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GovTech
Bhutan

UNDP

Artificial Intelligence Readiness Assessment (AIRA)

2024

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2024

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Abbreviations

AI	Artificial Intelligence
AIRA	AI Readiness Assessment
API	Application Programming Interface
BSQAF	Bhutan Statistics Quality Assurance Framework
BSSC	Bhutan Standard Statistical Code
BtCIRT	Bhutan Computer Incident Response Team
DITT	Department of Information Technology and Telecom
DHI	Druk Holding & Investments
e-GIF	electronic Governance Interoperability Framework
e-GP	e-Government procurement
FYP	Five Year Plan
G2C	Government-to-citizen
GDC	Government data center
GIS	Geographic information system
ICT	Information and communications technology
IT	Information technology
KII	Key informant interview
LLM	Large language model
LTT	Long-term training
MoF	Ministry of Finance
MoIC	Ministry of Information and Communication
NDI	National Digital Identity
NSB	National Statistics Bureau
GCIT	Gyalpozhing College of Information Technology
RGoB	Royal Government of Bhutan
REC	Royal Education Council
CST	College of Science and technology

GPU	Graphics Processing Unit
CPU	Central Processing Unit
RMA	Royal Monetary Authority of Bhutan
RUB	Royal University of Bhutan
DHI	Druk Holding and Investment
TTPL	Thimphu Tech Park limited
STEM	Science, technology, engineering, and mathematics
RSSTEM	Royal Society for Science, Technology, Engineering, and Mathematics
DITT	Department of Information Technology & Telecom
BICMA	Bhutan InfoComm and Media Authority
FDI	Foreign Direct Investment

Executive Summary

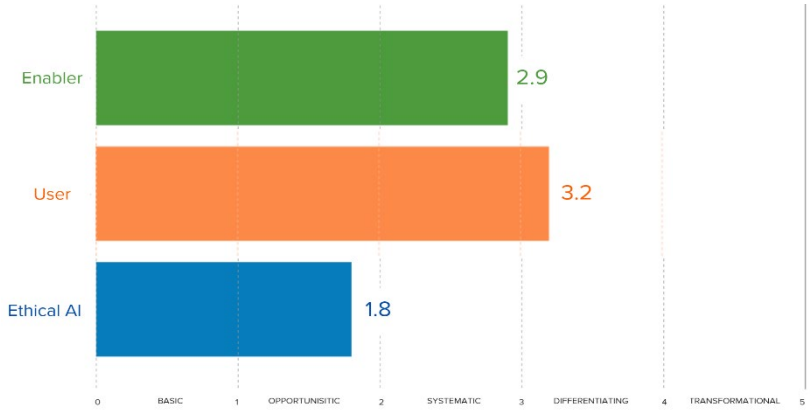
This report evaluates Bhutan's readiness to integrate Artificial Intelligence (AI) technologies within its governmental frameworks. Utilizing the UNDP's AI Readiness Assessment (AIRA) tool, this evaluation focuses on three key pillars—Government as an Enabler of AI, Government as a user of AI and Ethical AI—analyzing them across five phases of AI Readiness: *Basic, Opportunistic, Systematic, Differentiating,* and *Transformational.*

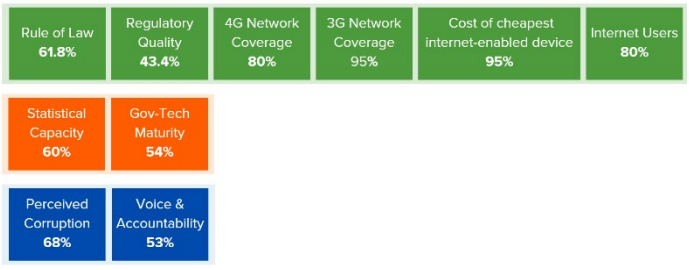
Pillars:

1. ***Government as an Enabler:*** Focus on the government's actions to support and shape the AI industry outside the public sector, in the wider economy within the private sector, academia, non-profits and other research institutions.
2. ***Government as a User:*** Focus on the government's preparation for and use of AI and data within the public sector.
3. ***Ethical AI***: Ensuring AI is used responsibly and ethically to protect citizens and prevent misuse.

Phases: ***Basic, Opportunistic, Systematic, Differentiating,*** and ***Transformational*****,** representing increasing levels of AI readiness and sophistication. The phases from Basic to Transformational represent a spectrum of AI readiness in government, ranging from minimal policy work and underdeveloped conditions (Basic) to advanced and innovative approaches with comprehensive strategies and implementation (Transformational). Progressing through these stages reflects improvements in policy development, organizational structure, technical and non-technical skills, ethical considerations, and AI integration across government functions and public services.

Key findings





*The definition of the different phases for the pillars of AI readiness can be found in page 11, table 2.

Government as an enabler: Systematic

Systematic: Targeted policy efforts are in place and conditions for AI adoption are progressing.

Measured across four dimensions of Innovation, Data, Infrastructure, and Skills.

Bhutan has laid a solid foundation for AI development through the 2018 Information, Communication and Media (ICM) Act of Bhutan and is bolstering its infrastructure with planned upgrades, including a third internet gateway and enhancements to the Government Data Center. The country's strong connectivity, supported by a fiber optic backbone and extensive 4G coverage, provides a strong basis for AI initiatives. Furthermore, to strengthen data management, a Data Governance framework is currently being developed.

Despite these advancements, the government faces several challenges as an enabler. While basic IT literacy programmes are ongoing there remains a significant gap in specialized AI, machine learning, and data science skills. Additionally, funding for AI initiatives remains dismal, and a comprehensive AI strategy to guide and enable an AI ecosystem is yet to be drafted and implemented. The country's continued reliance on neighboring nations for international bandwidth results in high internet costs, and limited access to high-end AI hardware creates further obstacles for AI development and testing.

Government as a user: Differentiating

Differentiating: Comprehensive and coordinated efforts for effective AI usage are established.

Measured across four dimensions of Vision, Technology, Skills, and Data.

Bhutan has made considerable progress in digital governance through strategic initiatives across its five-year plans, most notably in the "digital by default" approach of the 2019 e-Governance Policy. The government has established critical technological foundations, including secure digital platforms and interoperability between systems, with plans to strategically use AI and emerging technologies in its 13th Five-Year Plan. The GovTech Agency is taking a leadership role in establishing guidelines and exploring AI's role in government operations, signaling a proactive and coordinated approach to public sector AI integration and deployment.

While Bhutan has developed a pool of technical expertise within the public sector, there is a pressing need to enhance the necessary technical skills and competencies to meet rapid evolving demands of AI advancement. The government is attempting to address this through various digital literacy programmes for public servants. In terms of data management, significant inroads have been made to strengthen informed decision-making processes. However, continued efforts are needed to enhance data integration, accessibility, and the use of data-driven insights across all levels of government to fully capitalize on AI's potential.

Ethical AI: Opportunistic

Opportunistic: Initial policy work is underway, but significant gaps persist.

Measured across four dimensions of Accountability, Transparency, Safety, and Inclusivity.

Bhutan's readiness for ethical AI adoption shows significant room for improvement across all dimensions measured. While some policy work on ethical AI is underway, there are notable gaps in oversight, regulation, and public engagement in AI policy development. The accountability dimension reveals a mixed level of awareness about the existence of a dedicated body for AI ethics policy development and uncertainty regarding the publication of ethical AI principles. In terms of inclusivity, critical gaps persist in coordinated stakeholder engagement and public consultation processes, with a widespread lack of awareness about initiatives supporting inclusive AI research and gender equity in AI systems.

The safety dimension reflects a concerning gap, with a lack of comprehensive measures to ensure AI systems operate reliably and safely. Notably, there remains an absence of risk categorization frameworks and algorithmic impact assessments, with potential existential risks associated with advanced AI systems remaining unaddressed. Transparency is also a significant concern, with limited awareness of monitoring mechanisms for AI systems in the public sector and underdeveloped concepts of explainability in AI systems. These findings underscore the urgent need for structured oversight mechanisms, improved public engagement, rigorous safety protocols, and robust legal frameworks to support ethical AI integration and deployment in Bhutan.

Overall assessment

Bhutan demonstrates a promising foundation for AI readiness, with strengths in digital infrastructure and governance. However, critical gaps remain across all three pillars: as an enabler, user, and in ethical AI deployment. Specific challenges include cultivating specialized AI skills, funding, developing comprehensive AI strategies, and establishing a responsible and ethical AI framework. Additionally, data integration and accessibility also require improvements. Despite these challenges, the country's unique cultural values and traditions, and its deep commitment to Gross National Happiness (GNH), provide an opportunity to develop a distinctive approach to responsible AI adoption and integration, potentially establishing a global model for culturally attuned technological advancement by developing novel AI use-cases and products with international appeal.

Key recommendations

1. AI strategy and governance

- **Develop and implement a comprehensive national AI strategy** to ensure a unified vision of using AI to transform public service delivery, foster cross-sectoral collaboration for new areas of growth, and greater public engagement.
- **Create AI ethics policies** that reflect Bhutanese cultural values and contribute to global AI ethics discourse.
- **Formalize an application process for agencies and businesses intending to use AI systems**, with approval based on thorough risk analysis to ensure responsible and transparent use of AI systems.
- **Conduct consultations with the public and relevant stakeholders** during the planning process of developing and deploying public AI systems to ensure AI systems are developed and deployed with input from diverse stakeholders.

2. Funding and resources

- **Secure sustainable funding and resources** to support the implementation of the AI strategy, including investing in AI research and development, capacity-building programmes, and digital infrastructure enhancement projects.

3. Digital infrastructure

- **Strengthen Bhutan's digital infrastructure** by expanding high-speed internet, cloud computing, and data centers, enabling the seamless integration of AI and emerging technologies.

4. Data governance and interoperability

- **Enhance data quality, security, and interoperability** by implementing a comprehensive Data Governance framework with clear standards for metadata, data formats, and documentation.
- **Develop a central data portal** to house government administrative data, enabling various agencies to access and utilize the data for their needs.
- **Promote awareness of existing data standards** across various agencies and the public while ensuring strict enforcement to enhance data portability and consistency.
- **Create a data-sharing policy** to improve data access and utilization for both government and non-government agencies.

5. Capacity building and skill development

- **Identify and address skill gaps in AI across the government** by conducting a comprehensive AI skill needs assessment.
- **Introduce AI safety and ethics into education curricula** at secondary and post-secondary levels.
- **Integrate AI safety and ethics modules into GovTech Agency's digital literacy programme** for civil servants and the public.

6. Public awareness and ethics

- **Raise public awareness of AI's impact and promote accountability** while enhancing understanding of AI's legal implications.
- **Ensure datasets used for training AI systems are representative of the population** to prevent biases in AI systems before they are deployed in the public sector.

Bhutan is at a critical stage in its AI journey. By addressing the identified gaps, the country can leverage AI to enhance public service delivery, drive economic growth and sustainable development, and improve citizens' quality of life. Success will depend on balancing technological advancement with Bhutan's cultural values and development philosophy.

Introduction

1.1 Background

AI is poised to significantly influence many aspects of our lives, from individual experiences to the operations of multinational corporations worldwide. While the full extent of its impact is still unfolding, AI has the potential to drive substantial changes across sectors and contribute meaningfully to fulfilling national objectives and global progress on the Sustainable Development Goals (SDGs). This transformative capability is not without challenges and risks. As such, governments have a critical role in shaping the development and application of AI to ensure it conforms with ethical standards, human rights, and principles of good governance. They must work to create an environment that nurtures AI innovation and adoption while simultaneously ensuring its responsible implementation for public benefit. The government's AI readiness, therefore, hinges on its capacity to balance these two aspects effectively.

The Royal Government of Bhutan (RGoB), in collaboration with the United Nations Development Programme (UNDP) is advancing its commitment to harness the potential of AI. Recognizing the need for a strategic approach to harness AI's potential in public service delivery, the 13th Five Year Plan included the development of a National AI Strategy. Central to this effort is UNDP's AI Readiness Assessment (AIRA), a tool designed to evaluate Bhutan's preparedness for ethical AI adoption.

This assessment will identify key factors crucial for the ethical development and deployment of AI as Bhutan advances its digital transformation. It will also offer recommendations for policy, infrastructure, skill development, and other areas to enhance the effective and responsible use of AI technology in achieving the SDGs.

1.2 Rationale

This assessment for Bhutan, guided by the UNDP's AIRA framework, aims to evaluate the country's preparedness to leverage AI technology effectively and ethically. This assessment will help identify the government's strengths in AI readiness – as an enabler of AI environment and as a user of AI in government and public services - as well as areas for progress and improvement.

1.3 AIRA methodology

The AI Readiness Assessment (AIRA) framework considers the role of government as both a user of AI and an enabler of the larger AI ecosystem. Developing AI and other innovative technologies necessitates a vibrant technology ecosystem within a country's economy, and the government is a critical enabler of this ecosystem by establishing the rules and regulations under which it operates. Government policy can also direct financing and attention to specific areas of the economy, while also promoting the development of technical infrastructure and assisting citizens in acquiring digital skills. Government AI readiness also indicates that the government can leverage AI to improve its core processes and public service delivery. To deploy complicated technologies, the government must have the necessary tools and skills in place.

The government as an enabler and user are likewise interrelated. If the government has the necessary abilities and willingness to adapt to become an effective user of AI, it is more likely that officials will have the skills and motivation to assist the larger AI ecosystem. And if the larger ecosystem is growing, the government will have access to a greater pool of skilled individuals as well as a ready supply of new technologies.

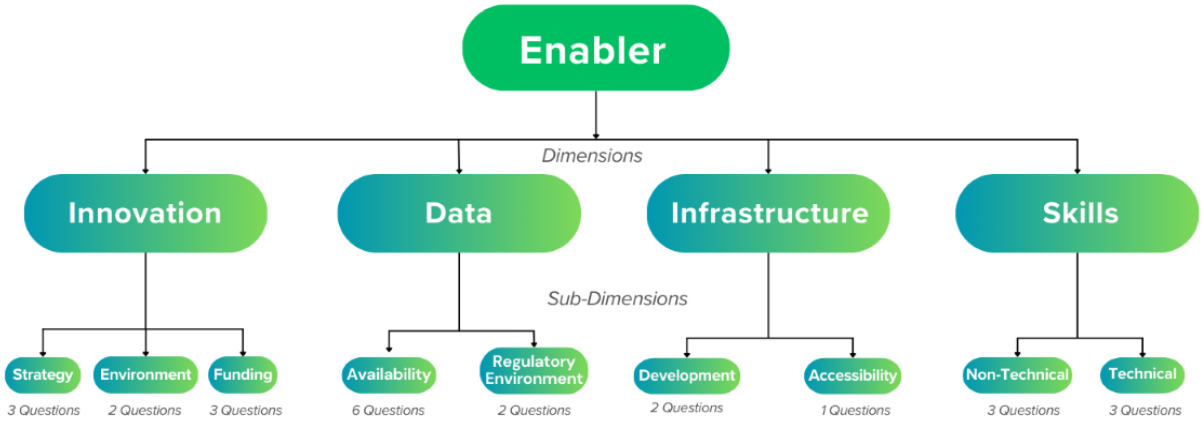
Finally, ethical usage of AI is required if it is to be used for citizens' advantage rather than as a tool of surveillance and discrimination. The report regarded the ethical use of AI to be a distinct section of the framework and proposed measuring elements of AI ethics throughout the other pillars. The independent pillar allows for deeper exploration into the various components of AI ethics, but also ensures governments grasp that these principles are not an afterthought, but rather woven across all aspects of AI development.

This assessment tool uses both quantitative and qualitative data to evaluate the government's readiness for adopting and enabling AI in an ethical and responsible way. The quantitative component consists of an online survey designed to gather insights from civil servants, reflecting their specific experiences and viewpoints. The data is further complemented using external metrics/indicators[1]. The qualitative component involves Key Informant Interview (KII), which expands the analysis to include input from the private sector, corporations, and academia. This combined approach offers a comprehensive understanding by integrating internal perspectives from civil servants with external viewpoints from other key stakeholders, providing a thorough measure of the government's readiness for ethical AI adoption.

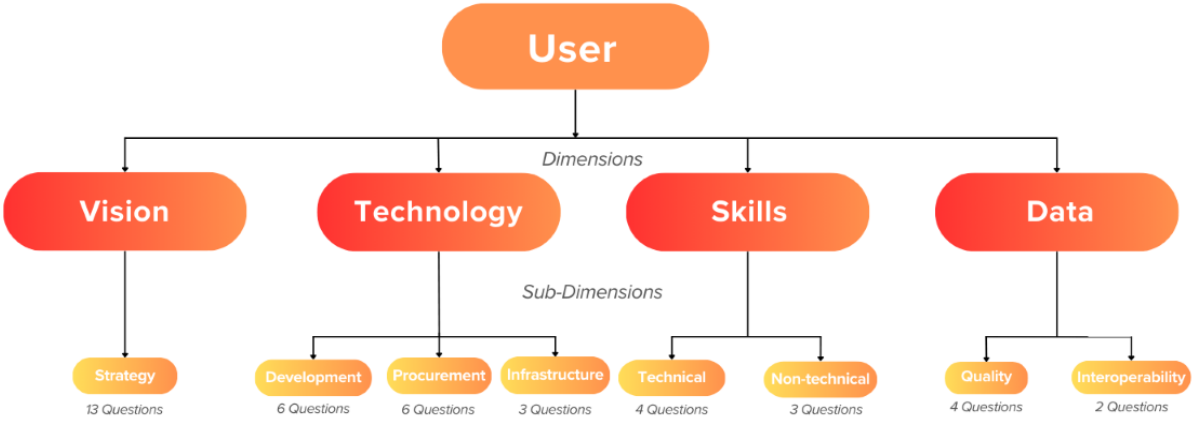
[1] External metrics/indicators includes GovTech maturity Index, Statistical Capacity, 3G network coverage, Regulatory Quality, Voice and Accountability, Perceived corruption, Cost of cheapest internet-enabled device, Rule of Law, 4G Network Coverage, Internet Users

The AI Readiness Assessment Framework converts responses from the survey and various external metrics into corresponding weighted scores. Every survey question is assigned a basic score. This score is then adjusted by multiplying it with a predetermined weight for that question. These weighted scores are then summed up to produce a percentile score for each sub dimension. To calculate a percentile score for each larger dimension, the framework takes the average of the sub dimension percentile scores. Finally, to derive a percentile score for each overarching pillar, the dimension percentile scores are averaged together.

Pillar 1: Government as an enabler



Pillar 2: Government as user



Pillar 3: Ethical AI

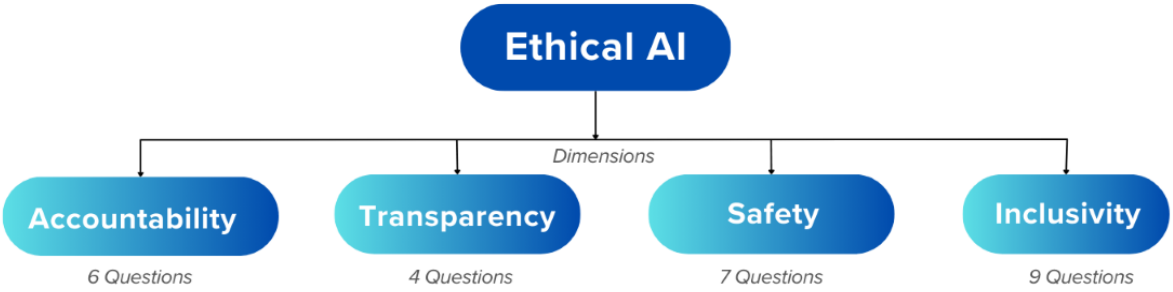


Figure 1: AIRA components.

Table 1: Different phases of AI readiness.

Pillar	Basic	Opportunistic	Systematic	Differentiating	Transformational
Government as an Enabler of the AI Environment	Little policy work Enabling conditions underdeveloped and given limited supported	Limited policy work Enabling conditions at basic level and may have some support	Targeted policy work Enabling conditions supported and advancing	Whole of government approach formalised or being formalised Strong support for and development of enabling conditions	Whole of government approach formalized and policy work at highest standard Strong support for and advanced development of enabling conditions, likely using innovative methods.
Government as a User of AI	Lack of government organizational structures, systems and policies needed for using AI Limited availability of technical skills	Some efforts to develop skills, structures and systems in government that are necessary for use of AI and improving data applications	Coordinated preparation for use of AI and data There is support for developing the required skills, structures and systems in government.	Approach to use of AI and data applications formalised and underway The required skills, structures and systems are likely at the level required to do so.	Vision for and implementation of AI in government is advanced Whole of government organisedin a way that supports AI use, including a formalised whole of government approach
Ethical AI	Societal backdrop and legal and policy environment not conducive to ethical development and use of AI	There has been some legal and policy work on directing ethical AI Societal backdrop may be an inhibitor	Policy work underway on ethical AI Societal backdrop not a significant inhibitor	Advanced policy work on ethical AI Positive societal backdrop	World-leading policy work on creating the conditions for ethical AI Positive societal backdrop

Digital & AI landscape in Bhutan

2.1 Digital landscape

Bhutan's digital landscape is undergoing a rapid transformation, driven by strategic initiatives across sectors. Internet penetration and digital connectivity are expanding significantly, with the government's efforts to extend 4G coverage and fiber optic networks across the country. The digital economy and e-governance initiatives have gained momentum, aimed at improving public service delivery, access, and economic growth. As the national digital momentum continues to grow, cybersecurity and data protection have emerged as critical issues that require the development of robust action and regulatory frameworks. Recognizing the critical role of human capital in digital development, education and digital literacy are being prioritized to equip the population with the skills necessary in the digital age. These interconnected elements form the foundation of Bhutan's ambitious national digital transformation, positioning the country well to leverage AI, and digital technology more generally, for sustainable development.

2.2 AI landscape in Bhutan

In general, there is mixed sentiment amongst the respondents on AI. The KIIs revealed that there is both excitement and anxiety in adopting and implementing AI. On the other hand, there are also feelings of uncertainty and confusion about understanding critical AI concepts and use-cases. The perspectives are similar across most developing countries which are now venturing into adopting AI. This can be partly attributed to the perceived complexity involved with AI implementation. As a result, policymakers often struggle to gauge the implications and potential risks associated, which inhibits their ability to craft appropriate policies and regulations. This is further made complex by existing regulatory frameworks that do not account well for new and rapidly emerging technologies, such as AI. The inability of regulatory bodies to update frameworks based on technological needs creates uncertainty for both innovators and researchers. This ultimately inhibits growth in new fields like AI.

At the core of any AI application development lies the consolidation of large datasets from sources, and the absence of regulatory guidance on data sharing and privacy creates further hindrances to even testing use cases. The concerns over data sovereignty and data localization add another layer of ambiguity.

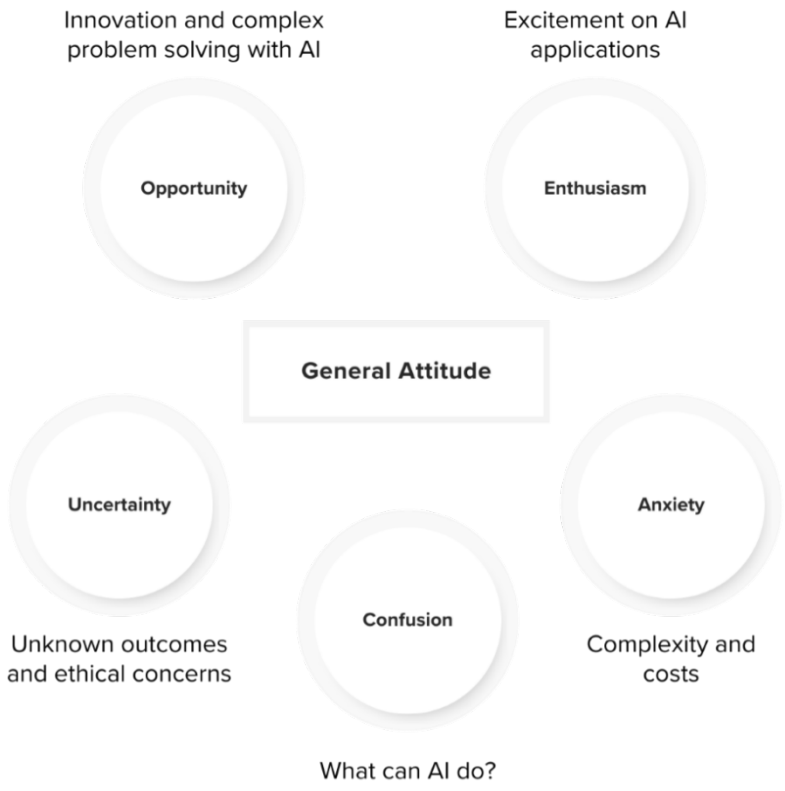


Figure 2: General attitudes towards AI

The RGoB has accorded special recognition to the potential benefits of AI despite its associated risk which could be mitigated. Since the formation of GovTech Agency in 2022, it has received additional mandates to explore and implement AI and other emerging technologies to enhance public service delivery.

Likewise, various educational institutions under the RUB such as the College of Science and Technology and the Gyalpozhing College of Information Technology have started incorporating AI-related courses in their curricula and are also actively engaging in research projects that explore AI applications in local contexts.

In the private sector, several companies are working on projects leveraging AI to improve their services and create new and innovative solutions. These companies on their own, as well as in collaboration with GovTech Agency, are also collaborating with international organizations and neighboring countries to enhance their AI capabilities. These collaborations include knowledge exchange, training programmes, and joint projects that aim to bring global AI advancements to Bhutan.

One of the most recent developments is the formation of the Bhutan AI Society, a newly founded AI community, with the aim to foster dialogue, networking, and bolster the responsible advancement of AI in Bhutan. Another notable collaboration is an international project led by

GovTech Agency in partnership with DHI, TTPL, and Omdena to establish an AI lab that aims to build local capacity through collaboration with global experts and promote AI startups in Bhutan with global market access. The programme is also intended to foster connections between local engineers and global developers and experts.

Drawing on insights from key informant interviews with government agencies, educational institutions, and private sector actors, Bhutan's AI landscape can be categorized into five levels of maturity: Awareness, Active, Operational, Systemic, and Transformational. This categorization is inspired by Gartner's AI Maturity Model, as illustrated in Figure 1.

AI maturity in this context refers to an organization's capacity to effectively leverage AI capabilities to enhance performance for customers, shareholders, and employees. It's important to note that this assessment is an internal evaluation of AI adoption levels specific to Bhutan's AI Readiness Assessment, rather than a direct application of international AI maturity metrics used by agencies like Gartner. The categorization provides a framework for understanding the current state and potential trajectory of AI adoption across various sectors in Bhutan.

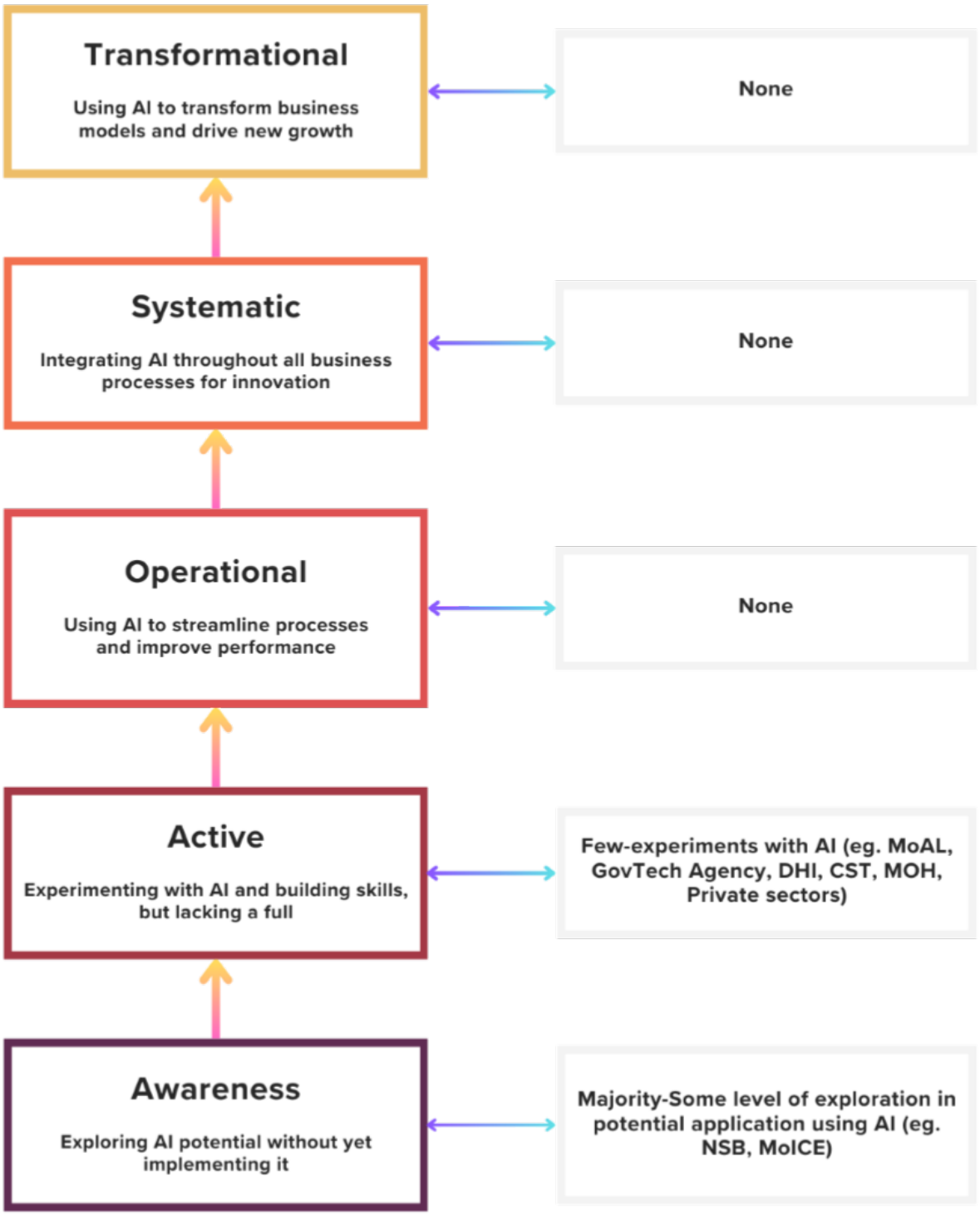


Figure 3: Gartner's AI maturity index

While AI adoption in Bhutan is still in its early stages, several organizations are spearheading initiatives to advance its implementation. GovTech Agency, DHI, and technological institutes under RUB like CST and GCIT are leading the way. These organizations are primarily focusing on AI pilot projects to explore practical applications and benefits of the technology. Beyond these pilot initiatives, significant steps are being taken to enhance AI preparedness. Some of these efforts are highlighted below. A notable example is GovTech Agency's infrastructure upgrade at the Government Data Center (GDC), which includes the installation of new Graphics Processing Units (GPUs). Despite being at a nascent stage, these efforts are important steps in Bhutan's commitment to building a foundation for AI adoption through targeted and practical real-world use-cases.

Figure 4: Current notable in-country AI development efforts

Assessment Results

3.1 Pillar 1: Government as an enabler of AI environment

Figure 5: Pillar 1 results, by dimensions

Government as an enabler of an AI ecosystem as Pillar 1 explores a government's actions to support and shape a national AI industry.

In its role as an enabler of AI development, the government of Bhutan is currently in the Systematic phase. This phase indicates that targeted policy efforts are in place and that conditions supporting AI adoption are progressing. The 2018 ICM Act[2] is pivotal in this regard, providing a structured regulatory framework for information and communications technology.

[2] Bhutan ICM Act 2018

It sets standards for data protection, telecommunications, and media, which are essential for establishing a secure and reliable foundation for AI development.

Moreover, the government's plan to upgrade the communication network and implement the third internet gateway will enhance infrastructure, ensuring reliable and high-speed connectivity necessary for effective AI operations and data exchange. The GDC will offer a robust and scalable platform for managing and processing large volumes of data, which is crucial for AI development and deployment. Additionally, the development of a Data Governance framework[3] will ensure that data is managed effectively, securely, and in compliance with regulations, creating a conducive environment for AI technologies.

Together, these initiatives indicate that the enabling conditions are evolving and progressing to create a supportive environment for broader ecosystem AI adoption. However, there are still gaps and areas needing improvement for Bhutan to effectively leverage AI technologies and drive innovation across various sectors. These aspects will be analyzed in detail in the following sections, organized by dimensions and sub-dimensions. The dimensions for evaluating the government as an enabler of AI are Innovation, Data, Infrastructure, and Skills.

3.1.1 Innovation

Innovation is the process of generating innovative ideas, products, and institutions. AI innovation in the wider economy requires a fair, entrepreneurial regulatory environment, committed funding, and a coordinated government strategy around AI.

Innovation involves creating new ideas, products, and institutions. For AI to drive broader economic advancement, it requires a supportive entrepreneurial regulatory environment, dedicated funding, and a well-coordinated government strategy.

The overall AI Readiness phase for Innovation is classified as Opportunistic, indicating that the enabling conditions are still relatively basic. Despite the rapid advancement of Bhutan's digital ecosystem in recent years, existing gaps continue to impede the development of a vibrant AI innovation culture**.** Innovation is measured by the sub-dimensions of funding, regulatory environment, and strategy.

Funding

Innovation inherently has associated risk and often there are no guarantees of financial returns. As such, a dedicated funding mechanism is essential for fostering innovation. The readiness

[3] Develop Data Governance Framework to establish a structured framework for managing and utilizing government data effectively, including data collection, storage, sharing, and privacy protocols as mentioned in the National Digital Strategy 2024.

phase for the funding sub-dimension is Systematic, indicating that the enabling conditions for funding to foster innovation are limited, but advancing.

The survey reveals that over half of the respondents are unaware of funding opportunities for AI researchers, and one-third indicated that such opportunities do not exist. Furthermore, only 10% of respondents reported government financial support specifically for businesses developing AI. These findings indicate a lack of adequate financial resources allocated to AI entrepreneurship and innovation.

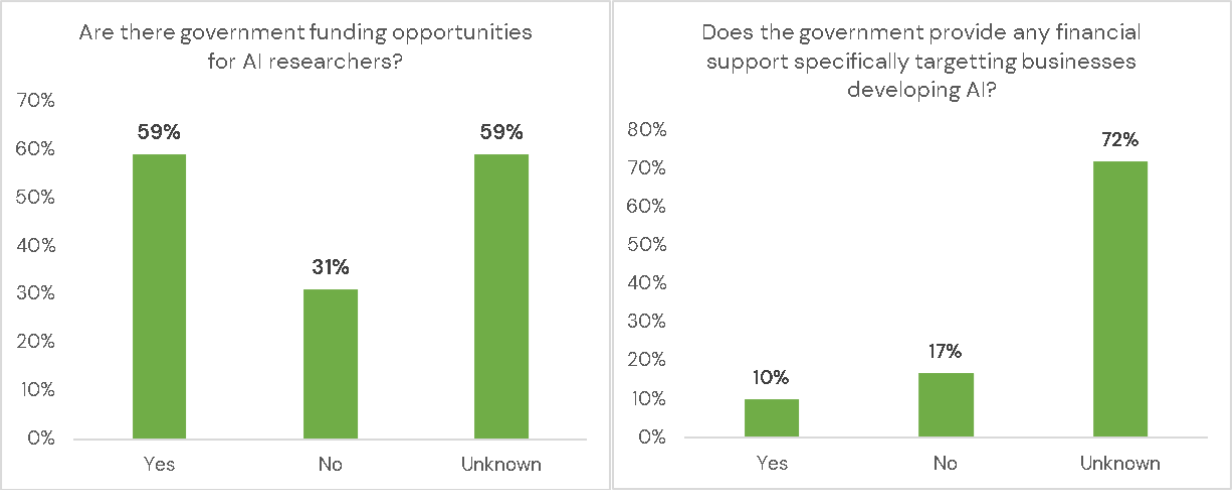


Figure 6: Financial support from the government for AI research and development

Several key informants from the private sector noted that the government should explore new mechanisms to incentivize local technology companies to innovate, even if these incentives do not immediately result in commercially viable products. At present, it is challenging for the private sector to nurture a culture of innovation when they must bear the full financial risk of failure on their own.

DHI stands out as one of the few organizations in Bhutan with an innovative culture[4], largely due to its substantial research and development budget. This funding enables them to employ dedicated teams of engineers and developers for prototyping and testing innovative products. Additionally, DHI's diverse portfolio of companies provides access to extensive datasets and interdisciplinary expertise, which further fuels their capacity to drive innovations in areas such as AI.

Regulatory Environment

The regulatory environment sub-dimension for innovation, particularly in the context of the government as an enabler of AI, refers to the framework of laws, regulations, and policies that shape and influence the development and deployment of AI technologies. This environment

[4] Innovation Strategy - Druk Holding and Investments

plays a crucial role in determining how effectively innovation can thrive. A supportive regulatory environment can help create a stable foundation for innovation, fostering an ecosystem where AI technologies can develop and integrate into various sectors effectively. The readiness phase for the regulatory environment stands at Systematic.

Survey findings indicate that the current regulatory environment for innovation in Bhutan is moderately conducive to starting and growing technology businesses. Specifically, 66% of survey respondents indicated that it is somewhat easy to start and expand a technology business in Bhutan, while 17% felt it is not easy. This suggests that while the regulatory environment is supportive to some extent, there is still room for improvement to make it more favorable for business growth and development. It also highlights the importance of continuous refinement and enhancement of the regulatory framework to further support AI and technology-driven innovation in Bhutan.

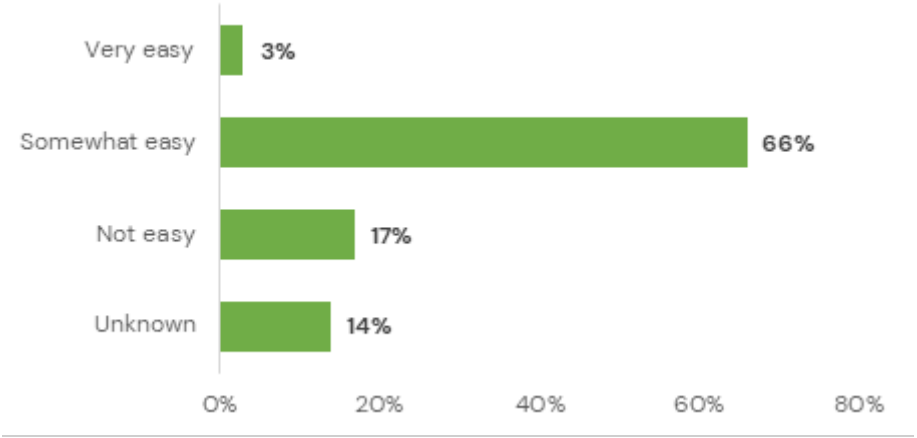


Figure 7: Ease of starting or growing technology businesses under current regulations

Respondents identified several key regulatory barriers for technology entrepreneurs, including challenges with accessing finance, unclear regulations, difficulties in obtaining necessary skills and resources, and a lack of online platforms and networks that enable entrepreneurs to offer remote services. These issues are summarized in the word cloud below.

Figure 8: Main regulatory barriers for technology entrepreneurs in the country

On the positive side, many respondents highlighted supportive regulations, such as government-sponsored national hackathons and innovation challenges, which provide seed money to successful participants to help establish startups. Additionally, tax incentives aimed at attracting and facilitating FDI including IT firms were also noted as beneficial measures.

Regarding the presence of a national standards body responsible for creating, amending, or implementing standards related to AI and data, 45% of respondents indicated the existence of such a body. The organizations mentioned include the Bhutan InfoComm and Media Authority (BICMA), GovTech Agency, and the National Statistics Bureau (NSB). The standards referenced were primarily for ICT in general, with the NSB serving as the custodian for data standards.

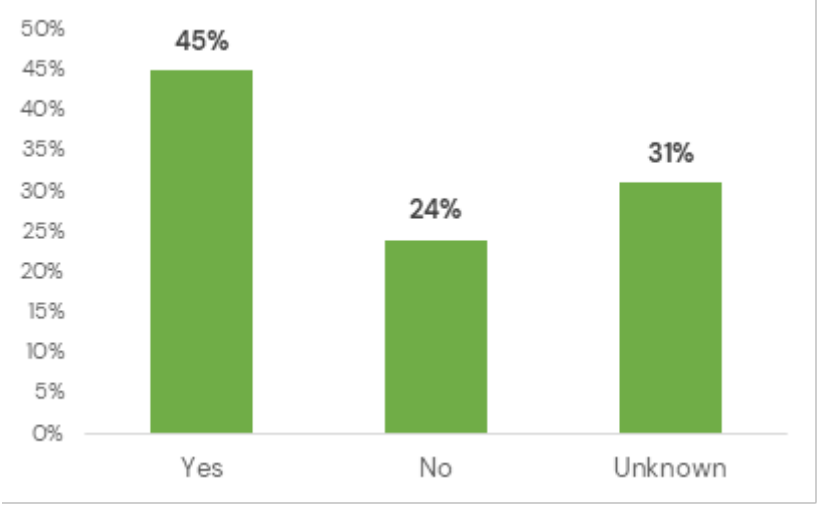


Figure 9: National standard body working on producing, amending, or implementing standards that are relevant to AI and Data

Strategy

The strategy sub-dimension is assessed through two key criteria: the existence of a dedicated government team focused on AI policy and the publication of an AI Strategy. The current readiness phase for this sub-dimension is Differentiating. This is reflected in the findings, where

nearly half of the respondents noted the presence of a dedicated government team, notably the establishment of GovTech Agency, which is working on developing an AI Strategy as part of the 13th Five-Year Plan. Furthermore, over half of the respondents (55%) reported that government agencies have shown support for AI research, commercialization, and its broader use in the economy, either through public statements or internal support.

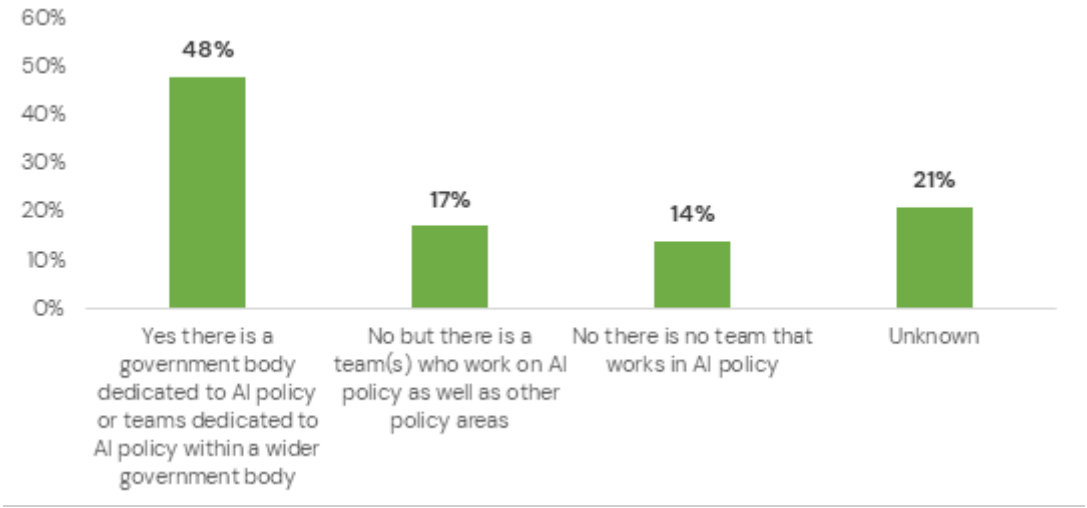


Figure 10: Government team dedicated to AI policy

Although there is a dedicated government body focused on AI Policy, more than half of the respondents mentioned that there is currently no AI strategy published. The survey is consistent with background research, as there are currently no policies or rules and regulations for AI, nor has an AI strategy been developed or any AI significant study in Bhutan been undertaken. These findings suggest that while efforts to create a strategic framework for AI are underway, the enabling environment is still in the early stages of development and requires further advancement.

3.1.2 Data

Data underpins the training and scaling of AI models. The availability of high-quality data is regulated in a responsible manner and is essential for AI readiness.

Data is fundamental to the training and scaling of AI models. The availability of high-quality data, managed and regulated responsibly, is crucial for AI readiness. Ensuring that data is both accessible, and of high-quality, forms the essential foundation for the effective development and deployment of AI technologies. The sub-dimensions of data are availability and regulatory environment.

The overall readiness phase for data is Differentiating which indicates that there is a strong effort toward building targeted policies and frameworks for data management and governance. This encompasses the development and strengthening of new and existing guidelines to ensure data quality, security, and ethical standards, as well as the creation of a comprehensive architecture and standards for data collection, storage, processing, and sharing.

Availability

Availability under the data dimension refers to the extent to which data necessary for training and deploying AI models is accessible and usable. The readiness phase for availability is Systematic. Data availability is assessed on key aspects such as data sharing, data portability, data standards and usability, and open data initiatives.

Open data initiative: The availability and quality of open data are vital for AI development and implementation. However, two-thirds of survey respondents indicated that they were unaware of any government open data portal, as shown in the figure below. Among those who acknowledged the existence of an open data portal, the majority mentioned that it offers minimal datasets. Key informant interviews revealed that while substantial administrative data is collected across government agencies, it was reported that access is often restricted within organizations, limiting cross-sector utilization. Recognizing this challenge, the 13th Five-Year Plan[5] highlights the importance of open data initiatives for supporting data-driven decision-making as part of its digital governance strategy. In response, GovTech Agency will be spearheading the development of an open data platform to support this strategy.

[5] Strategy 1: **Promoting digital governance**: Digital governance will involve rethinking public service delivery, revolutionising government operations, and implementing intelligent governance practices. Initiatives within public service delivery will prioritise the enhancement of efficiency and citizen satisfaction through technology-driven solutions. Meanwhile, efforts to transform government operations will target the reduction of operational costs and the process optimisation. Smart governance initiatives will underscore the importance of data-driven decision-making, citizen engagement, and open data initiatives.

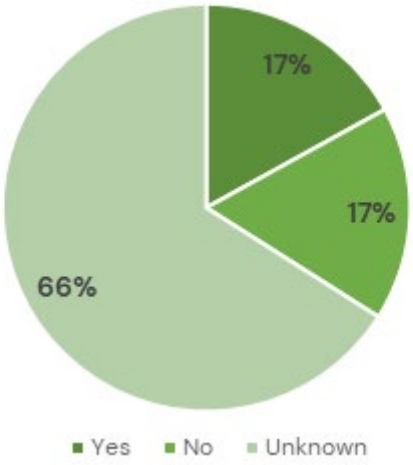


Figure 11: Presence of data portal in the government

Data sharing: Several agencies have pointed to the National Digital Identity[6] system as a leading example of innovative data sharing across the broader economy. This system is recognized for its groundbreaking approach to securely and efficiently exchanging information. It provides a streamlined and secure method for handling personal and sensitive data, ensuring privacy and protection while improving the efficiency of data management and access across various sectors. More than half of the respondents indicated that the government does not actively engage with external stakeholders regarding data availability in the wider economy. Among the 20% of the respondents who noted some level of engagement, stakeholders emphasized the need for better practices in preserving and maintaining historical data.

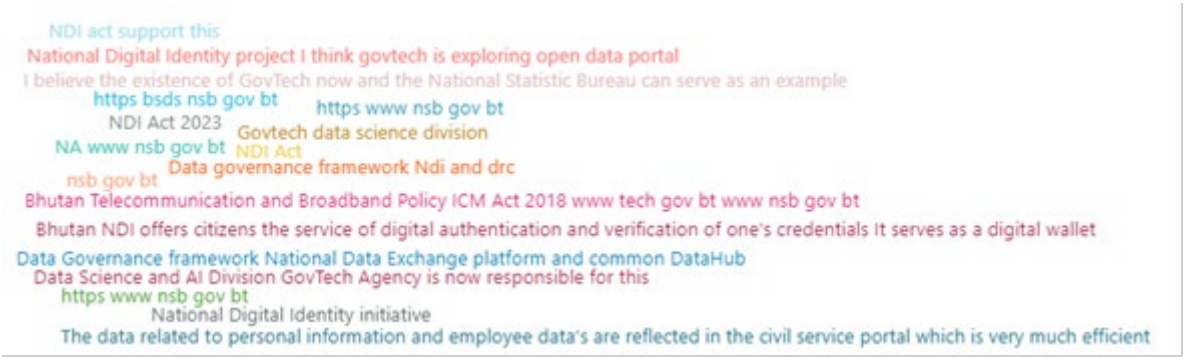


Figure 12: Innovative initiative for data sharing in the wider economy

Data Standards and Usability: Data standards ensure easy access, sharing, and integration of data across systems, which enhances AI training and deployment opportunities, promotes transparency, supports collaboration, and maintains data accuracy and reliability. Nearly 30% of respondents indicated that the government has data standards for the data it publishes publicly, while half of the respondents are unaware of any such standards. The NSB, which collects data from various agencies, is one of the few organizations that share data and has

[6] Bhutan NDI

established data standards protocols according to both the survey and several KIIs. However, KIIs also revealed that there are often competing data standards

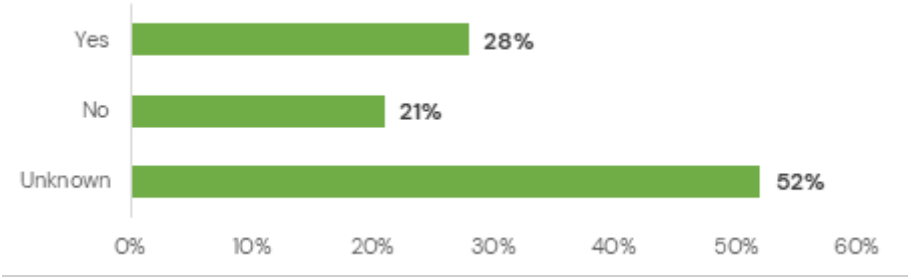


Figure 13: Does the government have data standards for datasets it publishes publicly?

Regulatory Environment

The regulatory environment within the data dimension plays a crucial role in enabling the government to support and advance AI initiatives. This environment encompasses the rules, policies, and frameworks that govern the collection, management, and use of data, which are essential for fostering AI development. Effective regulation in this domain ensures that data is collected, stored, and disseminated safely and ethically. The regulation primarily focuses on data protection and privacy laws that safeguard individual information. The readiness of the regulatory environment under the data dimension is in the Differentiating phase.

As indicated by the figure below, 61% of respondents reported that there is existing legislation for data protection and privacy. The main legislation in place is the 2018 ICM Act, which mandates the protection of citizen data and requires obtaining consent prior to any data sharing. Around 10% of respondents noted that there is draft data protection legislation currently under development, referred to as the Data Governance Framework[7]. This framework is set to be led by the NSB as part of the 13th Five-Year Plan.

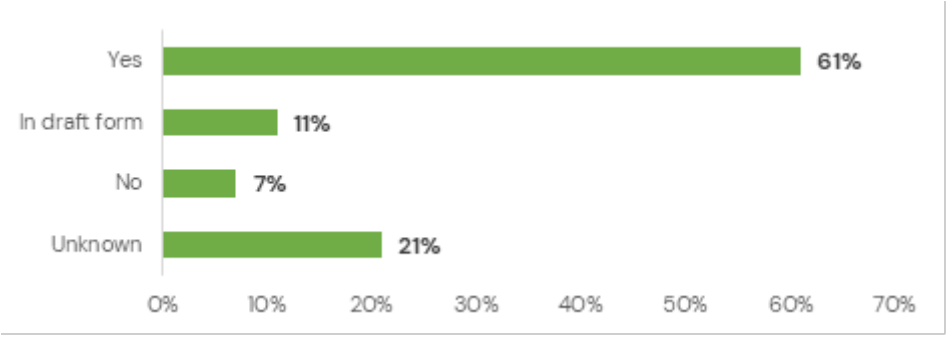


Figure 14: Data protection and privacy legislation

[7] Bhutan National Data Governance Framework

A gap analysis conducted in 2023 by GovTech Agency, in collaboration with the World Bank, revealed that the existing 2018 ICM Act's regulatory provisions are fragmented and unclear[8]. The analysis identified that the current framework is both insufficiently protective and overly restrictive. The provisions are fragmented and unclear, with privacy and data protection needing to be unified into a single regime. Service providers face vague obligations without direct penalties for non-compliance, and data subjects lack rights and effective redress against improper data processing. In response, the Royal Monetary Authority recently issued the Guidelines on Data Privacy and Data Protection 2022[9], which only apply specifically to financial service providers. These guidelines are more comprehensive than the 2018 ICM Act and align closely with provisions set out in the European Union's GDPR.

To address these deficiencies, the forthcoming Data Governance Framework is designed to enhance and unify the regulatory landscape, providing a more coherent and effective approach to both data protection and privacy.

[8] Gap Analysis of the Information, Communications, and Media Act of Bhutan 2018

[9] Royal Monetary Authority

3.1.3 Infrastructure

A strong AI infrastructure allows networks to connect different technologies and researchers to develop and deploy AI at scale. For AI to be a useful tool for the population, basic IT infrastructure needs to be in place.

Both digital and physical AI infrastructure are essential for fostering AI innovation. This infrastructure provides the necessary networks and connectivity for technologies and researchers to develop and scale AI solutions effectively. For AI to benefit the broader population, a solid foundation of basic IT infrastructure must be established.

The overall AI Readiness phase for infrastructure in Bhutan is Differentiating, which indicates that work is being done on integrating policies and resources to build and enhance infrastructure, ensuring that development is cohesive, meets broader national objectives, and supports sustainable development. This includes an emphasis on high bandwidth, low latency, reliable connections, scalability, and edge computing for AI growth. The sub-dimensions of infrastructure are development and accessibility.

Development

The readiness phase for the development sub-dimension under infrastructure is Transformational. This is primarily driven by the fact that Bhutan has excellent connectivity, particularly for government agencies and educational institutions, supported by an extensive fiber optic backbone network and nearly ubiquitous 4G mobile coverage. According to survey responses, over half of the respondents indicated that the government has policies to support the development of 4G and 5G telecommunication infrastructure. One key policy mentioned is the Bhutan Telecommunications and Broadband Policy 2014 as shown below. However, as a landlocked nation without direct access to the global submarine cable system, Bhutan relies on India for international connectivity. This reliance results in relatively high internet access costs due to limited international bandwidth. To enhance the resilience and reliability of its network, Bhutan is anticipating the operation of a third internet gateway[10]. There are also plans, some already underway, to enhance computing and telecommunications infrastructure in Bhutan. The 5G rollout has begun, covering 40 % of the population[11], according to the ITU.

[10] At the gate at last: Third internet gateway to materialise soon | Kuensel Online

[11] Population coverage, by mobile network technology: At least 5G - ITU DataHub

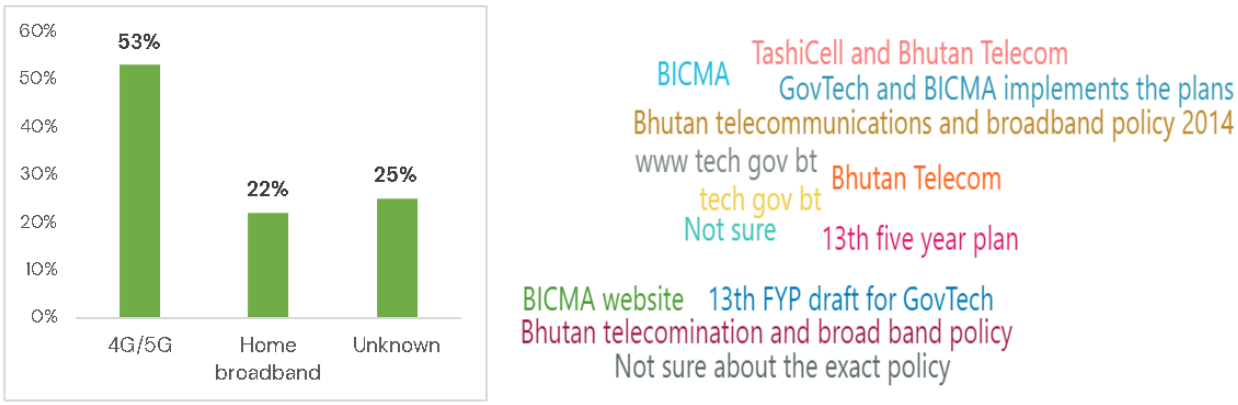


Figure 15: Policies to support the development of telecommunication infrastructure

However, the high cost of developing AI systems that require specialized hardware limits AI adoption among businesses, entrepreneurs, and the public in Bhutan. According to the KIIs, only a handful of organizations, such as GovTech Agency, DHI, and CST, currently have access to the high-end GPUs suitable for AI development. To address this issue, the government has taken some measures, including the launch of the AI Lab programme[12] in collaboration with DHI, Thimphu TechPark Limited, and Omdena. This initiative aims to enhance access to AI resources and support the entire AI ecosystem in Bhutan. Additionally, GovTech Agency plans to upgrade some GDC servers from CPUs to GPUs.

Cloud connectivity has emerged as a valuable solution to overcome hardware limitations. For instance, the Digital Kidu app[13] and other AI application testbeds benefit from cloud services. From the KIIs it was learned that this approach is widely adopted in Bhutanese academia, where faculty and students at GCIT use Google CodeLabs for coding and app development. While these efforts are a step forward in expanding access to AI infrastructure, further actions are needed to ensure a broad and significant impact.

[12] Launch of AI Lab Program in Bhutan

[13] Digital Kidu

Accessibility

The readiness phase for accessibility is at a Differentiating level, reflecting ongoing efforts to enhance telecommunications and advanced computing infrastructure, as well as initiatives aimed at ensuring equitable ICT access. The survey indicates that 65 % of respondents acknowledge the existence of policies designed to ensure equal access to ICT infrastructure. Among these, the E-Governance policy[14] is noted for making online government services accessible to everyone, including individuals with disabilities. Additionally, the BICMA under the 2018 ICM Act, is tasked with ensuring universal and affordable access to ICT services. This commitment is further supported by BICMA's Rules and Regulations on the Sharing of ICT Infrastructure (2019), which emphasize equal access to infrastructure as a fundamental objective.

3.1.4 Skills

Multiple skills are required to develop, validate, and deploy AI systems. Policy experts point to a 'skill gap' – a large gap between demand and supply for both technical and non-technical skills.

The overall AI Readiness phase for skills in Bhutan is Systematic, indicating that efforts are being made to create and support conditions that advance skill development. This includes implementing policies aimed at enhancing education and training programmes, fostering continuous learning opportunities, and ensuring access to resources that enable skill acquisition and improvement in line with current and future demands. These efforts have resulted in positive advancements in skill development, particularly through the integration of basic IT literacy in education, which provides a foundational environment for further growth. This is evident from the survey responses, where more than half of the respondents agreed that there are policies or initiatives to develop basic IT skills among the population as shown below.

[14] e-Governance Policy (Amendment 2021)

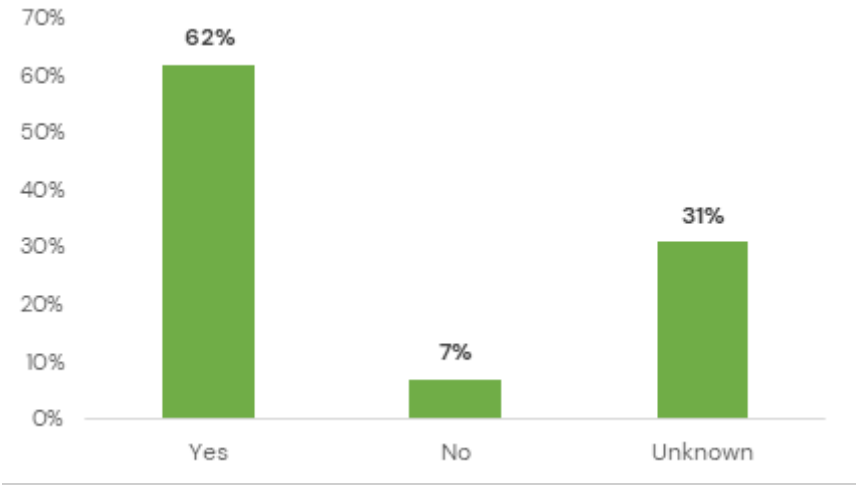


Figure 16: Policies or initiatives to develop basic IT skills among the population

Technical

The technical skills in the country are at the Systematic phase. While the survey responses confirm ongoing efforts to enhance basic IT skills, capacity building in specialized areas such as AI, machine learning, software development, and data science are still in their infancy. Only 24% of respondents mentioned existing policies or initiatives to support the development of these advanced skills within the population. Similarly, efforts to attract individuals with expertise in AI, machine learning, and data science from abroad are also in the early stages, with only 7% of respondents noting policies aimed at attracting foreign talent in these fields. This suggests a dual strategy of developing internal capabilities while also incorporating external expertise.

Several barriers hinder the growth of these specialized skills in Bhutan, as highlighted by survey responses and key informant interviews. The significant skills and knowledge gap limited educational offerings at the undergraduate level, and a lack of universities providing relevant courses in AI, machine learning, software development, and data science in Bhutan contribute to a shortage of STEM graduates as shown in the word cloud below. Consequently, the talent pool for these fields is small and largely confined to a few organizations like GovTech Agency, DHI, and academic institutions. The situation is further exacerbated by the emigration of experienced mid-level professionals, which depletes the already limited talent pool. Between January 2015 and May 2022, an average of 64 civil servants voluntarily resigned each month. However, from June 2022 to February 2023, this number surged to 234 resignations per month, with the majority at the P-level (professional category). A similar trend is seen in DHI companies, state-owned enterprises, and autonomous organizations outside the civil service[15].

[15] Civil Service Statistics | Royal Civil Service Commission

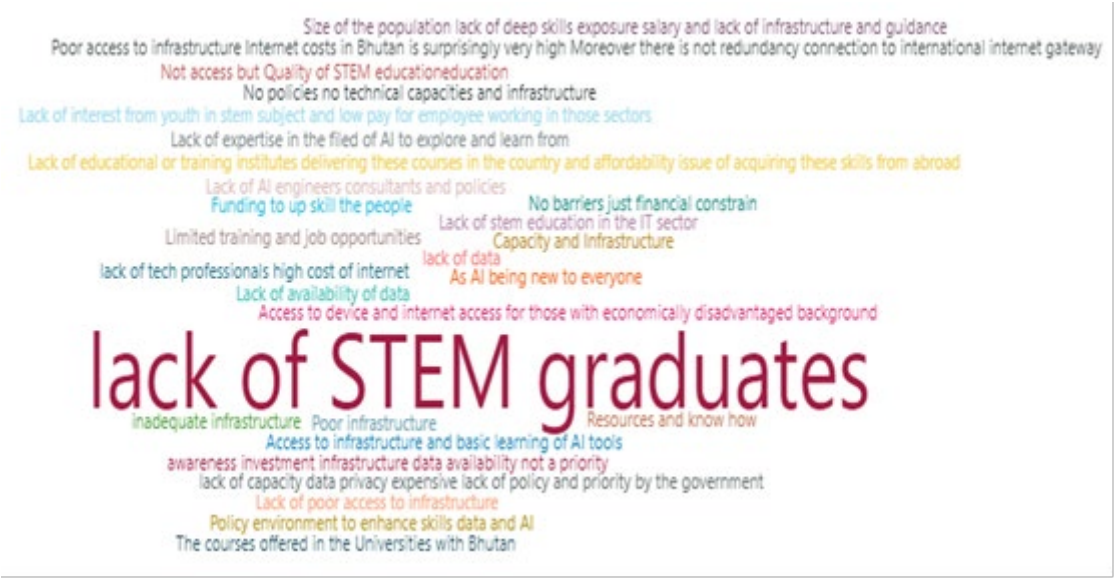


Figure 17: Key barriers to increasing the number of people with AI, machine learning, software development or data science skills in the population

To address these issues, the government has taken proactive measures. In 2022, out of 1,855 students enrolled in bachelor's degree programmes, only about 8% (153 students) were pursuing ICT and data science[16]. To remedy this shortage, the Royal University of Bhutan has shifted its focus towards STEM degrees, moving away from the Humanities and Arts[17] to better prepare graduates for the job market. Arts and Humanities courses will be revamped to better meet job market needs, incorporating subjects like Economics and Statistics to improve employability. Furthermore, the government has announced an investment of over 10 billion Ngultrums for 21st-century skilling programmes as part of the 13th Five Year Plan[18]. The programme will focus on transforming the technical and vocational education and training, TVET system, improving the tertiary education system, and promoting a culture of lifelong learning. These initiatives reflect a strategic approach to bridging the skill and knowledge gaps in the country.

Non-Technical

Non-technical skills in the country are currently in the Transformational phase, driven primarily by government support for enhancing basic IT skills. A key initiative was the Chiphen Rigphel programme (2010-2015)[19], which equipped 125,000 Bhutanese citizens with basic ICT skills, empowering them to become confident participants in an ICT-enabled world. Additionally, in

[16] Annual Statistics 2021-2022, Royal University of Bhutan

[17] RUB to revamp, phase out and introduce new courses across all 12 Colleges to make Graduates more employable – The Bhutanese

[18] Government to allocate Nu 10bn for 21st century skilling programme in 13th FYP - BBSCL

[19] NIIT successfully completes “Chiphen Rigpel” project in Bhutan, 2015

August 2021, the Code Monkey platform[20] was launched by RSSTEM, DITT[21], MoE, and REC to promote coding education and prepare Bhutanese youth for a digital future. GovTech Agency has also implemented a project to enhance digital literacy under the 12th Five Year Plan, which continues to be a priority in the 13th Five Year Plan. These initiatives are essential in building the foundation for improved digital literacy, a critical requirement for AI adoption.

Furthermore, the survey revealed ongoing efforts to develop policies that promote entrepreneurial skills. Nearly three-fourths of respondents mentioned the presence of policies or initiatives supporting the development of entrepreneurial skills. This demonstrates a comprehensive approach to building a robust ecosystem for fostering innovation and promoting technology-driven growth.

3.2 Pillar 2: Government as a user of AI

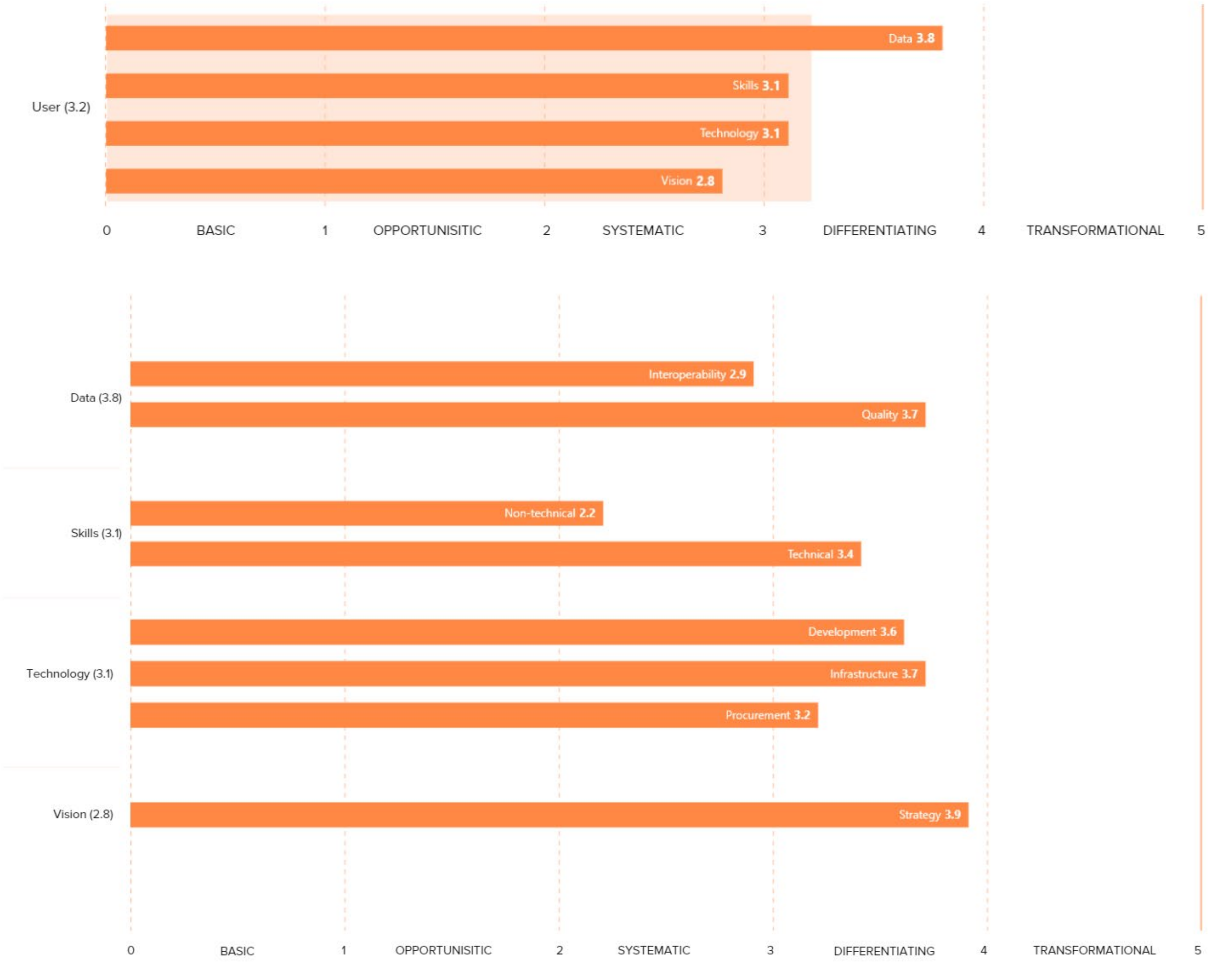


Figure 18: Pillar 2 results, by dimensions

[20] Code Monkey | Department of School Education

[21] DITT was under the erstwhile Ministry of Information and Communication technology.

Government as a user of an AI as Pillar 2 explores a government's effectiveness in integrating AI into public services and core operations. It assesses how well the government manages and implements the necessary technological resources and skills for complex AI technologies. Bhutan's overall AI readiness phase for Pillar 2 has been assessed as Differentiating[22]. This indicates that there are ongoing progressive efforts towards preparing for AI deployment and integration. It also reveals that the required foundational skills, structures, and systems are in place to introduce a formalized approach to the use of AI and data applications.

This assessment result is the outcome of several notable policy and programme initiatives undertaken by the government of Bhutan in recent years. The e-government project during the 11th FYP and the Digital Drukyul Flagship in the 12th FYP have emphasized digital infrastructure development and enhancing public service delivery. The current 13th FYP also has a targeted focus on ICT sector development through the "Digital Bhutan" initiative. Strong foundations have been laid with the realization of G2C, e-payment gateways, GDC, national data exchange platform, and NDI. The launch of National Digital Strategy 2024 for 'Intelligent Bhutan' also indicates the government's plans for AI implementation across government agencies.

However, for the government to improve and fully leverage AI, Bhutan will require a clear and strategic AI vision that aligns with national development plans. Although there have been significant achievements in Bhutan's digital landscape, continuing to strengthen digital infrastructure across agencies remains critical, all the while exploring and adopting emerging technologies. Other challenges include addressing the skills gap between technical and non-technical public servants, and issues of data quality and interoperability faced by several government agencies.

3.2.1 Vision

Within the public sector, a clear, coordinated vision for how AI will be used across departments is important in order to maximize AI's impact. This vision is especially integral to the governance of potentially harmful technologies.

Bhutan's AI readiness phase for Vision dimension was found to be Systematic. This suggests that while the overall vision for using AI across government functions is still in a developing stage, there is support for using AI integration and initial implementations.

Strategy

Under the pillar of government as a user of AI, Bhutan's readiness phase for Strategy sub-dimension was assessed as Differentiating.

[22] The external indicators that also contributed to the results include Bhutan's GovTech maturity rate of 54% and statistical capacity of 60%.

Bhutan has strategically developed and enhanced its digital initiatives, including e-governance infrastructure, to achieve effective digital governance. This process has evolved steadily over several FYPs. The 11th FYP introduced the initial e-governance mandate for the public sector. The 12th FYP focused on streamlining and enhancing the e-governance framework, primarily through the Digital Drukyul Flagship. The 13th FYP is expected to build on the previous initiatives, integrating emerging technologies into government systems to improve digital public service delivery.

Key milestones in Bhutan's digital transformation include the ICT Roadmap, first developed in 2011 and reviewed in 2015, which aimed to leverage ICT for socio-economic development, good governance, shared national consciousness, and sustainable economic growth[23]. The e-Governance Policy 2019 promoted a 'digital by default' approach, moving government services online where possible and shifting away from paper-based processes. This policy also underlined the accessibility for all citizens, including people with disabilities and those with limited digital skills.

To support these initiatives, Bhutan has implemented digital literacy programmes to educate citizens on the use of digital technologies and online services. By 2020, nearly 3000 citizens were trained nationwide[24]. Digital content on online services was made available through various platforms to increase outreach and awareness.

However, Bhutan has yet to develop specific strategies or policies for AI usage in the public sector, despite recent rapid advancements in AI technology. Nonetheless, discussion and action around AI implementation have already started among government agencies. 34 % of survey respondents reported that there were internal discussions regarding the support for AI usage in the public sector while 17 % noted public statements from management supporting AI usage. Agencies have identified GovTech Agency as the central government body to set the necessary guidelines for AI usage and explore its integration in the public sector.

In July 2024, GovTech Agency also launched the National Digital Strategy 2024, with the vision for an "Intelligent Bhutan" based on three pillars: digital society, digital economy, and digital governance. This strategy includes plans to formulate a National Emerging Technologies Strategy, focusing on using AI and other emerging technologies in government operations and improving public service delivery.

[23] Bhutan ICT Roadmap 2015 revised by the erstwhile MoIC with assistance from the World Bank

[24] Annual Report 2020-2021, DITT, MoIC

3.2.2 Technology

Government does not just enable technology – it also uses it. Governments both build AI tools internally and procure AI tools within the framework of their procurement regulations.

The Technology dimension under Pillar 2 was assessed as Differentiating. This suggests that there is support for using AI integration and initial implementations, the overall vision for using AI across government functions is still in a developing stage.

Infrastructure

The infrastructure sub-dimension under Technology was assessed as Differentiating which indicates that the RGoB has established key technological foundations. These include secure digital platforms, interoperability between government systems, and initial steps toward AI integration.

Bhutan has implemented G2C services as part of a major component of the ICT initiatives focusing on e-governance in the 11th FYP. G2C is a critical platform that provides citizens with access to various public services online, such as registering or renewing permits, licenses, or clearances, filing taxes (personal or business), and other essential services. Several online payment gateways for utility bill payments, government fees, and taxes have been developed to allow citizens to pay for public services electronically.

During the 11th FYP, Bhutan established a national government data center (GDC)[25][26] to consolidate the demand and use of ICT applications and standardize ICT infrastructure within the public sector by taking a whole-of-government approach. The center provides services for hosting and managing critical government applications and data. GDC is crucial for ensuring the reliability and security of digital services. The adoption of cloud services is also being promoted to improve scalability, flexibility, and efficiency in managing digital infrastructure.

Following the Civil Service Transformation Initiative in 2022[27], GovTech Agency was established to operate and maintain government systems and lead government digital transformation initiatives. This centralized approach to systems management allows for the development of a robust and integrated digital infrastructure, including data centers, cloud services, and security. Moreover, centralized systems management also ensures data quality, interoperability, security, and accessibility which is crucial for effective AI applications that rely

[25] Bhutan e-Government Master Plan 2014;

[26] GDC was an integral part of the e-governance initiative during the 11th FYP opting for a high-density data center solution to optimize the use of space while also ensuring scalability.

[27] As per the Civil Service Transformation Initiative Report 2022, GovTech agency was formed to introduce a whole-of-government systems development approach to harmonize all government functions and promote efficient and effective governance.

on large datasets. GovTech Agency's 13th FYP[28] also explores open data initiatives which will require drafting and implementing open data sharing protocols and policies, making government data available for research and development while ensuring privacy and security.

The Bhutan Computer Incident Response Team (BtCIRT)[29], under GovTech Agency, is mandated to enhance cyber security in Bhutan. It facilitates collaboration and information exchange among stakeholders, provides assistance in capacity building, and conducts sustained advocacy in computer security.

Figure 19: Awareness on AI use cases across the government by respondents.

Bhutan's AI readiness phase as a user of AI for development sub-dimension under Technology is Differentiating which indicates that the RGoB has established key technological foundations, including secure digital platforms, interoperability between government systems, and initial steps toward AI integration.

The NDI is an important gateway for creating a secure and integrated digital identity platform for the public. It involves the integration of biometric data, personal identification, and other critical information into a unified digital identity system. Efforts are underway to integrate NDI into the digital public services delivery, which will not only require more advanced digital infrastructure, but also improve data quality, security and interoperability. NDI implementation is expected to enable various AI applications, including personalized public services to enhance user experience and trust in government services.

The National Digital Strategy 2024 also introduces blockchain technology in public services delivery through NDI, such as document verification and using digital signatures for various application processes. NDI integration will foster innovation by providing a reliable platform for the development of new digital services and applications that leverage secure identity verification.

While the development of LLMs is crucial for various applications, the existing LLMs that are predominantly in English are limited in their applicability in diverse linguistic and cultural contexts of Bhutan. To address this challenge, GovTech Agency has initiated a project to

[28] 13th FYP 2024-2029

[29] As per the initial government order dated 20th May 2016, BtCIRT was established under the erstwhile MoIC as the national and governmental computer incident response team.

develop Dzongkha LLM for Bhutan. The initial phase of the project will be committed to developing a comprehensive Dzongkha corpus, and training and fine tuning an efficient national language model using open-source materials.

Nevertheless, challenges remain for understanding, exploring, and integrating AI in the public sector. Around 41 % of the survey respondents reported that there were no mechanisms for them to trial the use of technology or data in new ways within their departments. Furthermore, 38 % of respondents were not aware of any AI use cases. The 18 % who were aware largely cited projects that were mostly in initial planning or development phases. Some examples cited in the responses included development of chatbots to interact with the public on service platforms, predictive models in crop production to optimize yields, and remote sensing GIS drones.

Procurement

The procurement sub-dimension was found to be Differentiating which suggests the existence of a more formalized and structured procurement processes through the centralized e-GP system. However, procuring advanced AI technology and tools are new and poses challenges for the government.

A key takeaway from the survey regarding the government's technological aptitude in AI usage is its procurement framework. During the 11th FYP, the government transitioned from a paper-based procurement system to an e-procurement system to enhance transparency and efficiency in the government procurement processes. The e-GP system serves as a single point of access to the information on procurements made across various government agencies. Through this system, agencies can publish the tenders, corrigenda, and notifications of contract awards.

Figure 20: Barriers to AI procurement in the government.

While all government procurement now occurs through the centralized e-GP system, the current procurement regulations do not include any specific guidelines in AI procurement. Most survey respondents cited lack of knowledge being a primary reason for barriers to procuring AI tools and applications. Other reasons included high costs of AI applications and current regulations. These results indicate that, at present, there are minimal opportunities for

public servants, including procurement officials, to explore and learn about advanced technologies like AI.

3.2.3 Skills

To build or use AI, governments need both technical skills for building and adopting AI tools, and non-technical skills for supporting the use and integration of new technologies.

The Skills dimension under Pillar 2 was assessed as Differentiating which suggests that Bhutan has made significant progress in building the necessary foundational skills to support the government's use of AI and that there are on-going efforts to improve capacity.

Technical skills

The AI readiness phase for technical skills sub-dimension is assessed as Differentiating which suggests high competency levels of IT skills within the government positioning Bhutan to focus further on skills specialization such as machine learning and cloud computing.

Bhutan's public servants generally possess a strong technical foundation. From the survey assessment, more than half of respondents reported IT skills within the government to be proficient on basic digital platforms and tools. Similar outlooks were expressed in the KIIs. Various agency stakeholders noted the government's strong technical capabilities, specifically in areas such as networking, security, systems administration, and development.

In recent years, there has been a growing recognition of the importance of prioritizing advanced technical skills development, particularly in fields such as data analytics. Responding to this need, the RCSC has begun offering data science courses under its LTT scholarship programmes. This initiative reflects the government's commitment to building a highly skilled, future-ready public sector capable of effectively addressing the challenges and opportunities presented by the rapidly evolving digital landscape.

The government is not only setting sector-wide mandates on technology and digital governance but also relying on the GovTech Agency to develop and enhance the technical skills required for developing and using AI systems. As part of this effort, GovTech Agency provides its IT officers with licensed Udemy accounts[30]. This extensive access to Udemy's online courses is expected to raise awareness of emerging technologies and foster a culture of continuous learning and skills development among IT officers, encouraging them to enhance their skills to meet the growing needs of various agencies.

[30] As per the Annual Report July 2020 – June 2021, DITT, MoIC, the Udemy accounts were provided starting from the fiscal year 2020-21.

Figure 21: Government's top priorities for IT skills in the government

However, the majority (67%) of the survey respondents still shared concerns that there were not enough public servants with the advanced technical skills to build useful AI tools for the public sector use. Though Udemy access is a commendable effort to support building a skilled workforce, there has been no impact assessment to study the effectiveness of this programme. Furthermore, there are no monitoring and evaluation mechanisms in place to determine whether the mandatory tech learning paths have been completed. The absence of incentives or recognition for those who actively enhance their skills through the platform may also reduce motivation and engagement among employees.

Non-technical skills

The non-technical skills sub-dimension under Pillar 2 was classified as Systematic indicating a growing skills-gap between technical and non-technical government staff.

While several initiatives are underway to advance the technical skills, it is also critical to adopt a balanced and inclusive capacity-building strategy to promote a more cohesive and collaborative public sector that can effectively leverage technology and AI in improving public service delivery. The development of the G2C project during the 10th FYP introduced several comprehensive capacity building programmes. One such programme was the Chiphen Rigphel[31], implemented between 2010 and 2015. This programme included ICT training for government and local leaders, senior and middle level managers, teachers, youth, monks, entrepreneurs, and people in the rural communities.

The programme was further expanded during the 12th FYP as a digital literacy programme component under the Digital Drukyul Flagship[32]. While the digital literacy programme largely aimed at improving the digital skills of the public, hands-on training in computer fundamentals, online security, and digital services were carried out for the public servants to build digital capabilities and confidence in civil service.

[31] Bhutan e-Government Master Plan 2014

[32] Annual Report July 2020 – June 2021, DITT, MoIC

Contrary to the progress in advancing technical skills, concerns on the exclusivity of several programmes have also been raised. Regarding the availability of non-technical support staff, close to 60 % expressed there being very few complimentary non-technical staff who could support the government's technical programming. Most of the respondents also focused on skilling, reskilling, and upskilling of public servants overall, emphasizing a more balanced approach to capacity-building.

This widening gap in skills between technical and non-technical staff in the government is further exacerbated by the very limited availability of user guides for the government's IT systems and tools to learn and adapt to new systems. This disparity in skills can lead to inefficiencies in service delivery as non-technical staff struggle to effectively use the systems. They further underscored the importance of engaging and training respective agencies, as a lack of understanding and comfort with existing and emerging IT tools among non-technical staff can hinder the adoption of new technologies and innovative solutions.

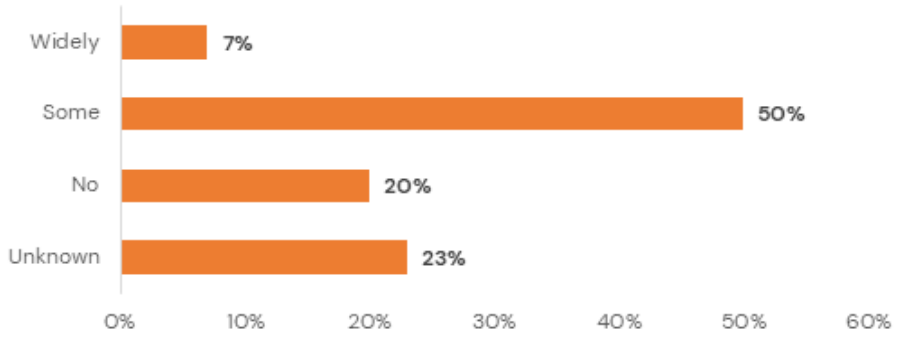


Figure 22: Perceived availability of user guides or playbooks for the government IT systems and tools

3.2.4 Data

Access to high quality, representative data is vital to developing accurate, non-discriminatory AI. Within the government, AI's value will also be maximized if information can be exchanged between different systems, i.e., interoperability.

The Data dimension under Pillar 2 has been identified as a Differentiating area, highlighting Bhutan's significant progress in laying the groundwork for a structured approach to managing data across government operations. However, while these foundational efforts mark an important step forward, further work is necessary to fully operationalize and strengthen these initiatives to achieve comprehensive and sustainable implementation.

Interoperability

The data interoperability sub-dimension has been classified as Systematic which suggests that there is a need for Bhutan to strategize efforts to fully integrate data across various government systems for seamless data exchange.

Since the early 2010s, the whole-of-government approach to streamline and integrate public service delivery systems was strongly emphasized[33]. The Shared Services was initiated to facilitate interoperability within the government, promoting common data hubs, systems, and data center services. In line with this, e-GIF was developed as a government enterprise architecture. The framework defined technical standards and best practices to enable government systems to integrate and interoperate across the government.

The common data hubs project was rolled out during the 11th FYP[34], primarily to develop people, land, business, and vehicle data hubs. As of June 2021[35], the national data exchange platform (datahub) had 12 agencies able to share data from their systems to authorized counterparts through standard RESTful APIs[36].

The formation of GovTech Agency boosted the whole-of-government agenda under the digital initiatives by centralizing government systems' development, operations, and maintenance, and ease data exchange. Most of the survey respondents agreed that data sharing across the government has comparatively improved. The centralization of ICT services under GovTech Agency, national datahub, centralized data center, and development of a data governance framework were some of the efforts shared by the respondents.

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33 Bhutan e-Government Master Plan 2014

34 Bhutan e-Government Master Plan 2014

35 Annual Report July 2020 – June 2021, DITT, MoIC

36 Some notable data that were available on the datahub included personal details, family details, land details, vehicle details, tax details, business license details, and civil servant details.

Figure 23: Efforts to improve data sharing across the government

While there is a general acknowledgement that several efforts are underway to ease data sharing within government agencies, KIIs indicated that agencies still face data sharing issues in absence of standard data sharing protocols and guidelines. Most government agencies maintain their own formats for collecting and storing data and lack clear intra-agency and inter-agency data sharing guidelines. While e-GIF lays out systems and data standards to be maintained by all government systems, some agencies shared their issues with weak monitoring and compliance checks under the framework stating that e-GIF was not thoroughly and consistently implemented. This unchecked practice of inconsistent data management adds to the government data exchange challenge.

Furthermore, difficulties in accessing user guides on the government's IT systems and tools have led to poor metadata management. Agencies shared that siloed metadata management practices not only lead to outdated or incorrect metadata that hinders data integration but also compromises administrative data integrity and quality.

Quality

The AI readiness phase for data quality sub-dimension was found to be Differentiating reflecting Bhutan's continuous efforts to improve data quality to drive effective decision-making processes.

The NSB plays a critical role in improving data quality as part of its mandate to streamline and strengthen statistical systems and ensure uniformity in concepts, definitions, and classifications for national and international data comparison. The agency has developed several standards guidelines and frameworks, including the BSQAF 2020, BSSC 2020, and Guideline on Assessing Quality of Administrative Data for Producing Official Statistics. Most of the data standards specified under the data architecture of e-GIF are also referenced from the standards developed by NSB, demonstrating a collaborative effort between NSB and GovTech Agency to define and set data standards, and implement them across the government systems.

The e-Governance Policy 2019 has incorporated the single sources of truths as one of its guiding principles. This principle aims to streamline and harmonize administrative data with

existing standards and foster data quality and integrity. Government agencies, as owners of their systems data, are responsible for data collection, storage, quality assurance through validations, and regular and timely updates.

The Data Management Guide 2023 was also developed by GovTech Agency[37] to improve data quality by informing data administrators across government agencies of best data management. The NSB has also prioritized the strengthening of administrative data quality across 12 identified sectors in the 13th FYP to drive data-informed policy creation, planning, and service delivery.

However, awareness among public servants of data and data management standards remains low. This was evident in more than half of respondents (64%) stating that they were not aware of any data quality frameworks or standards that the public sector needed to follow. This lack of awareness can result in minimal implementation and compliance with these standards, leading to poor data quality. This factor could also contribute to siloed data management practices, as cited earlier, including inconsistent metadata management.

Data quality issues are gradually becoming a primary focus of several agencies as data-driven decision and policy making initiatives bring greater scrutiny to the data they manage. Stakeholders during the KIIs shared that some of their major challenges involved validating and updating their data catalogs that were stored before the existing standards and guidelines were in place. Despite the principle of single sources of truth (under e-GIF) mandating respective agencies to carry out data quality checks, most agencies lack the required skills and tools to conduct quality checks and other monitoring activities.

It can be observed that despite having these standards and frameworks in place, there is still a major gap in their implementation efforts. Some stakeholders shared that even with the centralization of all ICT operations within GovTech Agency, they were not aware of any systems (and data) audits and reviews for data quality checks conducted by GovTech Agency in absence of a feedback mechanism or protocol.

[37] Moving forward, the mandate to create awareness on the guide and review and update the guide accordingly will be taken up by NSB in the thirteenth FYP.

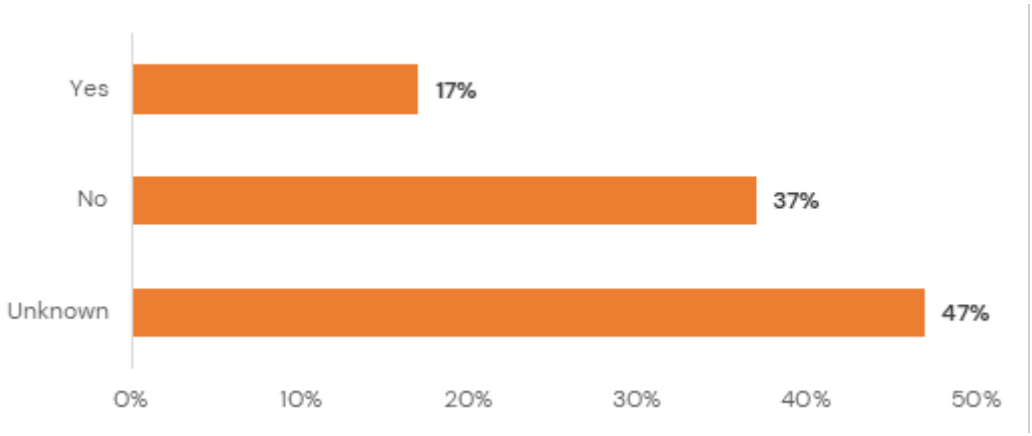

Figure 24: Awareness among respondents on data quality frameworks or standards in the government

3.3 Pillar 3: Ethical AI

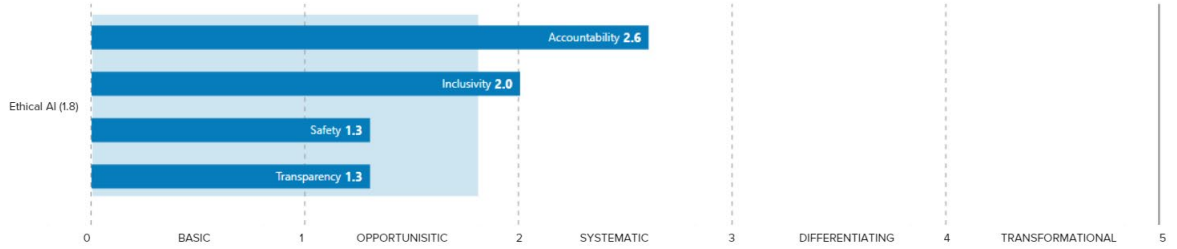

Figure 25: Pillar 3 results, by dimensions

Ethical AI, as Pillar 3, focuses on the policies and legal mechanisms that ensure the benefits of AI are shared inclusively, while safeguarding individual rights from the risks posed by AI technologies throughout their development and deployment.

Ethical AI refers to artificial intelligence systems that adhere to well-defined ethical guidelines, upholding fundamental values such as human rights, fairness, privacy, transparency, and accountability. It prioritizes ethical considerations in determining the legitimate and illegitimate uses of AI technology. As one of humanity's most promising innovations, AI is set to transform various sectors, including healthcare, education, finance, and transportation. However, as AI usage expands, ethical concerns have emerged, necessitating immediate attention. Responsible implementation of AI is not only a crucial ethical imperative but also essential for ensuring a sustainable technological future.

In Bhutan, the only legislation that even partially addresses ethical AI is the 2018 ICM Act. This act was designed to foster a conducive environment for the growth of the ICT and media sectors, aligning with the principles of GNH, which emphasize the well-being of the people, sustainable development, cultural preservation, and good governance. The act includes provisions for data protection, cybersecurity, and privacy protection, which resonate with GNH's focus on safeguarding the rights and well-being of citizens. However, the act does not

explicitly address the ethical use of AI, leaving a significant gap in the current legal framework. The overall AI readiness phase for Ethical AI is Opportunistic.

According to the survey, Bhutan is currently in the Opportunistic phase of Ethical AI readiness. In this phase, the country recognizes opportunities for AI integration but lacks comprehensive regulatory frameworks to guide its development and use. While several KIIs underscored the need for a regulatory framework, the KII with GovTech Agency emphasized that the recent emergence of AI necessitates a cautious approach; crafting policies without a thorough understanding of AI could hinder progress. This gap in policy highlights the urgent need for policymakers to explore the ethical, legal, and regulatory dimensions of AI.

This phase is further characterized by the nascent state of ethical considerations in AI deployment. Although there is a growing recognition of the need for ethical frameworks, significant gaps remain. For instance, the introduction of ethics modules at GCIT is a positive step towards integrating ethical considerations into education, yet it reflects the early stages of addressing these critical issues.

Concerns such as deepfakes, AI-driven academic dishonesty, and potential legal issues emphasize the need for immediate attention. Deepfakes, for example, pose significant risks to public trust and democracy by spreading misinformation and manipulating public opinion. AI-driven academic dishonesty threatens the integrity of educational institutions and undermines the value of academic credentials. Additionally, incorrect AI output could lead to legal consequences, damaging both public safety and trust in AI systems. These risks illustrate the potential for AI to cause significant harm if ethical considerations are not adequately addressed, making it crucial to establish clear guidelines and accountability measures.

While Bhutan is beginning to lay the groundwork for ethical AI, the lack of established guidelines and policies means that the growing number of AI projects in the country may inadvertently breach future regulations. This situation highlights the delicate balance between fostering innovation and ensuring the responsible and safe deployment and development of AI in Bhutan.

3.3.1 Accountability

AI actors must be held accountable for the proper functioning of AI systems. This includes accountability to citizens, through mechanisms such as the right to challenge public sector algorithms, and to institutions, through AI ethics policy frameworks, strategies, and targets.

Within the public sector, a clear, coordinated vision for how AI will be used across departments is important to maximize AI's impact. This vision is especially integral to the governance of potentially harmful technologies.

The overall AI readiness phase for Accountability dimension was found to be Systematic.

The survey analysis regarding accountability in AI reveals significant gaps in oversight and regulation. When asked about the presence of a government body responsible for developing AI ethics policies, (33%) of respondents were unaware of such an entity, (27%) confirmed its existence, (23%) denied it, and (17%) strongly affirmed its presence. This diverse feedback indicates considerable uncertainty and suggests the potential absence of a well-defined or widely recognized entity dedicated to AI ethics within the government. The KIIs reinforced this view, emphasizing the importance of establishing a structured oversight mechanism to ensure proper data training and human oversight. They further highlighted the need for robust legal frameworks and comprehensive quality assurance to bolster accountability in AI applications.

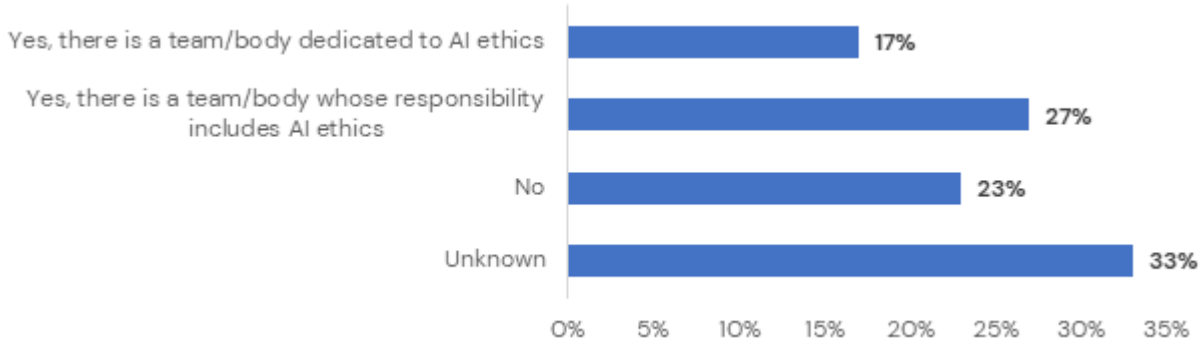

Figure 26: Is there a government body or team for developing AI ethics policies?

Regarding the publication or drafting of ethical AI principles, (63%) of respondents were unaware of any such principles, (37%) believed no principles had been published, and only (7%) indicated that the process was underway. This widespread uncertainty highlights a need for improved transparency and communication from the government regarding the development and dissemination of ethical AI guidelines. This aligns with insights from the KIIs, which repeatedly underscored the necessity of clear and comprehensive ethical guidelines to support accountability and pointed to the challenge posed by the lack of policies and regulations. For instance, a sensor-based AI technology project aimed at improving childbirth resuscitation faced major hurdles due to the absence of AI policies and a supportive environment. Despite being a promising initiative by a Japanese firm to train AI models in Bhutan, the project experienced delays because of the lack of data, rules, and clear procedures.

The proposal took three months to get clearance due to the committee's indecision, and even after GovTech Agency granted clearance, it still took an additional two months to get the project rolling. The pilot had limited success, with only two cases available, insufficient to train the model effectively. This insight from the KII underscores the difficulties in fostering innovation in Bhutan due to the absence of established AI guidelines and regulations. Additionally, responses about the applicability of ethical AI principles were evenly divided. (50%) of respondents were unaware whether these principles applied to both the private and public sectors, while the other half confirmed their applicability specifically only to the public sector. This division indicates a lack of clarity about the scope of these principles, suggesting that the government needs to define and communicate the breadth and applicability of ethical AI guidelines more clearly. This was confirmed across multiple KIIs with relevant stakeholders.

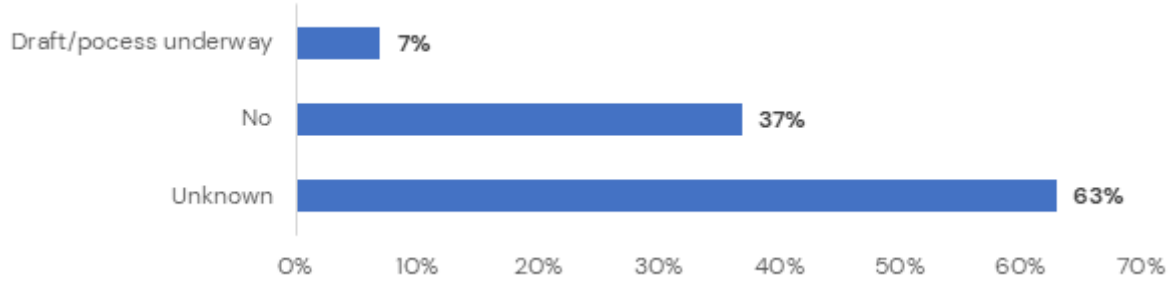

Figure 27: Has the government published or is the government drafting its principles for ethical AI?

Regarding involvement in international initiatives on ethical AI, such as the Organisation for Economic Co-operation and Development (OECD) AI Principles or UNESCO's work on the Ethics of Artificial Intelligence, (86%) of respondents were unaware of any such participation, and (10%) responded negatively. This significant lack of awareness points to a need for increased government engagement and transparency about its involvement in global ethical AI discussions and standards. Active participation in international initiatives is crucial for aligning national practices with global best practices and enhancing accountability. These global initiatives can support in providing model frameworks for developing trustworthy AI systems and promoting human-centered AI development. The KII findings support this, by suggesting that international engagement is essential for establishing structured guidelines and aligning with global standards.

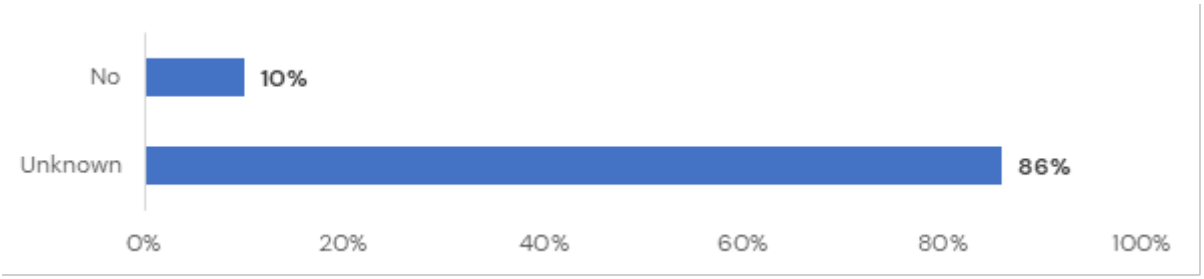

Figure 28: Is there a government involved in any international initiatives on ethical AI?

Finally, when asked if current legislation includes provisions for opting out of or challenging decisions based on algorithms used by the public sector, many respondents were unaware of such provisions, while a few stated that such provisions were included in draft legislation. This substantial gap in awareness or existence of these legal provisions highlights a potential shortfall in legal safeguards, which are essential for ensuring that individuals can challenge and seek recourse against algorithmic decisions. KII findings highlight the importance of legal safeguards and clear frameworks to support accountability, further emphasizing the need for well-defined legal provisions to address algorithmic decision-making.

3.3.2 Transparency

AI actors should provide meaningful information to foster a general understanding of AI systems and make stakeholders aware of when and how they will be affected by AI. Additionally, citizens should be able to know, where possible, how AI systems have arrived at an output. AI governance should also enable those diversely affected by an AI system to be able to challenge its outcome.

Transparency in AI usage is crucial for making AI systems understandable, explainable, and accountable. Transparency is vital for building trust, enabling informed decision-making, and ensuring accountability in the development and use of AI technologies. The current AI readiness phase for Transparency is Opportunistic.

The survey findings reveal significant gaps in the oversight of AI systems in the public sector. A substantial majority of respondents (67%) reported being unaware of any monitoring mechanisms for AI, with (27%) indicating that such mechanisms do not exist. Only a small fraction (7%) confirmed their presence. This widespread lack of awareness highlights a serious deficiency in systematic tracking and oversight, which is crucial for ensuring accountability and addressing potential biases in AI applications. Multiple KIIs emphasized the need for a structured approach to monitor AI usage and noted that the absence of formal policies and regulations contributes to the difficulty in tracking AI systems, reinforcing the survey results.

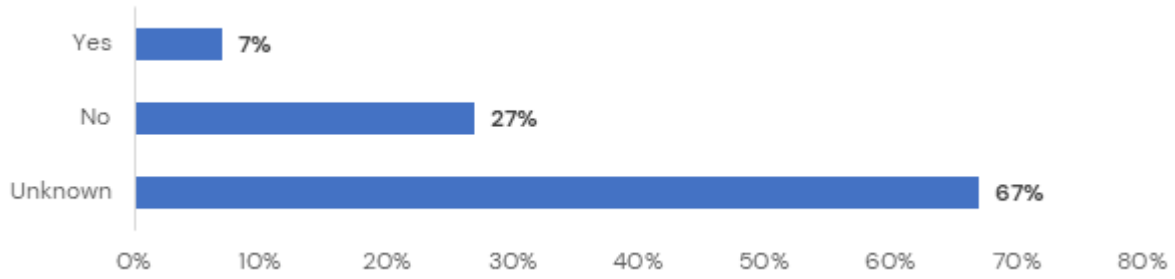

Figure 29: Does the government monitor and record the use of algorithms within the public sector?

Transparency regarding the publication of records related to government algorithms is equally concerning. Half of the respondents were unaware whether the government publishes these records, and the other half reported that no such publication occurs. This lack of publicly available records hampers the ability of stakeholders to evaluate the fairness and reliability of AI systems, thereby diminishing trust and complicating external review. KIIs echo these concerns, with several government agencies highlighting the critical role of transparent documentation in building trust and ensuring fair AI deployment.

The issue of transparency extends to the procurement of AI-based services and products. According to the survey, (67%) of respondents were unaware if the government publishes contract information related to these services, and (33%) confirmed that such information is not

published. This lack of transparency in procurement processes raises ethical concerns about the responsible acquisition and deployment of AI systems. KIIs support these findings, emphasizing the need for clearer and more transparent procurement practices. The importance of transparent partnerships and procurement processes was recognized, while unclear rules and guidelines in AI procurement were also highlighted.

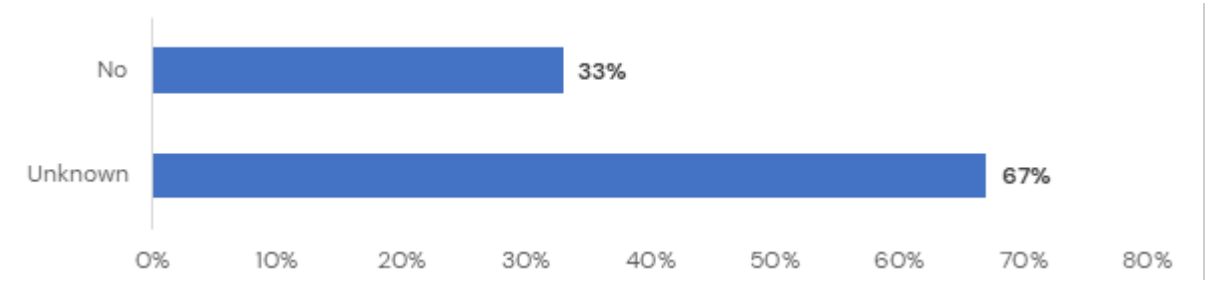

Figure 30: Does the government publish contract information for AI-based services and products that it purchases?

The concept of explainability in AI systems is another crucial area where transparency is lacking. The questionnaire revealed that (70%) of respondents were unaware of any legal right to explainability for government algorithms, with (30%) indicating that no such right exists. This widespread unawareness suggests a deficiency in legal frameworks that support transparency in AI. KIIs emphasized the need for legal frameworks to support transparency and explainability, noting that gaps in current regulations contribute to the lack of awareness about these rights. The importance of understanding and addressing biases in AI models also highlights the need for clear and explainable explanations of AI outputs.

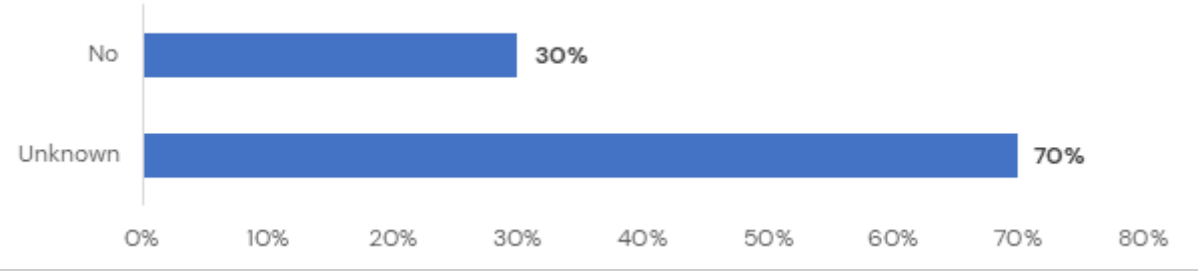

Figure 31: Does a legal right to explainability for algorithms used by government exist?

Overall, the analysis reveals several critical areas where transparency in government AI systems is lacking. There is a notable need for improved monitoring, public documentation, and clear procurement processes, as well as robust legal frameworks to support explainability. Addressing these issues is essential for enhancing transparency and public trust in AI technologies.

3.3.3 Safety

In both the public and private sector, the management of the risks associated with AI systems should be considered, to prevent malicious or unintended use, as well as reducing any potential existential risk that may arise.

Safety is essential for building trust in AI systems and ensuring that they can be used responsibly and effectively. The overall AI Readiness phase for Safety is Opportunistic.

The survey responses reveal several critical gaps in the current safety measures and approach related to AI. A significant concern is the lack of a framework for categorizing AI systems by the level of risk they pose to human life and health. Over half of respondents (57%) were unaware of such a framework, while (43%) indicated that no such framework exists. This indicates a substantial gap in the government's approach to AI safety. Proper risk categorization is crucial for prioritizing safety measures and ensuring rigorous evaluation of high-risk AI systems.

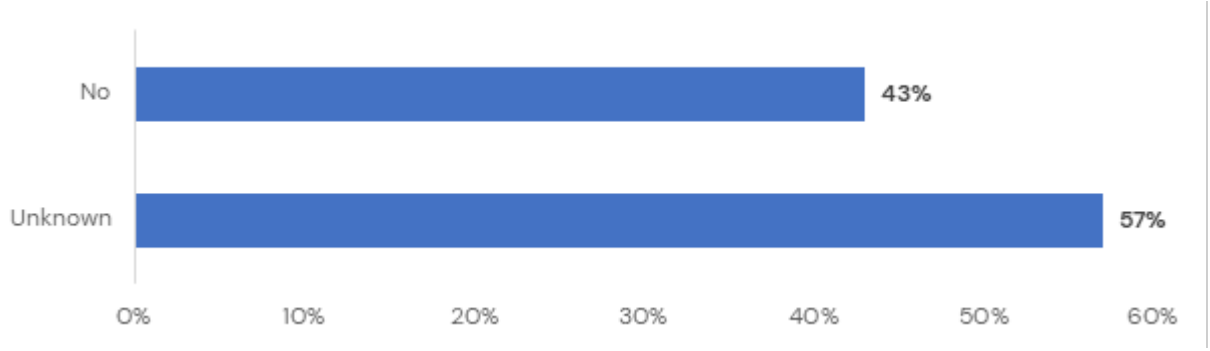

Figure 32: Has the government created a framework to categorize AI systems according to the level of risk they pose to human life?

The issue of existential risk associated with AI is also concerning. (63%) of respondents were unaware whether government AI strategies address AI as an existential risk, while (30%) said it does not, and only (7%) confirmed that it does. This lack of awareness and planning around the potentially catastrophic risks of advanced AI systems, such as an advanced AI system gaining control of weaponry or critical infrastructure, highlights a significant oversight in safeguarding against severe consequences of AI development. Addressing these existential risks is crucial to ensuring that the development and deployment of AI technologies do not inadvertently lead to harmful or disastrous outcomes.

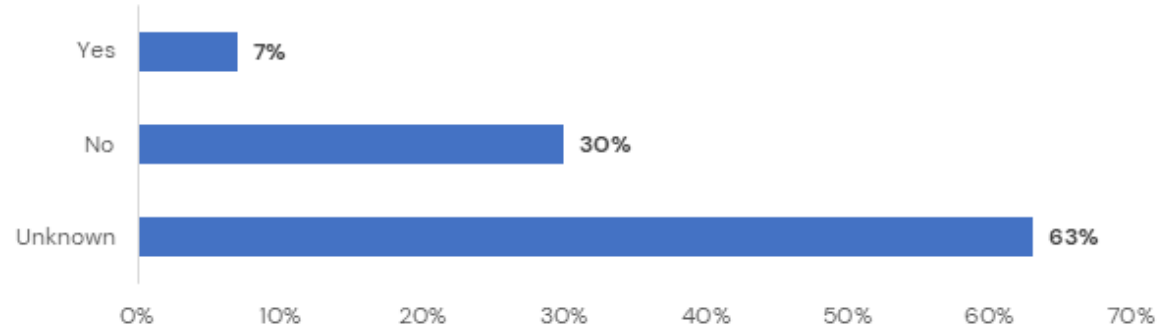

Figure 33: Do any official government AI strategies, research, documents, or frameworks refer to AI as an existential risk?

The implementation of algorithmic impact assessments is alarmingly limited. Most respondents (57%) were unaware of such assessments, (40%) indicated that they were not conducted, and only (3%) noted their existence in some departments. This significant shortfall in evaluating the societal and ethical impacts of AI systems poses a severe risk. In the context of AI-driven projects, the absence of rigorous impact assessments could lead to severe, potentially life-threatening outcomes due to incorrect AI-driven decisions. These gaps not only compromise safety but also highlight the urgent need for comprehensive safety measures and oversight in AI systems.

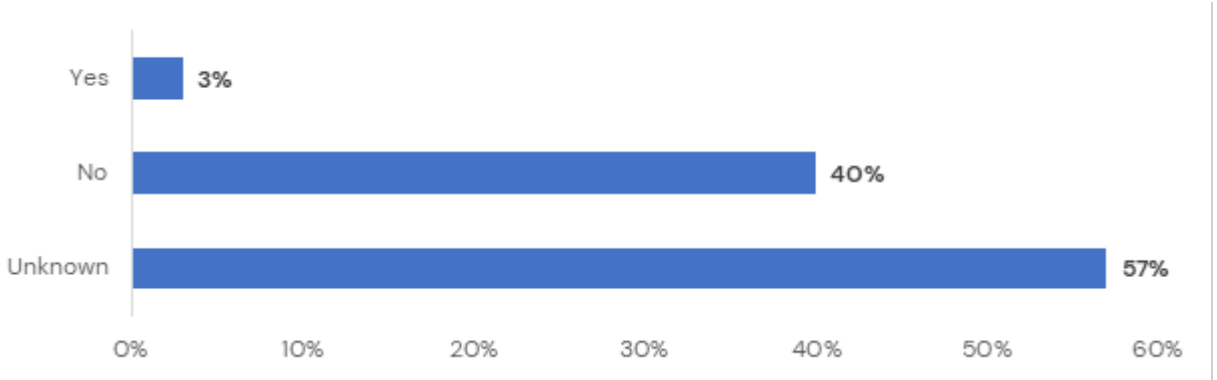

Figure 34: Has the government created any algorithmic impact assessment?

Additionally, there is a noticeable lack of government training programmes dedicated to AI safety and ethics. Most government officials are either unaware of the existence of such training or have confirmed that it does not exist. This gap in comprehensive training is significant, as educating stakeholders on AI safety is crucial for promoting a culture of ethical AI development. Furthermore, financial support for AI safety research is also inadequate. Many are unaware of government funding for AI safety research, and some stated that no such support is provided. This lack of investment in safety research highlights a need for increased funding to develop robust safety measures and ensure that AI technologies are both safe and beneficial.

Insights from KIIs further underscore and expand on these concerns. They emphasized the multifaceted nature of AI safety, highlighting the need to address potential biases in AI systems

through proper data training and the implementation of robust data privacy measures. KIIs also stressed the socioeconomic dimensions of AI Safety, in particular the importance of reskilling workers to mitigate job displacement risks. Additionally, they identified insufficient policies and infrastructure as significant challenges affecting overall AI safety in Bhutan. These insights underscore the need for a comprehensive approach to AI safety that encompasses technical, ethical, and societal considerations, including developing risk categorization frameworks, addressing existential risks, implementing algorithmic impact assessments, standardizing data protection measures, establishing training programmes, and increasing financial support for safety research.

3.3.4 Inclusivity

AI, like other transformational technologies, should advance the inclusion of underrepresented populations and reduce economic, social, gender, and other inequalities. This principle should be integrated into the design of AI systems, policies, and service frameworks.

Inclusivity in ethical AI involves designing and implementing AI systems that account for the diverse needs, perspectives, and contexts of all stakeholders to prevent biases and promote equitable access and benefits. The current AI readiness phase for inclusivity is Systematic.

The analysis of inclusivity in AI reveals several critical areas where improvements are needed. Half of respondents (50%) noted that the government is making efforts to promote equitable access through ICT infrastructure, such as providing PCs and laptops to rural schools. However, this support may not fully address diverse needs such as offering training programmes tailored to different educational backgrounds. In line with this, KII findings support the importance of public involvement and stakeholder consultation in ensuring AI solutions address diverse needs and are implemented fairly.

A significant communication gap exists regarding the availability of AI resources for non-private sector researchers. (60%) of respondents were unaware of any initiatives to facilitate or subsidize resources like cloud computing clusters, which are crucial for fostering innovation in academic and not-for-profit sectors. This gap was highlighted by KII insights, which underscored the need for increased transparency and communication about the availability of such resources to support inclusivity in AI research.

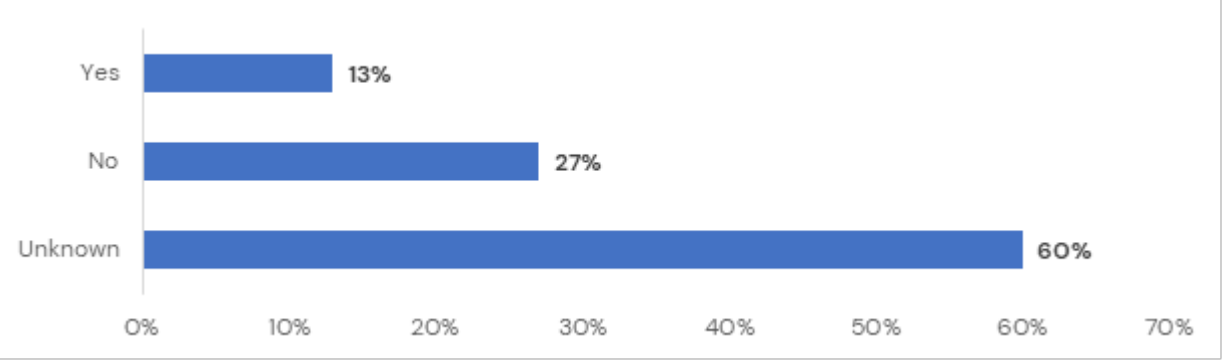

Figure 35: Does the government have any initiatives to facilitate or subsidize access to AI responses such as cloud and computing clusters for researchers working outside the private sector, in either academia or the not-for-profit sector?

Stakeholder engagement in AI and data ethics is currently insufficient, with (62%) of respondents indicating that the government has not engaged adequately with stakeholders. The absence of meaningful stakeholder engagement reflects a critical need for more inclusive policy-making processes. This point was further reinforced from the KIIs, which stressed the importance of inclusive data practices, and raised concerns about AI potentially exacerbating inequalities, particularly for underrepresented populations.

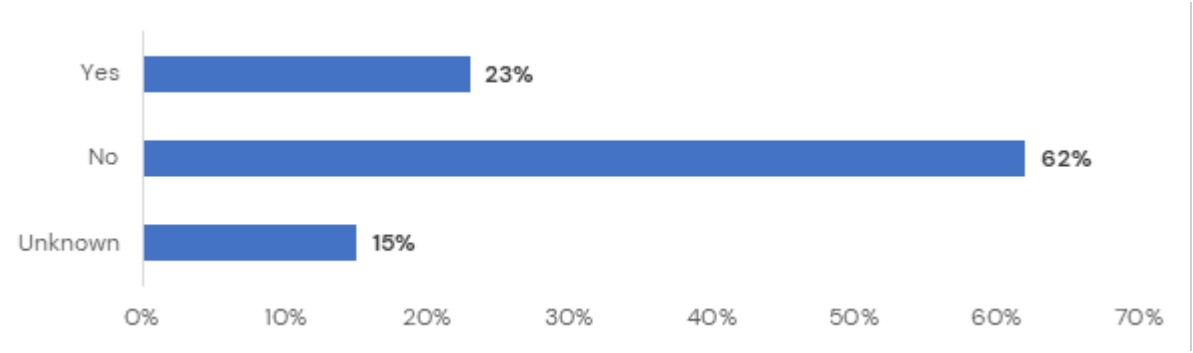

Figure 36: Has the government engaged with various stakeholders on the topic of AI or data ethics and how frequently does the engagement take place?

The lack of public consultations on new AI or data policies further underscores the need for a more inclusive approach to policy development. The absence of these consultations indicates a significant gap in reflecting the needs and concerns of all community members. KII findings support this, highlighting that improved stakeholder engagement and public involvement are essential for developing policies that are truly representative and inclusive.

Regarding ethical AI and gender equity, (57%) of respondents were unaware of any advocacy efforts, and (30%) reported no such initiatives. This suggests a lack of visibility and proactive measures to promote gender equity within AI systems. The KII findings align with this, as some government officials pointed out the need for AI models to be adapted to local contexts. This adaptation is crucial not only for ensuring cultural relevance but also for addressing specific issues such as gender bias. By incorporating gender equity into AI models, we can promote

fairness and inclusivity, ensuring that AI systems do not perpetuate existing biases or create new forms of discrimination.

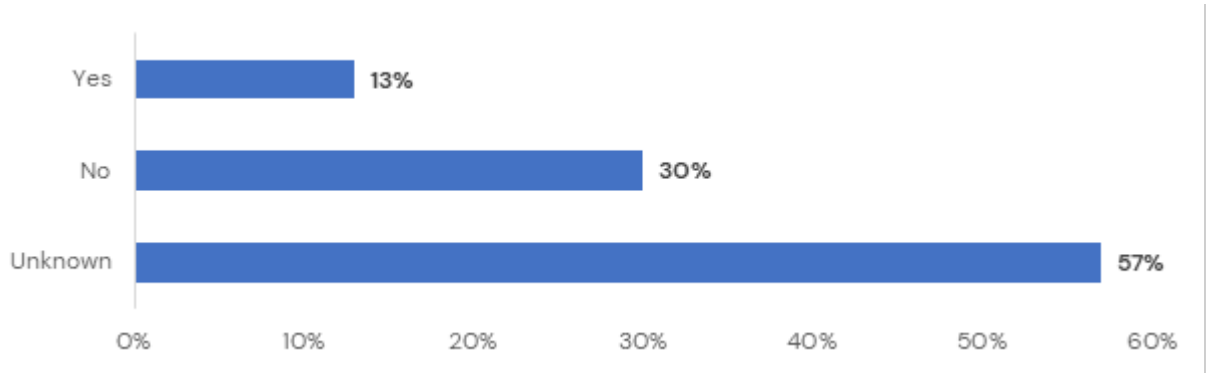

Figure 37: Does the government encourage raising ethical concerns and advocate for gender equitable AI?

In terms of making datasets more representative, (57%) of respondents were unaware of policies aimed at this goal, with (23%) indicating no such policies exist, and only (10%) confirming their presence. This highlights the need for clearer communication and comprehensive policies to ensure datasets are inclusive. KIIs insights further emphasized that inclusive data practices and transparency are crucial for addressing this gap.

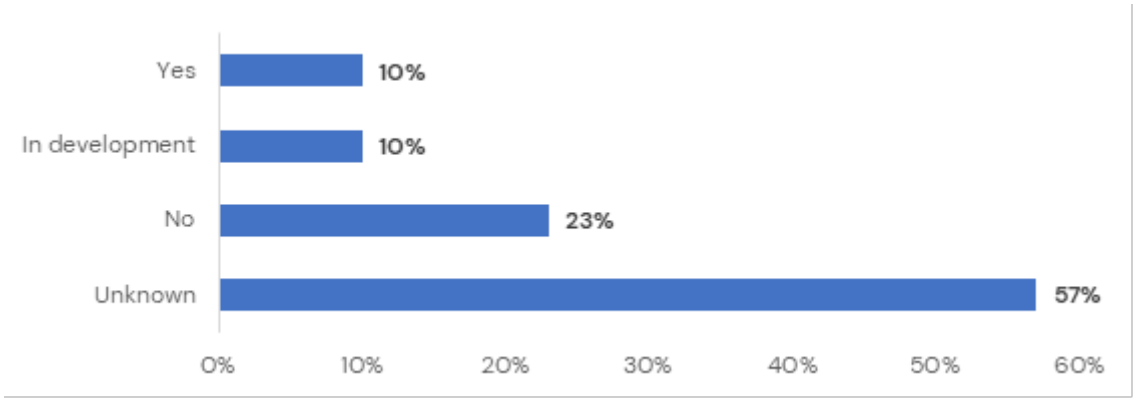

Figure 38: Does the government have any policies, initiatives or guidelines that aim at making datasets more representative of the population?

The overall analysis underscores the critical need for a holistic approach to Ethical AI in Bhutan, emphasizing the importance of integrating inclusivity into the development and implementation of AI technologies. By addressing these interconnected dimensions, Bhutan can foster an equitable and responsible AI ecosystem that not only mitigates risks but also maximizes the benefits for all segments of society.

Strategic Recommendations

Pillar 1 Government as an Enabler

1. Innovation

Goals	Recommendations/Intervention	Global Good Practices	Implementing Partner	Priority
Strengthen government support for innovation and position Bhutan as a proactive AI ecosystem enabler by creating a supportive environment with financial incentives that accelerates AI innovation, attracts talent, and fosters a collaborative ecosystem.	**Comprehensive AI innovation funding initiative for Bhutan** Explore a diversity of funding instruments and incentives for agencies, institutions, and individuals engaged in AI research and development, including innovation funds, innovation awards, interest free loans, tax incentives, open innovation challenges, and dedicated AI accelerator programmes.	**EU: Digital Europe Programme** • The EU Digital Europe Programme strengthens digital capacities by funding AI projects, supporting large-scale initiatives, and hosting open innovation challenges to tackle societal and economic issues. ***Source***: *European Commission - Digital Europe Programme* **United States: National AI Initiative** The U.S. government has established the National AI Initiative that promotes AI research, development, and deployment through various funding programmes. ***Source:*** *National AI Initiative Office*	MoF, DHI	Medium

		Singapore: AI Singapore (AISG) AI Singapore is a national programme aimed at enhancing AI capabilities and adoption in Singapore through Innovation funds and AI Accelerator Programmes. ***Source:*** *AI Singapore*		
Empower Bhutanese tech companies, startups, and innovators with knowledge, skills, government support, and innovation to rapidly develop AI products for global markets, thereby accelerating Bhutan's AI readiness and technological advancement.	**Encourage a global-first mentality in AI innovation.** Implement incentives for tech companies to develop products that address both Bhutanese and global needs. Leverage Bhutan's unique national strengths in ecological preservation, cultural heritage, and geographical isolation to develop novel AI use-cases and products with international appeal. As an initial step, it is recommended that the government can facilitate capacity-building workshops for technology entrepreneurs to highlight global opportunities and demonstrate how they can capitalize on Bhutan's distinctive attributes and offerings. This approach aims to position Bhutanese innovators at the forefront of niche and emerging AI markets while also contributing to national technological and development goals.	**United Arab Emirates: UAE Strategy for Artificial Intelligence** **Global-First Mentality**: Supporting AI innovation with international funding and market focus. **Capacity-Building Workshops**: Hosting events like AI Everything to connect local entrepreneurs with global opportunities. ***Source:*** UAE AI Strategy **Canada: Pan-Canadian AI Strategy** **Global-First Mentality**: Supporting AI firms to expand globally with funding and international collaboration through Canadian Institute for Advanced	GovTech Agency, DHI	Medium

		Research (CIFAR) and Global Innovation Clusters. **Capacity-Building Workshops**: Providing workshops and accelerators to help tech entrepreneurs navigate global markets and showcase Canadian innovations. ***Source:*** CIFAR - Pan-Canadian AI Strategy **South Korea: National AI Strategy** **Global-First Mentality**: Supporting companies with AI solutions for international markets and encouraging global collaboration. **Capacity-Building Workshops**: Providing education and resources to entrepreneurs on global AI ***Source:*** Korean Ministry of Science and ICT		

2. Data

Goals	Recommendations/Intervention	Global Good Practices	Implementing Partner	Priority
Improve data consistency and interoperability across government agencies, while raising awareness and enforcing standards to enhance data reliability and usability.	**Enhance cross-agency data consistency and interoperability.** Review, harmonize, and reconcile existing data standards across government agencies. It is recommended that this be followed with a comprehensive awareness campaign to educate agencies and the public about these standardized data practices. Implement strict enforcement measures to ensure adherence to these standards, promoting data portability and consistency throughout the government ecosystem.	**European Union: General Data Protection Regulation (GDPR) and AI Act** • **Harmonizing Data Standards:** The GDPR sets a harmonized framework for data protection and privacy across EU member states, impacting how data is handled for AI applications. • **Raising Awareness and Enforcement:** The European Data Protection Board (EDPB) and national data protection authorities actively raise awareness and enforce GDPR compliance. ***Source:*** European Commission - GDPR and European Commission - AI Act **Singapore: AI Governance Framework** • **Harmonizing Data Standards:** Singapore's AI Governance Framework outlines principles for data management and use in AI.	NSB and GovTech Agency	High

		• **Raising Awareness and Enforcement:** The Infocom Media Development Authority (IMDA) raises awareness through guidelines, workshops, and certification programmes. *Source*: Singapore IMDA - AI Governance **South Korea: AI National Strategy** • **Harmonizing Data Standards:** South Korea's AI National Strategy includes efforts to standardize data practices across different sectors to ensure data portability and consistency. • **Raising Awareness and Enforcement:** The government engages in public-private partnerships and educational campaigns to raise awareness of data standards. *Source*: Korean Ministry of Science and ICT - AI Strategy		
Improve data accessibility and integration across government agencies to	**Implement a centralized government data portal.** Develop and launch a unified data portal to serve as a central repository for all data. This portal should	**United States:** AI.gov • AI.gov is the United States' portal for AI initiatives, providing access to federal AI resources, datasets, and	NSB and GovTech Agency	High

reduce data silos and establish a foundation for Bhutan's AI ecosystem.	enable various agencies to access and utilize data for operational needs, while providing controlled public access to the portal for research, reporting, and educational purposes. Implement robust security measures to protect sensitive data. This centralized approach will enhance data availability, promote greater cross-agency collaboration, and support the growth of AI-driven solutions for Bhutan's public and private sector.	information. It includes data related to AI research and development efforts by various government agencies. *Source:* data.gov.sg and AI.gov **European Union: AI4EU** • AI4EU is the European Union's AI-on-demand platform, offering access to AI resources, tools, and datasets from various EU projects and initiatives. It aims to support AI research, development, and innovation across member states. *Source:* AI4EU **Singapore: AI Singapore** • AI Singapore is a national programme that brings together government agencies, research institutions, and industries to advance AI research and deployment. The portal provides access to AI datasets, research, and tools. *Source:* AI Singapore		

3. Infrastructure

Goals	Recommendations/Intervention	Global Good Practices	Implementing Partner	Priority
Improve internet bandwidth and affordability to ensure broader access to high-speed internet, crucial for AI development and deployment across Bhutan.	**Multi-stakeholder collaboration to boost internet bandwidth and affordability.** Initiate and support joint initiatives between government, telecom companies, and other critical stakeholders to improve internet infrastructure. This collaborative effort should focus on expanding high-speed internet coverage across all Dzongkhags, reducing costs to ensure more equitable access, and upgrading existing network infrastructure to support AI-driven technologies.	**India: BharatNet** • **Description:** BharatNet is a government initiative aimed at providing high-speed internet access to rural and underserved areas across India. Enhanced internet infrastructure supports AI readiness by improving connectivity. • **Partners:** Indian government, telecommunications providers. *Source:* BharatNet **Japan: 5G Rollout and International Connectivity** • **Description:** Japan has been actively working on expanding 5G networks and enhancing international internet connectivity. These efforts support AI development by improving data speeds and reducing latency.	GovTech Agency and Telecom Companies (Bhutan Telecom and Tashi Cell)	Medium

		• **Partners:** Japanese government, telecom operators. ***Source:*** Ministry of Internal Affairs and Communications - 5G **Australia: National Broadband Network (NBN)** • **Description:** The NBN is a government-led initiative to provide high-speed broadband access across Australia. By improving internet infrastructure, the NBN supports AI research and innovation by enhancing data connectivity and access. • **Partners:** Australian government, telecommunications companies. ***Source:*** NBN Co		

4. Skills

Goals	Recommendations/Intervention	Global Good Practices	Implementing Partner	Priority
Foster innovation and job creation in the AI sector to drive greater interest and investment in AI ventures, leading to higher enrollment in STEM courses and building a skilled workforce for future AI advancements and ecosystem development in Bhutan.	**Implement policies to boost AI entrepreneurship and STEM enrollment.** Develop and implement policies and initiatives to drive AI entrepreneurship and business growth. Initiative can include mentorship programmes, targeted campaigns to promote STEM education and careers. This will create employment opportunities and in turn encourage more students to enroll in STEM courses.	European Union: Horizon Europe • **Description:** Horizon Europe is the EU's research and innovation programme that funds AI research and entrepreneurship. It provides grants and support to AI startups and projects, fostering job creation and promoting STEM education among students. ***Source:*** Horizon Europe **Singapore: AI Singapore** • **Description:** AI Singapore is a national programme to boost AI capabilities by providing funding and support to AI startups and research. The programme also includes initiatives to train students and professionals in AI, creating employment opportunities and encouraging STEM education. ***Source:*** AI Singapore	MoICE, GovTech Agency	High

		Canada: Pan-Canadian Artificial Intelligence Strategy • **Description:** This strategy aims to establish Canada as a global leader in AI by funding AI research institutes, supporting AI startups, and developing a skilled AI workforce. These efforts have led to job creation in the AI sector and greater interest in STEM education. ***Source:*** Pan-Canadian Artificial Intelligence Strategy		
Enhance AI readiness by building a stronger skills base, enriching academic programs, and cultivating a more innovative and competitive AI ecosystem in Bhutan.	**Attract AI talent and businesses through strategic incentives and partnerships.** Develop comprehensive policies to attract individuals and businesses with AI expertise to Bhutan. The government should offer attractive incentives to large AI companies to establish offices in Bhutan, facilitating knowledge transfer and training in AI. Encourage engineering and technological institutions to proactively seek international partners for collaboration in both academia and industry. This approach will facilitate knowledge transfer, improve local training opportunities, and encourage	**Canada: Global Skills Strategy and Pan-Canadian AI Strategy** • **Description:** Canada's Global Skills Strategy, along with the Pan-Canadian AI Strategy, provides fast-track visas and other incentives to attract skilled AI professionals and businesses. The strategy includes collaboration with AI institutes like the Vector Institute, MILA, and Amii, which partner with major AI companies to facilitate knowledge transfer and training.	GovTech Agency, MoICE	High

	collaboration between international and local institutions. By enriching curricula and exposing students and faculty to the latest trends in research and development, Bhutan can create a more dynamic AI ecosystem that supports innovation and global competitiveness.	***Source:*** Global Skills Strategy and Pan-Canadian AI Strategy **United Arab Emirates: National AI Strategy 2031** • **Description:** The UAE's National AI Strategy 2031 focuses on positioning the UAE as a global leader in AI. The strategy includes incentives for AI businesses to set up in the UAE, partnerships with international AI companies, and initiatives for AI education and training. The government collaborates with various sectors to promote AI development and talent acquisition. • **Impact:** Increased AI business activity and talent development in the UAE. ***Source:*** UAE National AI Strategy **Singapore: AI Singapore** • **Description:** AI Singapore is a national programme designed to boost the country's AI capabilities. It includes collaboration with local and		

		international AI companies and research institutions, offering grants and incentives to attract AI businesses and talent. The initiative focuses on developing AI skills through training programmes and industry partnerships. *Source:* AI Singapore		

Pillar 2 Government as a User

1. Vision

Goals	Recommendations	Global Good Practices	Implementing partner	Priority
Ensure a unified vision of using AI to transform public services delivery, foster cross-sectoral collaboration for new areas of growth, and enhance public engagement in AI initiatives in Bhutan.	**Develop a national AI Strategy for Bhutan** Create a national AI strategy that aligns with Bhutan's broader development plans, employing a multi-sectoral approach to craft a holistic and inclusive vision for AI adoption and innovation prioritizing ethical AI frameworks.	**United Kingdom:** AI Sector Deal is part of its broader Industrial Strategy. It aims to boost AI research and development, support AI startups, and ensure ethical AI deployment. *Source:* UK AI Sector Deal **Rwanda: Rwanda's national AI strategy** is part of its broader vision to become a leading digital hub in Africa, aiming to harness AI to address	GovTech Agency	High

		national challenges such as healthcare, agriculture, education. ***Source:*** National AI Strategy for Rwanda		
Secure sustainable funding and resources to ensure the successful implementation and long-term viability of Bhutan's National AI Strategy.	**Establish dedicated funding mechanisms for AI development.** Explore diverse funding sources - such as government allocations, public/private partnerships, and international grants/revenue-generating programmes for long term viability and maintaining momentum on national AI strategy.		GovTech Agency and MoF	High
Enhance public awareness and engagement to foster AI understanding while building trust and support for AI initiatives.	**Launch comprehensive AI awareness and engagement campaign.** Develop and implement public awareness and engagement campaigns, including public consultations and workshops, to promote a well-informed population that can more actively engage in and support Bhutan's AI journey.		GovTech Agency	Medium

2. Technology

Goals	Recommendations	Global Good Practices	Implementing partner	Priority
Strengthen Bhutan's digital infrastructure by exploring adoption of AI and other emerging technologies to foster innovation and enhance government operations.	**Invest in advanced digital infrastructure and innovation labs.** Encourage the exploration and adoption of emerging technologies such as AI, blockchain, and the Internet of Things (IoT) within government operations. This includes pilot projects and innovation labs for new technologies to provide valuable insights before broader implementation.	**Republic of Korea:** K-City Network was launched to develop smart cities using advanced digital infrastructure. This initiative includes the integration of 5G, IoT, AI, and big data technologies into urban planning to improve traffic management, energy efficiency, and public safety. ***Source:*** K-City Network	GovTech Agency DHI, MoF	High
Enhance cybersecurity measures.	**Strengthen cybersecurity framework.** Strengthen cybersecurity frameworks to protect sensitive government data and AI systems from cyber threats. This includes implementing robust encryption, access controls, and regular security audits.	**United Kingdom:** Technology Code of Practice and Service Standard Assessments was implemented as a structured approach to technology audits and regular service standard assessments. This framework ensures that digital services across government agencies are continuously reviewed, aligned with best practices, and optimized for performance, security, and user experience. ***Source:*** GDS Technology Code of Practice	GovTech Agency and NSB	High

Equip civil servants with the knowledge and tools to incorporate ethical standards in AI procurement to promote responsible and transparent AI adoption within government operations.	**Implement targeted training on AI procurement for government officials.** Develop and conduct a series of focused workshops for civil servants involved in AI procurement. These sessions should cover the importance of ethical considerations in AI procurement processes and provide practical guidance on evaluating tenders against established ethical guidelines. Training should emphasize key areas such as fairness in AI algorithms, transparency of AI decision-making processes, data privacy protection, and other areas. It is recommended that workshops are regularly updated to keep pace with rapid developments in AI technology and ethics.	**Canada:** Public Services and Procurement Canada has organized workshops and training on ethical procurement practices, including for AI technologies. These initiatives are aimed at improving standards and ensuring ethical considerations are integrated into procurement processes. ***Source:*** Public Services and Procurement Canada	GovTech Agency, and MoF	High

3. Skills

Goals	Recommendations	Global Good Practices	Implementing partner	Priority
Identify and address skill gaps in AI across the government by conducting a comprehensive AI skill needs assessment.	**AI skills need assessment.** Using global best practices, conduct an AI skill needs assessment across the government to identify skill gaps to ensure that the civil servants are equipped with the necessary competencies to effectively implement and manage AI technologies.	**Singapore - Smart Nation Initiative** included AI skills needs assessment to identify gaps in the public sector workforce. This led to the implementation of training programmes and partnerships with educational institutions to build AI competencies among civil servants and improve the delivery of smart services. ***Source:*** Smart Nation Singapore	GovTech Agency	High
Strengthen AI capabilities within the government by offering tailored training programs for civil servants.	**Provide AI training for capacity building and skills enhancement.** Provide tailored AI training for the civil servants, available both online and in-person, with clear and measurable outcomes. Allocate dedicated learning time during working hours to ensure effective skill development.	**Rwanda: Rwanda Innovation Fund** was set up by the government of Rwanda, in partnership with UNDP, to support technological innovation, including AI. focusing on building local capacity and enhancing skills in AI through various training and development programmes. ***Source:*** Rwanda Innovation Fund	GovTech Agency and RCSC	High
Ensure system user manuals and playbooks are easily accessible and understandable, with	**Enhanced accessibility to user manuals and playbooks.**	**Microsoft:** Learn Platform offers comprehensive manuals, interactive tutorials, and videos for various Microsoft applications and services. ***Source:*** Microsoft Learn	GovTech Agency	Medium

multimedia tutorials to support effective learning.	Raise awareness about system user manuals and playbooks, ensuring they are easy to find and understand. Consider creating multimedia tutorials to facilitate learning.			

4. Data

Goals	Recommendations	Global Good Practices	Implementing partner	Priority
Enhance data quality, security, and interoperability by implementing a comprehensive data governance framework.	**Develop data governance framework.** Develop and implement the data governance framework to enhance data quality, security and interoperability. The framework should establish stringent standards and guidelines for metadata, data formats, data documentation processes throughout the entire data management lifecycle to ensure seamless data integration and usage.	**Australia – National Data Sharing and Integration Plan** establishes standards for data management, including interoperability, metadata, and documentation practices. ***Source:*** National Data Sharing and Integration Plan	NSB, GovTech Agency	High
Create a data sharing policy to improve data access and utilization for both government and non-government agencies.	**Data sharing policy** Formulate a comprehensive data sharing policy or guideline aimed at improving data availability and utilization to improve public service delivery, enhance decision-making processes, optimize planning, and advance research and innovation efforts.	**Singapore:** Their open data platform offers access to a broad range of government datasets, cultivating a culture of transparency and innovation for academic research and public use. ***Source:*** Singapore's Open Data Portal	NSB, and other government agencies	High

Ensure all agencies and the public are aware of and comply with existing data standards to enhance consistency across digital public services.	**Increased awareness of existing data standards** Raising awareness of the data standards among the different agencies and the public, and strictly enforcing their compliance across the existing digital public services delivery to promote data consistency		NSB, and GovTech Agency	High
Review and improve data quality within government systems and initiate data annotation to boost its usefulness for future projects.	**Data quality and annotation review** Conduct a comprehensive review of existing systems and their data within government agencies to assess quality and usability. Begin annotating data where possible to enhance its utility for future projects.	**Australia:** The **National Data Asset Framework** enhances data quality and annotation across government agencies, focusing on usability and integration for future projects. ***Source:*** https://ardc.edu.au/programme/national-data-assets/	NSB and GovTech Agency	High

Pillar 3 Ethical AI

1. Accountability

Goals	Recommendations/ Intervention	Global Good Practices	Implementing Partner	Priority
To stay updated on the latest developments in AI ethics.	Engage with AI ethics experts and organizations to ensure that AI policies are informed by current ethical standards and practices and stay updated on the latest developments in AI ethics.	**United Kingdom** - The UK government's **AI Council**, composed of top AI experts, academics, and industry leaders, provides guidance on AI ethics and governance. ***Source:*** AI Council **United States** – The **National Institute of Standards and Technology (NIST)** collaborates with AI ethics experts and stakeholders to develop and regularly update frameworks and guidelines for trustworthy AI. ***Source:*** NIST	GovTech Agency, OAG and international experts	Medium
To raise public awareness of AI's impact and promote accountability.	Raise public awareness of AI's impact and promote accountability: Raise awareness among citizens about AI's impact on their lives and the importance of holding AI systems accountable.	**European Union** – **AI4People** initiative fosters a European dialogue on the ethical and social impacts of AI through public consultations, educational campaigns, and discussions. ***Source:*** AI4People Institute	GovTech Agency	Medium

		United Kingdom – The **Alan Turing Institute's** public engagement activities include lectures, workshops, and educational resources to raise awareness of AI's societal impact and promote transparency and accountability in AI applications. ***Source:*** The Alan Turing Institute		
To create AI ethics policies that reflect Bhutanese cultural values and contribute to global AI ethics discourse.	Research and publish studies on legal issues surrounding AI systems, providing a foundation for enacting AI-related laws.	**European Union – High-Level Expert Group on AI** developed the "Ethics Guidelines for Trustworthy AI" and a comprehensive report on AI regulation. Their recommendations have shaped EU AI policies and regulations, laying the groundwork for laws addressing ethical and legal issues in AI. ***Source:*** High-level Expert Group on AI; European AI Alliance **Australia – Australian Law Reform Commission (ALRC) AI looks at inquiries into** AI legal issues—such as liability, privacy, and ethics—aimed to recommend legal reforms for AI challenges. Its findings have influenced	GovTech Agency, and OAG	Medium

		Australian legal reforms and shaped policies addressing AI's legal complexities. ***Source:*** ALRC		

2. Transparency

Goals	Recommendations/Intervention	Global Good Practices	Implementing Partner	Priority
To maintain transparency and accountability of AI systems in public use.	Systematically document and maintain a list of all governmental and public AI systems, including deployment details, risks, and performance reports.	**New York City, U.S.A.** – The **Automated Decision Systems** task force reviews and documents AI and algorithmic systems used by city agencies, detailing their uses, risks, and governance practices. ***Source:*** ADS Report 2019 **European Union** – The European Commission's **AI Watch** monitors AI development, uptake, and impact in Europe, including development, usage and impact of AI across the public administration sector in all EU member states. ***Source:*** AI Watch, European Commission's Joint Research Centre	GovTech Agency	Medium

3. Safety

Goals	Recommendations/Intervention	Global Good Practices	Implementing Partner	Priority
To enhance digital literacy with a focus on AI ethics and safety.	Integrate AI safety and ethics modules into the GovTech Agency's digital literacy programme for civil servants and the public.	**Finland** –The Finnish government, in partnership with the University of Helsinki and Reaktor, launched the free "**Elements of AI**" course to educate the public on AI, including safety and ethics modules. With over 750,000 global participants, the course has significantly raised AI awareness and understanding and is praised for its comprehensive approach to AI ethics and safety. ***Source:*** Elements of AI **Singapore** – Supported by the InfoComm Media Development Authority, the Singapore Computer Society developed the **AI Ethics & Governance Body of Knowledge**, offering training on AI ethics, safety, and governance. ***Source:*** AI Ethics & Governance	GovTech Agency	High
To equip students with foundational	Introduce AI safety and ethics into education curricula at secondary and post-secondary levels.	**United Kingdom** – The UK has integrated AI and ethics modules into the secondary school curriculum to boost digital literacy, provide	Ministry of Education and Skills	Medium

understanding of AI ethics and safety.		students with a foundational understanding of AI ethics and safety protocols, and prepare them for the future workforce. ***Source:*** AI in education **Finland** – The Finnish National Agency for Education (EDUFI) has introduced AI and ethics education in secondary schools, with teachers trained to deliver these modules effectively. ***Source:*** Finnish National Agency for Education	Development, GovTech Agency, RUB, JSW, Khesar Gyalpo University of Medical Sciences of Bhutan	
To ensure AI systems are appropriately classified and managed according to their potential risk.	Adapt and enhance international best practices for categorizing AI systems based on the risks they pose.	**OECD** – The OECD's **AI principles** provide guidelines for categorizing AI systems based on risk, emphasizing transparency, accountability, and risk management, and is widely adopted by member countries and organizations. ***Source:*** OECD's AI Principles **European Union** – The EU's **AI Act** provides a comprehensive framework for categorizing AI systems by risk to ensure regulation based on the potential impact on fundamental rights and safety. ***Source:*** EU's AI Regulatory Framework	GovTech Agency	Low

4. Inclusivity

Goals	Recommendations/Intervention	Global Good Practices	Implementing Partner	Priority
To ensure AI systems are developed and deployed with input from diverse stakeholders.	Conduct consultations with the public and relevant stakeholders during the planning process of developing and deploying public AI systems.	**Singapore** - Their **Personal Data Protection Commission (PDPC)** held **public consultations on the Model AI Governance Framework**, gathering input from industry, academia, and the public, and serves as a model for other countries to develop a balanced and effective AI governance system. ***Source:*** Public Consultation for the Proposed Advisory Guidelines on Use of Personal Data in AI Recommendation and Decision Systems **Australia** – Their **AI Ethics Framework Consultation** included industry experts, academics, and community representatives on the AI Ethics Framework to develop a comprehensive framework addressing diverse ethical and practical concerns. ***Source:*** Australia's AI Ethics Framework	GovTech Agency	Medium

To prevent bias in AI systems before they are deployed in the public sector.	Ensure datasets used for training AI systems are representative of the population.	**Google** – Their **inclusive and representative AI research** has developed methods to ensure diverse population reflection, reduce bias in AI training, and enhance AI fairness. ***Source:*** Google's Responsible AI **International Business Machine (IBM)**- IBM's **AI Fairness 360 toolkit** provides techniques to ensure representative and unbiased AI training datasets. Applied in projects across healthcare and finance, it has successfully identified and mitigated biases, leading to more equitable AI systems. ***Source:*** AI Fairness 360 toolkit	GovTech Agency	Medium

Annexure

Profile of survey respondents

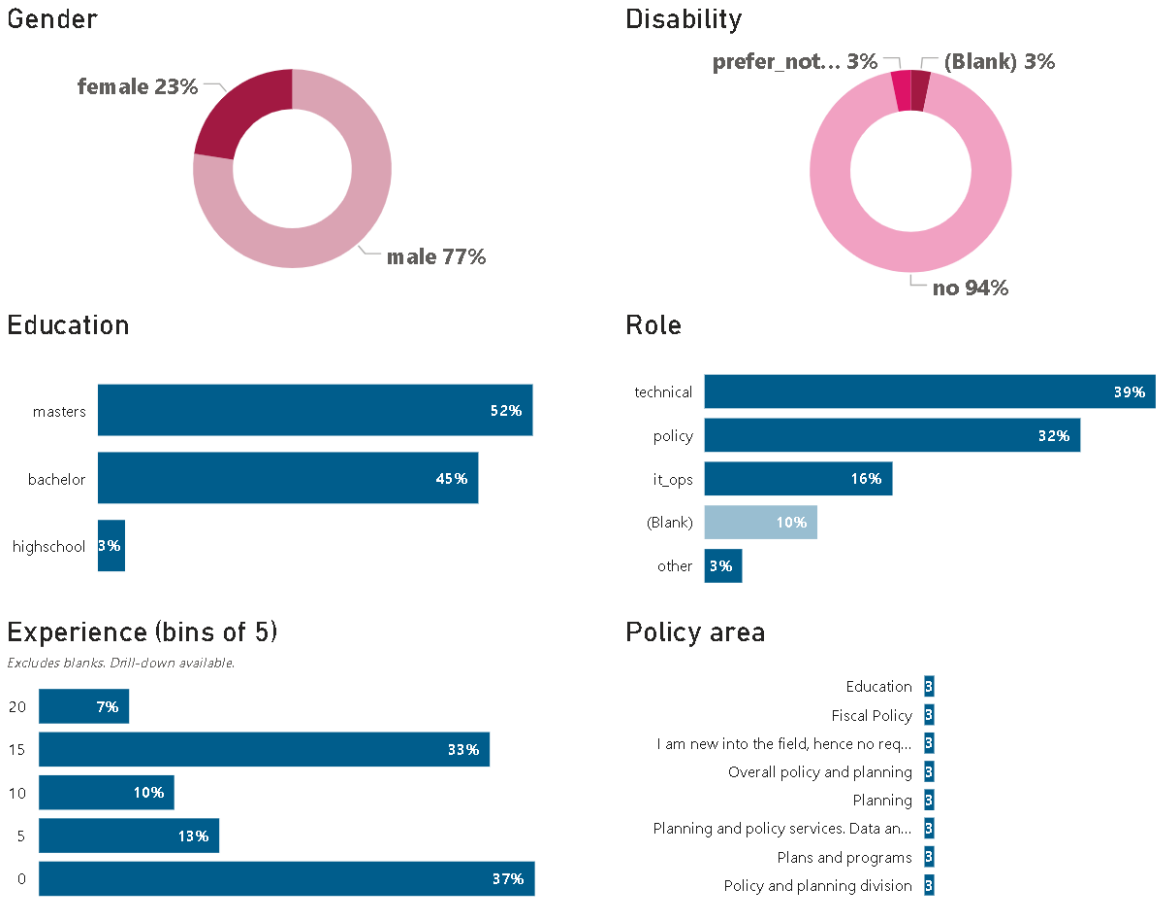

Figure 39: Survey Demographics


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