts have predicted that jobs in existence today will no longer be in existence 10 years down the line. The ability to adjust and re-skill oneself will be necessary for survival. There is little doubt that technology is here to stay. With the onset of the Fourth Industrial Revolution (IR4) bringing in new technology trends, like Artificial Intelligence, Block Chain technology, Internet of Things, etc., people are expected to understand and work with technology.

In other words, IR4 will require our education system to produce a new kind of worker — a knowledge worker. Tomorrow's citizens must possess new sets of skills — to adapt, manage, and take advantage of IR4 — and exhibit transferable skills like critical thinking, innovation, creativity, problem solving, and communicative and collaborative skills. They must also know technology and be able to solve all aspects of challenges endangered by this ever-changing technology.

Realising the need to prepare future citizens to work with IR4, and as envisioned by His Majesty The King about the need to skilfully navigate the new digital and technological landscape, the government felt the need to strengthen ICT in education, and hence identified it as one of the priority target areas in the 12th FYP. Accordingly, it approved the support through the flagship project.

The Education Flagship Project will complement the implementation of iSherig-2 with a major focus on coding education.

In the IR4, coding is one form of language that everyone is expected to know. It empowers one to understand and communicate with technology and it is going to be all-pervasive in future. Many countries are making coding a part of children's education. Coding fosters creativity, problem solving, and collaboration, as they work innovatively with their peers.

Through the flagship project, the MoE is looking into introducing ICT education from Classes PP to XII as a compulsory subject, with a major focus on coding, integration of ICT in STEM, and the day-to-day teaching learning process, as well as ICT infrastructure development in schools.

In preparing to introduce coding education, the MoE is training 277 teachers in block and script coding — in collaboration with the REC and the Department of Information Technology and Telecom (DITT), with technical support from Leap Learner (a successful edutech start-up with a global presence that works to teach children coding). These trained teachers are expected to teach coding immediately in schools with Computer Lab, from the 2020 academic session. The MoE is planning to implement this in all schools by 2021, by training the teachers in the rest of the schools in July, 2020.

To support the implementation of coding education, and as recommended in iSherig-2, the MoE will be establishing computer labs in all primary schools, additional labs in large secondary schools, and revamping local area network in all the existing ICT labs in secondary schools.

The flagship also aims to enhance STEM education through integration of ICT into the curriculum to make learning of science and mathematics more interesting, so that it will contribute to achieving the 12th FYP's

Agency's Key Result Areas on STEM performances in the Grade VI and X examinations.

Technology has a huge potential to support making the teaching-learning process efficient and interesting. Every teacher will be trained in integrating ICT in the teaching-learning process. To ensure the sustainability and proper functioning of the equipment supplied, workers in school ICT laboratories will also be trained in hardware, software, and network troubleshooting and management of the labs.

Through this implementation, MoE aims to achieve the following outcomes:

- Globally competent Bhutanese citizens in the 21st Century
- Quality of ICT education enhanced.

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