

A Journey in Economic Transformation

Why is an STI Economy Strategy Important for Bhutan?

Ujjwal Deep Dahal

An Opportunity

A developing nation must balance its dreams and aspirations of long-term progress with its immediate and urgent priorities. Many a time, the ability to dream and position for the next decades becomes paralysed for nations and companies alike. While there may be dreamers, urgency tends to take precedence. Bhutan as a nation is breaking the shackles of this mindset.

We have always been aware of the challenges of geography, demography and connectivity for Bhutan to grow its economy. While these may impede certain domains of business possibilities, the global transition to a digital economy and, importantly, the market volume around us, provide unprecedented opportunities. With the positioning of the Gelephu Mindfulness City as a gateway for South and Southeast Asia, we are presented with an extraordinary opportunity to contribute to building the next-generation economy.

The Druk Holding and Investments (DHI) was created by Royal Charter in 2008 with the primary mandate “to hold and manage the existing and future investments of the Royal Government of Bhutan for the long-term benefit of its shareholders, the people of Bhutan”. The DHI, as the investment arm of the government, is re-imagining itself through the lens of an innovation and technology-led economy, leveraging not only the opportunities of the 21st century, but also the emerging transformation mindset of the nation.

Energy and Computing: A Foundational Impetus for Economic Progress?

Science as a knowledge framework and technology as a tool have accelerated human progress over the centuries. The advancements of economies in the

last 500 years of the Industrial Revolution, and the exponential growth of technology in the last decades fuelling the impetus of an Artificial Intelligence (AI) era, provide the opportunity for Bhutan to leapfrog its economy.

Historically, every time a fundamental force of nature has been discovered (gravitational, electromagnetic, and weak and strong nuclear force), humanity has witnessed a shift in economic and social progress. More importantly, the progress in the science and technology of energy and computing has provided the foundations for nations to leapfrog and even shift the economy.

Energy Technology

The evolution of energy science and technology - from the use of muscle power, wood, water and wind to renewables and nuclear power - has provided extraordinary growth in the quality of life of humans and the economic progress of societies and nations. While steam-powered engines and electricity fuelled the initial industrial revolutions, the advancements in renewable energy technologies, grid-scale energy storage, electric grid modernisation, and market decentralisation, provide impetus for the next potential leap in energy systems advancements. This is fuelled exponentially by innovations in advanced nuclear reactors, fusion energy and breakthroughs in materials science, providing the pathways to shape the future of energy. Additionally, digitalisation, artificial intelligence, blockchain technology and the Internet of Things (IoT) would play increasingly important roles in building sustainable energy systems.

Computing Technology

Through civilisations, the effort to compute faster and cheaper has been an endeavour and an important measure of development. The advancements in mathematics and technology over the civilisations, from abacus to mechanical computing and vacuum tubes, which eventually led to the discovery of semi-conducting materials and the advent of transistors, changed the landscape of computing.

AI revolution today hinges on the power to compute with possibilities of sub five nanometer transistor technology on the horizon, building the most

powerful ASIC (application specific integrated circuits), GPUs (graphic processing units) and cloud computing architectures, unleashing the next generation of industries. The future holds the exponential growth of today's computing power as commercial part of quantum computing eludes.

The reason I talk about the technology of energy and computing and its evolution is their correlation to the industrial revolutions civilisations have witnessed with the evolution and growth of these two technologies. As we sit at the cusp of the next generation of energy and computing systems, the potential for exponential growth made possible by a science, technology and innovation (STI) led economy must be our focus.

A Framework for Building the Foundations of an STI Economy

To create change, it is important to craft the new rather than incrementally mend the old. For Bhutan to establish STI economy pathways, a disruptive innovation philosophy, with a shift of mindset in the way we perceive the future, is important. The courage to dream a long-term future and design a strategy within and amongst the government, industry, academia and society (the quadruple helix model) to build the framework for STI as a pillar of economic growth, should be a discussion as a national development agenda.

Clayton Christensen's theory of disruptive innovation explains how smaller, less established companies can disrupt established markets and industries by introducing simpler, cheaper and often initially inferior products or services that address the needs of underserved segments of the market. Over time, these disruptive innovations capture market share, eventually displacing incumbent firms.

The question for us is how can we build a national ecosystem to create disruptive innovation that leads to new industries and jobs, i.e., industries of the future? Furthermore, how do we design these ecosystems in a way that captures the potential of science to innovate and create technology-based solutions to address and pre-empt future problems? With this, we not only plan to survive in the next decades but also to thrive and create a globally relevant economy for Bhutan.

One area that requires our immediate attention is investment in building a talent pipeline through academic reforms. Further, we need to provide resources for national research and development at the applied and fundamental levels in basic and advanced science and technology.

In this innovation-driven ecosystem, we should promote exchange of knowledge, prototyping of ideas, and acceptance of failure as experience gained for venturing into the next idea. Basically, entrepreneurship will need to be celebrated and be a natural choice for the next generation for an STI economy to flourish. What resources and policy innovation that the state needs to provide to build such an ecosystem may be the most important question for us.

DHI's Strategy for a 10X Journey

While DHI contributes about 30% to the national GDP today, operating in the areas of energy, telecom, banking, mines and minerals, etc., it is important to strategise the next-generation industries, not only to ensure future relevance but also to take the opportunity of the exponential growth of technology and the global AI industrial era.

With a firm conviction to create knowledge and industry of value for the future of humanity, DHI has a three-pronged approach to create the 10X journey path, with strategic focus on managing the existing portfolio, making future-focused investments, and establishing a knowledge-based innovation ecosystem.

Portfolio Management Strategy

DHI's current holdings of 22+ portfolio companies span a diverse range of industries, from energy, telecommunications, banking and aviation to natural resources, pharmaceuticals and food and beverage. These companies have continuously evolved to serve their respective industry requirements.

However, with the threats of new and innovative startups entering the market, it is crucial that we not only meet existing demands but innovate to disrupt the industries we serve. Given the diversity of the DHI Group, our portfolio management strategy, at its core, places the existing and upcoming investments within four quadrants designed to meet specific

growth requirements. The four quadrants - Growth Zone, Strategic Zone, Potential Zone, and Future Zone - represent companies based on their performance trends and forecasts, and industry predictions and their potential to contribute to Bhutan's STI economy.

- **Growth Zone** - Companies placed within the Growth Zone will need to be operationally overhauled to ensure scalability, cost reduction, financial performance, and customer experience.
- **Strategic Zone** - Companies placed within this quadrant are integral to the Bhutanese economy and society. Even with their maturity, stability, and limited market threats, these companies will be required to carry out internal restructuring to design agile and disruptive solutions to stay ahead of the technological and industrial changes.
- **Potential Zone** - While opportunities for companies placed within the Potential Zone are exponentially high, they are also faced with the vulnerability of disruption by emerging technologies. Therefore, these companies will be required not only to quickly adapt to industry disruptions but also to future-proof their solutions and designs to stay ahead of the curve and secure market leadership.
- **Future Zone** - As DHI charts through the 10X journey, focusing on the Future Zone is paramount for the company. The investments in existing and upcoming companies in the Future Zone will be strategically designed to ensure that we are leveraging the opportunities presented by the next-generation innovation in energy and computing.

Investment Strategy

DHI's investment strategy will be rooted in the Future Zone, aimed at building a linkage between energy and computing and the future global economy. These future-focused investments will not only diversify the current portfolio but also pave new economic avenues leading to an STI economy.

- **Energy and resources** to diversify Bhutan's hydropower portfolio and explore alternative energy technologies to optimise hydropower, geothermal energy, hydrogen production, solar and

- wind power and, importantly, grid scale storage systems.
- **Mining and minerals** to identify, explore and strategise the rare earth and critical minerals to cater to the demands of global future industries.
- **Technology** to create innovative solutions leveraging emerging technologies like IoT, (Industrial Internet of Things) IIoT, Drones, AI/ML, blockchain, etc. towards building foundations for industries, ranging from Bio-Technology to Quantum computing to hardware and manufacturing capabilities utilising the Super Fab Lab.
- **Digital assets** to explore diverse verticals in the digital assets industry, including decentralised finance, decentralised autonomous organisation, gaming, metaverse, digital tokens and NFTs (Non fungible tokens) to facilitate inclusive economic participation.
- **Infrastructure** to execute complex projects for establishing economic and foundational infrastructure, including digital, financial and physical infrastructures.

Innovation Strategy

To propel the vision for an STI Economy, DHI has designed a comprehensive innovation strategy to facilitate applied and fundamental research in science and technology. At the heart of the strategy is the Innovation Ecosystem envisioned to bring together national and global stakeholders committed to driving innovative problem-solving, skills development, research and application, eventually leading to the creation of disruptive start-ups, innovative business models, and technology-based solutions.

The innovation ecosystem is funnelled by three co-dependent and interacting stakeholders, i.e., the Department of Innovation and Technology (DHI InnoTech), the Jigme Namgyel Wangchuck Super Fab Lab (JNWSFL), and the Green Tech Trust Fund (GTTF), each playing fundamental roles to activate the ecosystem.

- The Department of Innovation and Technology, InnoTech, since its inception, has been on a dynamic mission to strategise technology and innovation to establish a tech-based Bhutanese

economy. The department ideates solutions to address challenges and prototypes, and scales these solutions through applied and fundamental research. Once tested, these solutions spin-off in the market as technology ventures and start-ups, igniting a culture of innovation and entrepreneurship.

- **Jigme Namgyel Wangchuck Super Fab Lab.** JNWSFL is a core part of the DHI innovation ecosystem, with its capabilities to provide an open platform for digital design, fabrication and innovation, equipping a community of users with resources and tools to design and test innovative solutions. The JNW Super Fab Lab represents Bhutan's commitment to digital transformation and innovation, and its goal to be part of the global community, not only as a benefactor but a contributor to open-source communities.
- **Green Tech Trust Fund.** While the value of ideation and research and development enabled by the right set of tools and hardware capabilities cannot be undermined, access to funds for successfully implementing and scaling innovative solutions is a crucial component for fuelling an STI economy. Therefore, the Green Tech Trust Fund is planned to be established to enable a venture capital culture for innovators and creative minds nationally and globally. The GTTF will provide the cushion to increase risk tolerance of promising entrepreneurs that enter the market through the national innovation ecosystem channels.

The above three funnels will play enabling roles in successfully implementing innovative solution designs to cement Bhutan's STI economy in fundamental and applied research and play a foundational role in unlocking DHI's 10X journey.

Looking Forward

As Bhutan embarks on a journey of economic transformation, the promise of science, technology and innovation (STI) can underpin the nation's strategy for sustainable growth and global relevance. The opportunities presented by advancements in energy and computing technologies stand as catalysts for Bhutan's leap into the next-generation economy.

By embracing a disruptive innovation philosophy and adopting a quadruple helix model, involving the government, industry, academia and society, Bhutan can pave the way for transformative change. It is, therefore, crucial for policymakers in all four sectors to recognise the benefits of placing the right measures and providing the necessary resources, tools and regulatory frameworks to support an STI-led economic growth. Nationally we need to allocate resources, and plan to establish critical relationships globally to build the STI economy on the foundations of research and development in science and technology.

As the commercial arm of the government, DHI's commitment to a 10X journey underscores the importance of forward-looking strategies aimed at future relevance and value creation. Through strategic portfolio management, future-focused investments in energy and computing, and innovation ecosystem, DHI aims to spearhead Bhutan's transition towards an STI-driven economy.

Looking ahead, Bhutan must seize the opportunities presented by advancements in the technology of energy and computing to take on a significant role in the global economy. By embracing an innovation mindset, leveraging the opportunities presented by emerging technologies, and establishing strategic partnerships globally, Bhutan can unlock an exponential economic growth and create value by finding the opportunities of the 21st century.