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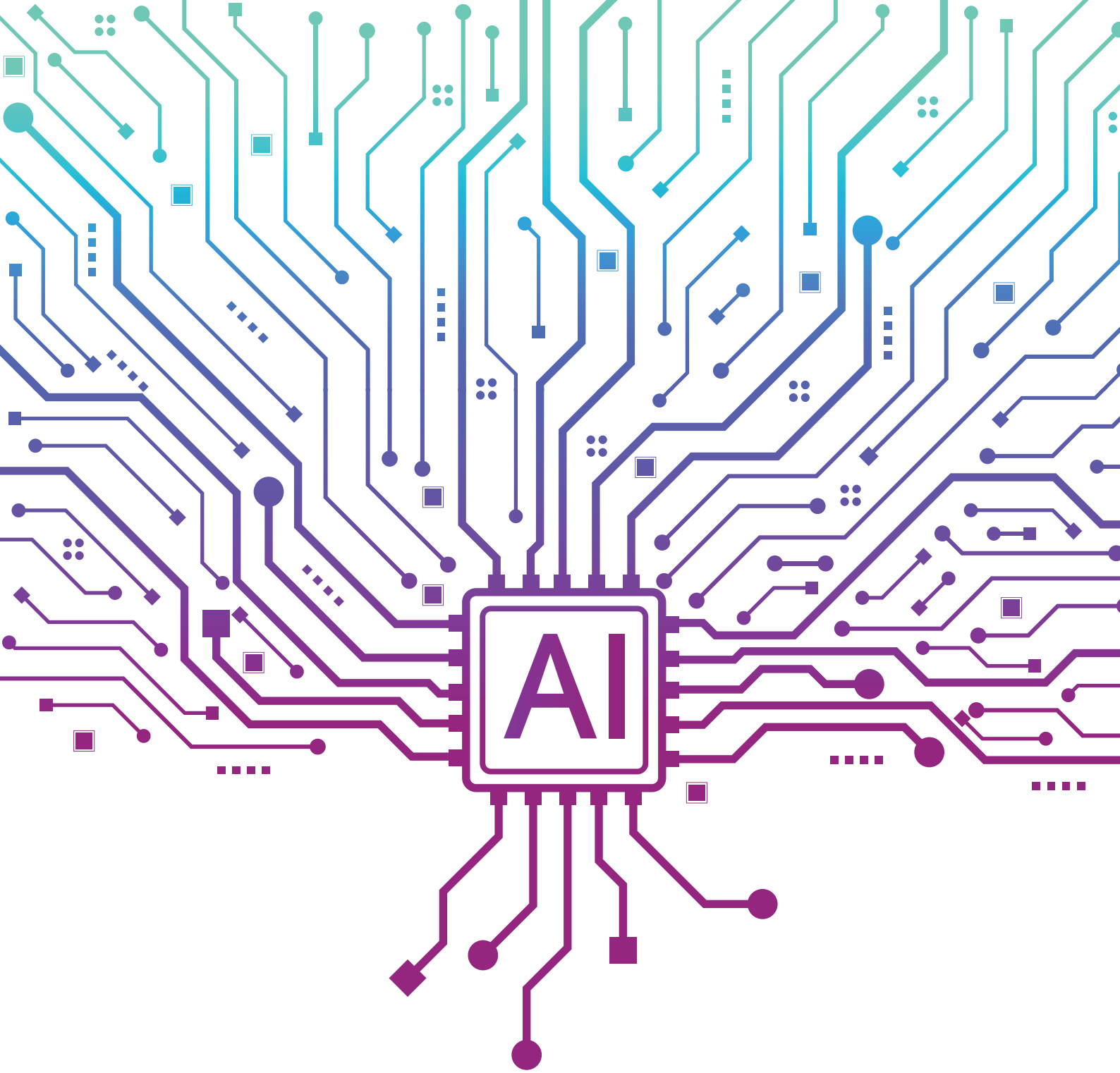
Empowering Public Sector Leadership:

A Competency Framework for AI Integration in India

Draft Report



Report

Empowering Public Sector Leadership:

A Competency Framework for AI Integration in India

Ministry of Electronics
and Information Technology

March, 2025

Artificial Intelligence (AI) is set to shape societies, economies, and security landscapes worldwide. AI has the potential to facilitate the delivery of a wide range of citizen-centric services across sectors.

In the words of Hon'ble Prime Minister Shri Narendra Modi ji, "India has a double AI advantage—Artificial Intelligence and Aspirational India."

India, through its active role in the Global Partnership on Artificial Intelligence, is working to leverage AI for inclusive and sustainable development, utilising global partnerships to accelerate progress on issues that matter most to developing countries.

The India AI Mission symbolises India's proactive and strategic vision for the responsible integration of AI. This mission aims to leverage AI to drive inclusive growth and improve governance, positioning India as a global leader in AI development and deployment.

This competency framework is designed to support the goals of the India AI Mission. This framework will empower public sector officials with the skills and knowledge required to navigate the AI landscape effectively.

It is my sincere hope that readers will find it a valuable resource for building AI competencies that will not only contribute to India's growth but also help shape the global AI discourse.

Shri Ashwini Vaishnaw
Minister for Railways, information and Broadcasting, Electronics & Information Technology, Government of India

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Artificial Intelligence is rapidly evolving as the driving force behind India's digital economy. AI is estimated to add USD 450–500 billion to India's GDP by 2025, and is central in shaping the future of the country's technological and economic landscape. As AI becomes a top priority in both policy agendas and industry, the Government of India has demonstrated a strong commitment to fostering a vibrant and inclusive AI ecosystem at both international and domestic fora.

India served as the lead chair of the Global Partnership on AI (GPAI) and has launched the ambitious IndiaAI Mission. These initiatives aim to create an environment that promotes AI-driven innovation, while also ensuring its ethical and responsible use. This competency framework for public sector leadership seeks to address the critical need for upskilling and reskilling, ensuring that government officials possess the behavioural, functional, and domain specific skills necessary for effective AI integration. The framework is designed to empower public officials to navigate the complexities of AI, addressing key concerns such as data privacy, cybersecurity, and the ethical implications of AI. It identifies key competencies across various levels of leadership, ensuring that public sector officials can successfully integrate AI in a manner that is ethical, inclusive, and aligned with India's broader vision of digital transformation.

Through this framework, India aims to not only harness the potential of AI but also build the capacity of its public sector to lead in AI governance, ensuring India remains at the forefront of responsible AI use. This Framework is a step towards equipping India's public sector leadership with the tools to drive AI's integration while safeguarding societal values and national interests, advancing the goals outlined in the IndiaAI Mission.

Shri Jitin Prasada
Minister of State, Commerce and industry, and Electronics and Information Technology, Government of India

Artificial Intelligence holds great potential in enabling India's digital and economic ambitions. The role of the public sector in shaping and regulating its growth is increasingly vital. The AI Competency Framework addresses the urgent need for equipping public officials with the skills necessary to effectively engage with AI technologies. This framework emphasises the development of behavioural, functional, and domain-specific competencies that are essential for policymakers, regulators, and government leaders to navigate the evolving AI landscape.

India's National Strategy on AI and the recently launched IndiaAI Mission have laid a strong foundation for AI-driven innovation, entrepreneurship, and the ethical use of AI, positioned to harness its benefit for positive societal impact. However, realising this vision requires public sector officials who are not only AI-literate but capable of overseeing AI's deployment with an eye on inclusivity, fairness, and security.

This framework is designed to fill existing skill gaps, particularly in understanding AI's technical aspects, managing its ethical implications, and aligning its use with India's developmental priorities. It also provides a foundation for capacity-building initiatives and career progression, ensuring that public sector officials can lead AI's integration across governance and public services effectively.

This Framework serves as a comprehensive guide to preparing public sector leadership for the challenges and opportunities presented by AI, ensuring that India continues to drive responsible and inclusive AI development.

Shri S. Krishnan
Secretary, Ministry of Electronics and Information Technology

Artificial Intelligence is rapidly transforming how governments worldwide deliver public services and develop policies, and India stands at the forefront of this shift. Through key initiatives like the India AI Mission and participation in the Global Partnership on Artificial Intelligence, India is building a comprehensive ecosystem that promotes AI innovation, fosters international cooperation, while ensuring ethical and responsible usage of AI technologies.

Empowering Public Sector Leadership: A Competency Framework for AI Integration in India, provides a roadmap to equip public sector officials with the necessary knowledge and skills to engage with AI technologies. This AI Competency Framework is designed to help officials understand AI's functionalities and limitations and develop the behavioural, functional, and domain-specific competencies needed for AI's integration into governance functions.

The framework is aligned with the objectives of the India AI Mission, which aims to democratise access to AI tools, enhance data quality, and foster AI innovation. It also complements India's involvement in GPAI, through which the country actively contributes to the global dialogue on AI's responsible development and deployment.

At its core, this framework highlights the importance of informed policymaking, identifying opportunities to enhance public service delivery through AI, and ensuring that AI systems are deployed ethically responsibly. The framework maps the AI lifecycle to the roles and responsibilities of public officials across departments and ministries to offer a tailored approach to addressing the specific needs of the public sector. It also helps identify skill gaps and supports targeted training initiatives, ensuring that public officials are prepared to lead AI's integration responsibly.

As India continues to position itself as a global leader in AI, this competency framework will be instrumental in empowering public sector leadership to navigate AI's complexities and unlock its full potential for the nation's growth and development.

Shri Abhishek Singh
Additional Secretary,
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Acknowledgement

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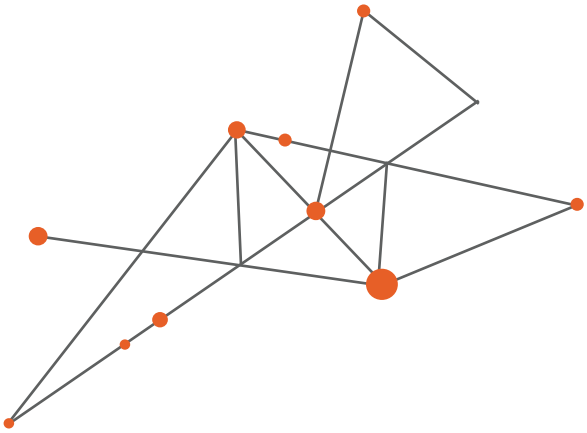

CHAPTER 1

Laying the Groundwork: AI's Role and Challenges in Public Sector Transformation

1.1. Background

Artificial Intelligence (AI) has emerged as a transformative force across industries, governments and society worldwide and India is no exception. AI is expected to add USD 967 billion to the Indian economy by 2035 and USD 450–500 billion to India's GDP by 2025, accounting for 10% of the country's USD 5 trillion GDP target.[1] Therefore, AI is now firmly positioned as a crucial technology for India to realise its developmental and economic goals.

Two key developments highlight India's focused commitment on catalysing the power of AI for the benefit of its citizens and economy - The National Strategy on AI and the IndiaAI Mission. The main thrust behind the introduction of these two initiatives is to promote innovation, entrepreneurship and address social and economic challenges. The National Strategy recognises AI as a tipping point in human technological evolution, emphasising its potential to boost productivity, reduce costs, and drive innovation across sectors like healthcare, education, agriculture, and finance. It underscores AI's role in accelerating economic growth and social impact, with a focus on inclusivity under the theme 'AI for All'. To realise this vision, the IndiaAI Mission[2] aims to build a comprehensive ecosystem that fosters AI innovation by democratising computing access, enhancing data quality, developing indigenous AI capabilities, attracting top AI talent, enabling industry

1 Press Information Bureau, 'After assuming the G20 Presidency, Shri Narendra Modi Government to assume the Chair of Global Partnership on AI (GPAI)' (2022) <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1877503> accessed 20 November 2022.

2 Press Information Bureau, 'Cabinet Approves Ambitious IndiaAI Mission to Strengthen the AI Innovation Ecosystem' (2024) <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1882467 >n accessed 7 March 2024

collaboration, providing startup risk capital, ensuring socially impactful AI projects, and promoting ethical AI. The IndiaAI Mission aims to propel India to the forefront of artificial intelligence globally. This initiative promotes technological self-reliance, ensures ethical and responsible AI deployment, and democratises AI benefits across all sections of the society.

India is committed to shaping the future of AI for India. India served as the Lead Chair of the Global Partnership on Artificial Intelligence (GPAI) for 2024. As part of India's presidency, it is leading several key initiatives, including hosting the GPAI Summit in New Delhi last December. This summit was a pivotal moment for GPAI, during which the New Delhi Declaration was adopted, reaffirming the commitment of 29 member countries to promoting responsible AI development and deployment. The 2023 GPAI Ministerial Declaration reasserts the shared dedication to promoting AI that is safe, secure, and reliable, while also fostering innovation and sustainability in GPAI initiatives aimed at tackling social issues.[3] Additionally, as part of its commitment to advancing the responsible development, deployment, and adoption of AI, India organised the Global IndiaAI Summit in July 2024. The Summit focused on key pillars of the AI ecosystem, including Compute Capacity, Foundational Models, Datasets, Application Development, Future Skills, Startup Financing, and Safe and trusted AI. At both international and domestic forums, India actively advocates for fair access to critical AI resources, equitable sharing of AI benefits, and mitigating risks while fostering international cooperation.

1.2. Need for AI Competency Framework for Public Sector Officials

The public sector is set to play a crucial role in enabling India to realise its developmental and economic priorities through AI, particularly in two key areas - policy development and regulating the development and use of AI systems. However, significant skill gaps exist within governments, more so in the Global South.[4] The AI Readiness Index 2023[5] indicates that low-income countries lack data and infrastructure availability, skilled human capital and innovation capacity. The South and Central Asia region ranks low globally in AI readiness, with significant disparities among countries due to differences in economic development, technological adoption, and governance. The World Bank GovTech Maturity Index 2022[6] also captures similar trends in public sector digital transformation and notes that there is a growing interest in improving digital skills in the public sector.

Thus, a competency framework that clearly defines attributes, skills, and knowledge required by public officials is necessary to enable them to effectively engage with AI technologies throughout their lifecycle. It should entail behavioural, functional and domain-specific competencies for public officials, considering their various roles throughout the AI lifecycle.

3 Dr Nivash Jeevanandam, 'Global Partnership on Artificial Intelligence (GPAI) Summit - 2023' (IndiaAI, 3 May 2024) https://indiaai.gov.in/research-reports/global-partnership-on-artificial-intelligence-gpai-summit-2023 accessed 11 August 2024.

4 UNESCO, 'Artificial intelligence and digital transformation: competencies for civil servants' (2022), <https://unesdoc.unesco.org/ark:/48223/pf0000383325> last accessed on August 7, 2024.

5 Oxford Insights, Government AI Readiness Index 2023, <https://oxfordinsights.com/wp-content/uploads/2023/12/2023-Government-AI-Readiness-Index-2.pdf>last accessed on August 7, 2024.

6 WBG GovTech Maturity Index 2022 Update: Trends in Public Sector Digital Transformation; Washington, DC. World Bank, 2022. <https://openknowledge.worldbank.org/server/api/core/bitstreams/5e157ee3-e97a-5e42-bfc0-f1416f3de4de/content> last accessed on August 7, 2024.

Such a framework can be an effective tool to build a foundational understanding of AI technologies, ensuring that they are aware of the potential opportunities and challenges associated with AI. It can promote AI's ethical and responsible use, emphasising the importance of ethical considerations and compliance with legal standards. It can also help government departments identify skill gaps in specific roles and government departments, and develop skill-development initiatives to address these gaps. Additionally, the Framework could be a solid foundation to develop training programmes, courses and other capacity building programmes for each position within government departments to compare performances and support career progression of government officials.

1.3. Goals and Objectives

The objective of this Report **Empowering Public Sector Leadership: A Competency Framework for AI Integration in India** is to equip government officials with the necessary foundational knowledge and skills to:

- Gain a basic understanding of core AI functionalities and limitations;
- Defines the behavioural, functional, and domain-specific competencies required for public officials.
- Develop an awareness towards emerging AI technologies and their potential impact on government services;
- Identify opportunities to leverage AI technologies to enhance the efficiency and quality of government public service delivery and
- Enable informed policymaking and an effective oversight mechanism for AI implementation.
- Identify skill gaps and develop targeted training and capacity-building initiatives.
- Provide a foundation for career progression and performance comparisons within government roles.

1.4. Structure of the Report

The report is structured into seven key parts to guide public sector officials in understanding and implementing AI competencies:

1. **Introduction:** The first chapter provides an overview, sets the context for AI relevance in the Public Sector and outlines the core objectives of the Competency Framework.

2. **AI Primer:** This chapter offers foundational knowledge on AI to educate public officials on the basis of AI including its capabilities, limitations and and its applications in the public sector.

3. **Introduction to the Framework:** The third chapter introduces the competency framework itself explaining its design based on AI lifecycle. It explains how the roles and responsibilities of public officials are mapped against these lifecycles, with the framework divided into three levels:

- Level 1: Policy level officials
- Level 2: Mid-level officials (Programme level)
- Level 3: Project implementers and supporting officials

4. **Behavioural Competencies:** The fourth chapter enumerates behavioural competencies for public officials. It includes necessary skills and attitudes for managing AI initiatives.

5. **Functional Competencies:** This chapter outlines functional competencies consisting of the practical skills and technical knowledge required for AI projects.

6. **Domain Competencies:** The chapter on Domain Competencies discusses sector-specific skills and the available training and capacity-building programs to support officials in developing these competencies.

7. **Conclusion and Recommendation:** The report concludes with offering strategic advice to the government on how to establish and sustain these competencies across the public sector, ensuring that officials are equipped to navigate the evolving AI landscape effectively.

CHAPTER 2

Demystifying AI: A Primer for Public Officials

2.1 What is Artificial Intelligence (AI)?

Artificial Intelligence (AI) is a machine system that uses the input it receives to generate output such as predictions, content, recommendations or decisions.[7] It analyses large data sets to produce this aforementioned output for a given set of human-defined objectives.[8] The Organisation for Economic Cooperation and Development (OECD)[9] defines AI as:

"*A machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment.*[10]

AI systems operate by receiving input from their environment, which they process through models and algorithms to generate various outputs such as predictions, content, recommendations, or decisions. The input can include data or rules provided by humans or other machines. For example, a visual object recognition system takes image pixels as input and processes them through a neural network to classify objects within the image. AI systems can influence both physical and virtual environments, performing tasks in real-world settings like autonomous driving or digital spaces like virtual assistants. Additionally, some AI systems possess the ability to adapt and evolve after deployment, learning from

7 OECD, 'Artificial Intelligence, data and competition' (2024) 18 OECD Artificial Intelligence Papers <https://doi.org/10.1787/e7e88884-en> accessed 5 August 2024

8 ISO, 'What is Aritficial Intelligence' <https://www.iso.org/artificial-intelligence/what-is-ai> accessed 5 August 2024

9 The OECD definition is preferred over others because it is widely recognized and adopted by numerous countries, providing a consistent and reliable framework for understanding and implementing AI technologies.

10 Id.

new data and interactions. This adaptiveness is seen in recommender systems that tailor suggestions based on user preferences or voice recognition systems that improve their accuracy over time.[11]

An AI system is designed to achieve specific objectives, which can be either explicit or implicit. Explicit objectives are directly programmed by developers, such as a navigation app aiming to provide the fastest route. Implicit objectives, on the other hand, are not directly programmed but are inferred through a set of rules or learned over time. For instance, self-driving cars follow traffic rules to implicitly protect lives, while AI models like ChatGPT learn to generate coherent text by mimicking human language patterns through a process of imitation learning and reinforcement learning.

2.1.1. Understanding Specialised Domains of Artificial Intelligence

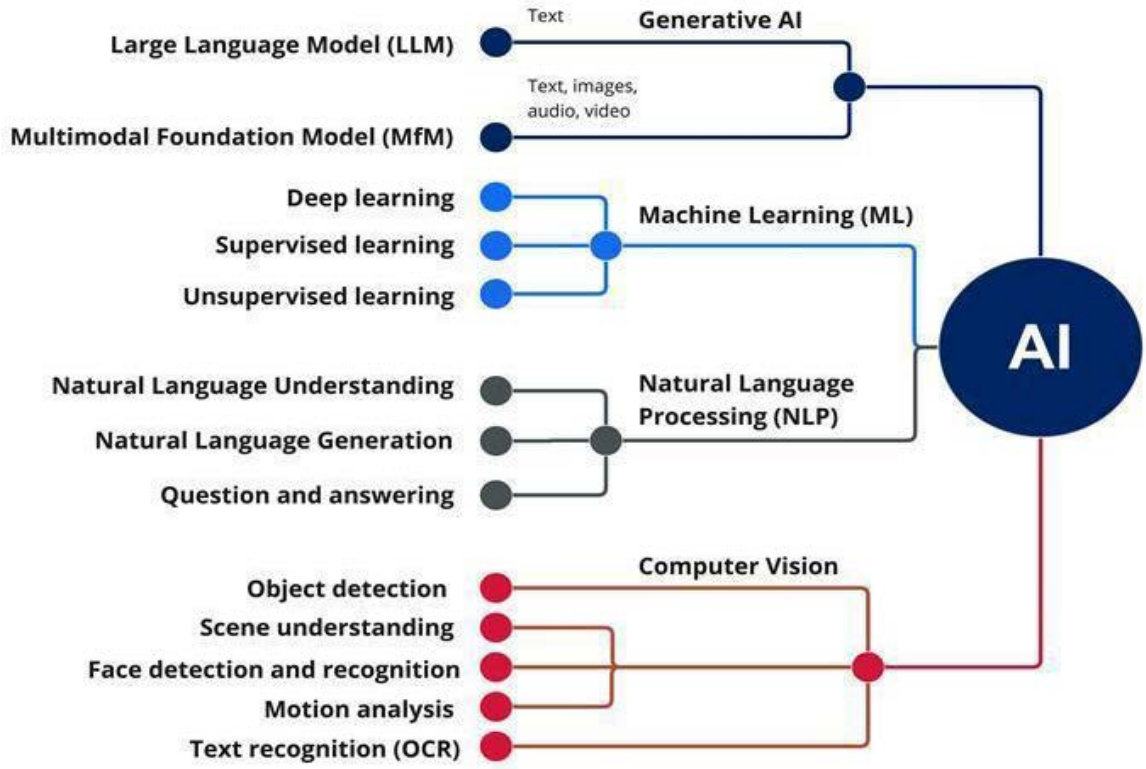

Image Courtesy: https://www.digital.nsw.gov.au/policy/artificial-intelligence/a-common-understanding-simplified-ai-definitions-from-leading

Over the years, communities of researchers have supported the development of various AI subfields, with each focused on a specific set of tasks that are generally aligned with different human abilities. These include:

11 The OECD definition also emphasises the importance of these varied capabilities, ensuring a comprehensive understanding of AI's potential and complexities. This understanding is essential for policymakers to effectively leverage AI in public service and governance.

A. Machine Learning:

Machine learning is a subset of AI that describes the ability of machines to learn and improve at tasks with experience without being explicitly programmed to do so.[12] Such machines are able to adapt in response to new data and experiences to produce outcomes without the intervention of a human programmer.[13] The system trains itself on large data sets for the purposes of description (analysing the data to explain what happened), prediction (study data to extract patterns and make predictions) and prescription (make suggestions about the proper course of action).[14]

There are three categories within machine learning:

- *Supervised machine learning*: The system is trained on labelled data sets.[15] It allows the models to become more accurate over time.[16] Supervised learning is aimed at building an artificial system that "can learn the mapping between the input and the output, and can predict the output of the system given new inputs".[17] Illustrative examples of such machine learning include: minimisation of financial risk by identification of users likely to default on loans, image or voice recognition based on patterns, email filtering and so on.
- *Unsupervised machine learning*: In unsupervised learning, there is no defined training data set and outcomes are unknown. The system recognises underlying patterns in data without requiring human supervision or explicit instruction.[18] For instance: recommendations by engines for popular e-commerce platforms and OTT services often employ these systems to build out user profiles, natural language processing (NLP) etc.
- *Reinforcement machine learning*: Reinforcement learning trains the system in a way similar to how humans learn (via trial and error). The algorithms learn by "trying different options in rapid succession".[19] Outcomes are given either favourable or unfavourable feedback, and the algorithms adapt accordingly. For instance, telling self-driving vehicles when it makes the right decision allows it to learn what the correct course of action is over time.[20]

B. Deep Learning

Deep learning is a subset of machine learning, often commonly referred to as an artificial neural network. It was built to mimic the functioning of the human brain. The algorithm possesses multiple layers of interconnected 'nodes' capable of recognising complex patterns in vast amounts of data. Each layer is programmed to learn a specific feature.[21]

12 Jamie Berryhill and others, 'Hello World: Artificial Intelligence and its use in the public sector' (2019) OECD Observatory of Public Sector Innovation <https://oecd-opsi.org/wp-content/uploads/2019/11/AI-Report-Online.pdf> accessed 5 August 2024.

13 McKinsey & Company, 'What is Machine Learning' (Mckinsey & Company, 30 April, 2024) <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-machine-learning> accessed 5 August 2024

14 Sara Brown, 'Machine learning, explained' (MIT Management, Sloan school, 21 April, 2021) <https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained> accessed 5 August 2024

15 Labelled data sets contain raw data that has been identified (eg.picture, text, video) and given labels to specify its context for the machine learning models. IBM, 'What is data labelling' <https://www.ibm.com/topics/data-labeling> accessed 5 August 2024

16 Sara Brown, 'Machine learning, explained' (MIT Management, Sloan school, 21 April, 2021) <https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained> accessed 5 August 2024

17 Qiong Liu and Ying Wu, 'Supervised Learning' (2012) Encyclopedia of the Sciences of Learning <https://doi.org/10.1007/978-1-4419-1428-6_451> accessed 5 August 2024

18 Sara Brown, 'Machine learning, explained' (MIT Management, Sloan school, 21 April, 2021) <https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained> accessed 5 August 2024

19 OECD, 'Artificial Intelligence in Society' (2019) OECD Publishing < https://www.oecd.org/content/dam/oecd/en/publications/reports/2019/06/artificial-intelligence-in-society_c0054fa1/eedfee77-en.pdf> accessed 5 August 2024

20 Sara Brown, 'Machine learning, explained' (MIT Management, Sloan school, 21 April, 2021) <https://mitsloan.mit.edu/ideas-made-to-matter/machine-learning-explained> accessed 5 August 2024

21 NITI Ayog, National Strategy for Artificial Intelligence (June 2018) <https://www.niti.gov.in/sites/default/files/2023-03/National-Strategy-for-

Each layer will process its assigned feature and pass the information on to the next layer.[22] For instance, in an image recognition exercise, the first layer of nodes might identify the number of sides, the second would identify the shape and the third might identify objects. After this, if the training data is labelled, the algorithm connects the image (object) with the correct label ('dog', 'cat' etc.).[23] Once the system has been trained, it can extract higher-level patterns and make predictions for new datasets also.

Deep learning is a more advanced version of machine learning[24] and can process a wider range of data resources (including text and images) while requiring lesser human intervention.Over time, the system gains a high level of accuracy and precision. Some examples of its deployment include sectors like healthcare where models are used to speed up image-diagnosis and prescribe the most effective medical regimen. The finance sector uses the system's ability to recognise patterns to identify fraudulent transactions.[25]

C. Natural Language Processing (NLP)

Natural Language Processing (NLP) is a subset of AI that focuses on the interactions between human language and computers.[26] It refers to computer programs that process human text and speech using machine learning and deep learning to understand and interact with human language. Their common applications include chatbots, AI translation systems, and virtual assistants.[27]

D. Computer Vision

Computer vision is a field of AI that employs machine learning and neural networks to extract meaningful information from digital images, videos, and other visual inputs, enabling systems to make recommendations or take actions based on visual data.[28] Key tasks include image classification, which predicts the class of a given image (e.g., identifying objectionable images on social media); object detection, which identifies and counts objects in images or videos (e.g., detecting damages on an assembly line); object tracking, which follows objects in sequence or real-time (e.g., autonomous vehicles tracking pedestrians and other cars); and content-based image retrieval, which searches and retrieves images based on their content rather than metadata (e.g., improving search accuracy in digital asset management systems).[29]

Artificial-Intelligence.pdf> accessed 5 August 2024

22 ISO, 'Deep Learning: the mechanics of magic' <https://www.iso.org/artificial-intelligence/deep-learning> accessed 5 August 2024.

23 ISO, 'Deep Learning: the mechanics of magic' <https://www.iso.org/artificial-intelligence/deep-learning> accessed 5 August 2024.

24 McKinsey & Company, 'What is deep learning' (Mckinsey & Company, 30 April, 2024) <https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-deep-learning> accessed 5 August 2024

25 ISO, 'Deep Learning: the mechanics of magic' <https://www.iso.org/artificial-intelligence/deep-learning> accessed 5 August 2024.

26 Dibyendu Banerjee, 'Natural Language Processing (NLP): A step-by-step guide' (Indiaai, 22 July, 2020) <https://indiaai.gov.in/article/natural-language-processing-nlp-simplified-a-step-by-step-guide> accessed 5 August 2024

27 OECD, 'AI Language models: Technical, socio-economic and policy considerations'(2023) 352 OECD Digital Economy Papers <https://doi.org/10.1787/13d38f92-en> accessed 5 August 2024

28 IBM, 'What is Computer Vision'https://www.ibm.com/topics/computer-vision accessed 5 August 2024

29 University of San Diego, 'What is Computer Vision? An Introduction' <https://onlinedegrees.sandiego.edu/introduction-to-computer-vision/> accessed 5 August 2024

E. Generative AI

Generative AI relies on sophisticated machine learning[30] models called *deep learning*[31] *models*—algorithms that simulate the learning and decision-making processes of the human brain. These models work by identifying and encoding the patterns and relationships in huge amounts of data, and then using that information to understand users' natural language requests or questions and respond with relevant new content.[32]

Generative AI can create various types of content across multiple domains. In text, models based on transformers can produce coherent, contextually relevant text for instructions, documentation, emails, blogs, articles, and more, including automating tedious writing tasks like summaries. For images and video, tools like DALL-E and Midjourney generate realistic images, original art, animations, and apply special effects efficiently. In sound, speech, and music, generative models synthesise natural-sounding audio for chatbots, audiobooks, and create original music. In software development, generative AI generates code, autocompletes snippets, translates between languages, and aids in debugging. For design and art, it produces unique artworks, assists in graphic design, and enhances virtual simulations. Additionally, generative AI generates synthetic data for simulations, aiding fields like drug discovery by creating molecular structures with specific properties.[33]

2.2 AI use in the Public Sector

Artificial Intelligence is proving itself as a transformative force for the public sector, offering the potential to modernise governmental operations, enhance service delivery, and address complex societal challenges.[34] In the public sector, AI's application spans automating routine tasks to free up human resources for more strategic activities, augmenting predictive analytics for data-driven decision-making, and personalising public services to meet user needs more effectively.[35] Countries across the globe have successfully harnessed AI's potential to successfully deliver and improve public delivery systems.[36]

India too demonstrates its commitment to utilising AI's potential through the development of various AI tools and technologies to enhance public administration. These initiatives aim to address critical issues ranging from language technology and urban data management to railway optimization and financial transactions. Below is a summary of a few government projects leveraging AI to achieve significant advancements in priority areas:

30 IBM, 'What is machine learning' <https://www.ibm.com/topics/machine-learning> accessed 5 August 2024
31 IBM, 'What is deep learning' <https://www.ibm.com/topics/deep-learning> accessed 5 August 2024
32 IBM, 'What is Generative AI learning' <https://www.ibm.com/topics/generative-ai> accessed 5 August 2024
33 Ibid.
34 Jamie Berryhill and others, 'Hello, World: Artificial Intelligence and its use in the public sector' (2019) OECD Working Papers on Public Governance 36 <https://doi.org/10.1787/726fd39d-en> accessed 5 August 2024
Also defined as 'systems which have the capacity to processed data and information in a way that resembles intelligent behaviour, and typically includes aspects of reasoning, learning, perception, prediction, planning or control, as per UNESCO's Recommendations on the Ethics of Artificial Intelligence, available at: https://unesdoc.unesco.org/ark:/48223/pf0000380455
35 Farooq Khuram and Bartosz Jakub Solowiej, 'Artificial Intelligence in the Public Sector: Summary Note' (2021) 1 World Bank Group <https://documents1.worldbank.org/curated/en/746721616045333426/pdf/Artificial-Intelligence-in-the-Public-Sector-Summary-Note.pdf> accessed 5 August 2024
36 See use cases mentioned on pages 49-51 under the heading 'Artificial Intelligence as a Tool to Address Challenges in the Public Sector', Report titled, 'Artificial Intelligence and Digital Transformation, Competencies for Civil Servants', UNESCO, available at: https://unesdoc.unesco.org/ark:/48223/pf0000383325

Initiative	Description	Impact on Citizens/ User Group
Bhashini (National Language Technology Mission)	Launched in July 2022, this mission provides language technology solutions as digital public goods through the BHASHINI platform, using AI/ML and NLP to develop open-source models, tools, and solutions for Indian languages.	Enhances language accessibility and ecosystem development.
SIA, SBI	Launched in 2017, it is an artificial intelligence-powered software that has the capability to respond to 850 million queries a day , making it the largest-financial sector AI solution in the world. This intelligent assistant is a multilingual chatbot that can respond in 14 languages in speech or text.	Quick responses to standard queries and FAQ related to personal banking services, proactive services
Financial fraud detection, supported by ICICI Bank	It operates on an automated and AI driven platform to prevent and detect fraud, as well as the recovery of corporate loans.	Maximises recovery by highlighting undisclosed information and unidentified patterns associated with the defaulter.
National Pest Surveillance System, DAa&FW	Provide a nation-wide view of pest and disease infestations at field level and automate the process of providing expert support on pest identification and timely delivery of pest surveillance based advisory to the farmer, specific to his/her need.	Assist in the avoidance of pest epidemics, help in minimising the crop loss due to pests with the real data submission by Government, resources & lead farmers. A repository of national pest scenario available to various public agencies, working in the field of plant protection to identify the pest hotspots and thus to formulate plant protection policies.
Krishi 24/7, DA&FW	AI-powered solution to identify and manage agricultural news articles of interest to aid timely decision-making. The tool scans news articles in multiple languages and translates them into English. It extracts essential information from news articles, such as headline, crop name, event type, date, location, severity, summary, and source link, ensuring that the ministry receives timely updates on relevant events published on the web.	for automated agricultural news monitoring and analysis. It addresses the need for an efficient mechanism to identify and manage agricultural news articles of interest to aid timely decision-making.

NHAI AI-Based Face Recognition System	Deployed to monitor attendance and location of field staff at project sites, this cloud-enabled AI system uses real-time location tracking and data analytics to increase transparency and accountability.	Prevents unauthorised absenteeism, improves project management, and ensures accurate attendance logging.
AI-based RBIS (Pension Distribution Office)	AI-based system to overcome shortcomings of traditional pension distribution, ensuring accurate and complete fund disbursement.	Enhances transparency and efficiency in pension distribution.
GeoAgro-iKrishi System	Provides real-time, data-driven farming advisories to farmers in Madhya Pradesh using IoT devices and AI.	Empowers farmers with personalised agricultural insights.
Jaadui Pitara (Magic Box)	An initiative by NCERT for foundational stage children, offering educational content through play-based learning.	Enhances early education with engaging, informative content.

2.3 Limitations and Concerns of AI

Despite its tremendous benefits, implementation of AI systems in the public sector involves navigating a complex landscape of technical challenges, from ensuring algorithms generalise well to addressing biases and security risks. This section provides an overview of the broader technical challenges to consider when implementing an AI system.

2.3.1 Problem Selection

One of the most pressing challenges related to AI, especially in the public sector, is the risk of problem (mis)selection—wherein AI technologies are applied to problems they are ill-suited to solve or where their impact is exaggerated. Many AI solutions suffer from over-promising and under-delivering, especially when they are marketed as transformative solutions to complex societal issues but fail to deliver on those promises.

There are instances wherein AI vendors exaggerated the capabilities of their technologies, leading to governments and organisations to adopt systems that either do not work as intended or are fundamentally flawed. For instance, the Dutch government's AI system for identifying benefits and fraud led to significant harm, where over a thousand innocent families were unjustly penalised. Such instances demonstrate how misguided trust in AI can cause real-world harm when the technology is applied to the wrong problems or based on false assumptions.[37]

Moreover, the AI industry's reliance on pseudoscientific claims further complicates responsible AI deployment. AI projects are often framed in scientific language without adhering to rigorous peer-reviewed processes, thereby creating an illusion of credibility without sufficient evidence. This phenomenon can lead to the selection of AI for tasks beyond its actual capabilities, especially in high-stakes domains like healthcare, education, and justice, where the cost of failure is immense.[38]

37 University of Amsterdam, 'Childcare Benefit Scandal: Transparency and Accountability Remain Critical' (7 February 2023) https://www.uva.nl/en/shared-content/faculteiten/en/faculteit-der-rechtsgeleerdheid/news/2023/02/childcare-benefit-scandal-transparency.html accessed 20 September 2024.

38 Bernard Marr, 'Spotting AI-Washing: How Companies Overhype Artificial Intelligence' Forbes (25 April 2024) https://www.forbes.com/sites/

To mitigate these risks, public sector leaders must prioritise critical evaluation of AI solutions before deployment. This involves thoroughly questioning whether AI is truly the right tool for a specific problem, examining the evidence base for its proposed benefits, and ensuring that any claims made by vendors are rigorously tested and independently validated.

2.3.2 Lack of Explainability and Transparency (Black Box Problem)

The Black Box phenomenon refers to when input and the output can be examined but not the system's code or the processes that led to the decision.[39] In other words, the path of calculation is concealed from the user. A black-box system can be designed to hide any of the three elements of a ML system: the algorithm, the training data or the model.[40] Typically, developers put either the model or the training data in a 'black-box' in order to protect their intellectual property rights as well as to maintain the cybersecurity of the program.[41]

However, there has been rising discourse around the problems that arise from this opacity. This property can exacerbate the issues in scenarios where the AI model malfunctions such as autonomous vehicles hitting pedestrians, AI facial recognition leading to wrongful arrests, misdiagnosis and data leaks in healthcare settings etc. Even the training sets may be entrenched with bias that would be inherited by the AI model. This occurred with Amazon's AI recruiting model displayed gender bias against women during the hiring process[42] because its training data associated male candidates with more favourable work qualities. In another instance, an American criminal risk prediction black box model called COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) displayed racial bias and judged black offenders far more likely to commit crimes than their white counterparts.[43]

This lack of transparency can lead to distrust and concern, especially when AI impacts important areas like healthcare, finance, and justice. For individuals, this means they might not know why a loan application was denied, why a medical diagnosis was given, or why they were flagged for security reasons. For businesses, it complicates the ability to ensure their AI tools are fair and unbiased, which can have legal and ethical implications. Even developers and policymakers face challenges, as they may struggle to debug, improve, or regulate AI systems without knowing how they work internally. Overall, the black box problem makes it hard for everyone to hold AI accountable, trust its decisions, and ensure it works in a fair and reliable way.

bernardmarr/2024/04/25/spotting-ai-washing-how-companies-overhype-artificial-intelligence/ accessed 20 September 2024.

39 Bartosz Brożek and others, 'The black box problem revisited. Real and imaginary challenges for automated legal decision making' (2023) 32 Artificial Intelligence and Law <https://doi.org/10.1007/s10506-023-09356-9> accessed 5 August 2024

40 A machine-learning system has three components- an algorithm, training data and a model. The algorithm learns to identify patterns after being trained on a large collection of examples-the training data. Once the ML algorithm has been trained, it becomes a model.

41 Saurabh Bagchi and The Conversation US, 'Why We Need to See Inside AI's Black Box' (Scientific American, 26 May, 2023) <https://www.scientificamerican.com/article/why-we-need-to-see-inside-ais-black-box/> accessed 5 August 2024

42 Rachel Goodman, 'Why Amazon's Automated Hiring Tool Discriminated Against Women' (*ACLU,* 12 October, 2018) <https://www.aclu.org/news/womens-rights/why-amazons-automated-hiring-tool-discriminated-against> accessed 5 August 2024

43 Cynthia Rudin and Joanna Radin, 'Why are we using black box models in AI when we don't need to? A lesson from an explainable AI competition' (HDSR, 22 November, 2019) <https://hdsr.mitpress.mit.edu/pub/f9kuryi8/release/8> accessed 5 August 2024

2.3.3 Data Biases and Algorithmic Fairness

Marginalised groups are often not represented enough or are represented in a skewed manner in training data sets.[44] The use of such flawed or inadequate data may result in incorrect decision making, which can have adverse real-life consequences. For instance, an Argentinian study worked with three open-source machine learning algorithms. The purpose of the study was to examine how gender bias in X-ray image datasets affected the model's ability to aid doctors in diagnosis. The study revealed that the model performed worse in diagnosing women across a wide range of chest conditions when trained on this skewed dataset. The algorithm's accuracy was lesser when analysing X-ray images of people whose sexes were underrepresented in the dataset.[45] Another notable example of such bias in India was reflected in Manipal hospital's collaboration with IBM Watson for Oncology. The partnership was meant to assist healthcare professionals in diagnosing and treating cancer. However, the dataset reflected a bias towards U.S. patients and their healthcare standards due to their overrepresentation in the dataset. This severely limited its universal applicability for exploring treatment options for people outside the U.S.[46]

Algorithms using data as input should be thoroughly audited against baseline datasets by both user and supervisors to ensure fairness. Additionally, the developers should test whether sensitive and protected information can be inferred from datasets' various attributes.[47] Datasets must be constantly re-weighted and re-adjusted to correct bias and delink associations[48], especially in labelled data sets, where the data may be labelled by someone with inherent bias.[49]

2.3.4. Generalisation, Underfitting, and Overfitting

Within the realm of Machine Learning, generalisation is defined as the capacity of an AI model to accurately predict outcomes for data it has not previously encountered, rather than just the data on which it was trained.[50] It's crucial to underline, however, that whether conducted by humans or machines, not all analysis is definitive. Once trained, computers are capable of generating predictions swiftly, but the validity of these predictions requires confirmation. On the other hand, the issue of underfitting arises when a model is too simplistic to capture the complexity of the data it's trained on, resulting in poor predictive performance. Whereas overfitting occurs when an algorithm becomes overly specialised. Such models might perform exceptionally well during training, however, their performance can significantly deteriorate when exposed to new, unseen data.[51]

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44 Berkman Klein Center for Internet & Society, 'Algorithms and Justice: Ethics and Governance of Artificial Intelligence Initiative' (Harvard University, 2019) <https://cyber.harvard.edu/sites/default/files/2019-10/2019AIAlgorithmsJusticeOnePager.pdf> accessed 5 August 2024

45 Agostina J. Larrazabal and others, 'Gender imbalance in medical imaging datasets produces biased classifiers for computer-aided diagnosis' (2020) 117(23) Proceedings of the National Academy of Sciences <https://www.pnas.org/doi/epdf/10.1073/pnas.1919012117> accessed 5 August 2024.

46 Claire Munõz Parry and Urvashi Aneja, 'Artificial INtelligence for Healthcare: Insights from India' (2020) Chatham House <https://www.chathamhouse.org/sites/default/files/publications/research/2020-07-30-artificial-intelligence-for-healthcare-munoz-parry-aneja.pdf> accessed 5 August 2024

47 OECD, 'Artificial Intelligence, Machine Learning and Big Data in Finance' (2021) OECD Publishing <https://doi.org/10.1787/98e761e7-en> accessed 5 August 2024.

48 Susan Leavy, Barry O' Sullivan and Eugenia Siapera, 'Data, Power and Bias in Artificial Intelligence' (2020) Center for Research on Computation and Society, Harvard University <https://crcs.seas.harvard.edu/sites/projects.iq.harvard.edu/files/crcs/files/ai4sg_2020_paper_81.pdf> accessed 5 August 2024.

49 Heinrich Jiang and Ofir Nachum, 'Identifying and Correcting Label Bias in Machine Learning' (2019) Proceeds of Machine Learning Research <https://arxiv.org/pdf/1901.04966> accessed 5 August 2024.

50 Jamie Berryhill and others, 'Hello, World: Artificial Intelligence and its use in the public sector' (2019) OECD Working Papers on Public Governance 36 <https://doi.org/10.1787/726fd39d-en> accessed 5 August 2024

51 Janiesch, C., Zschech, P., & Heinrich, K. (2021) Machine learning and deep learning. Electronic Markets, 31(3), 685–695. <https://doi.org/10.1007/s12525-021-00475-2> last accessed on August 1, 2024.

2.3.5. Security Risks

The security risks associated with AI are diverse and significant. This includes data poisoning, where attackers deliberately skew AI models by manipulating their training data. On the other hand, adversarial attacks involve crafting inputs that deceive AI systems, such as subtly altered images or text that lead to misclassification. Another major concern is model stealing or inversion, where attackers reconstruct AI models or their training data from the model's outputs, potentially exposing sensitive information. Additionally, AI systems can be compromised through supply chain attacks, where tainted components in the AI infrastructure impact multiple systems.[52] Insider threats also pose a substantial risk, with employees or contractors capable of altering AI algorithms or leaking data. To mitigate these risks, comprehensive security protocols including secure coding practices, rigorous testing, continuous monitoring, and the implementation of privacy-preserving technologies like federated learning are essential.[53]

2.3.6. The Human Factor

Human oversight in AI is crucial as these systems are intended to augment, not replace, human judgement. Embedding human oversight into AI deployments ensures that decisions are critically assessed and validated, aligning with ethical standards and enhancing efficiency.[54] The development and implementation of AI require a multidisciplinary approach involving domain experts, data scientists, ethicists, and policymakers, fostering solutions that are technically adept and ethically sound. Furthermore, addressing the human element in AI highlights the importance of human expertise in creating holistic solutions and addressing complex problems that technology alone cannot resolve. This collaborative, human-centric approach ensures that AI technologies are implemented successfully and ethically.[55]

2.4. Guiding Principles for Development and Deployment of AI System in Public Sector

AI as the potential to make a substantial impact on individuals, communities, and society. To ensure that AI systems in the public sector lead to positive outcomes and avoid unintended harms, public officials align themselves with certain guidelines/ principles that promote ethical, fair and responsible AI practices. To this end, the government of India has come up with Principles for Responsible Management of AI Systems under NITI Aayog's Approach Document for India, Part 1 – Principles for Responsible AI.[56] These Principles build on the National Strategy on AI[57] and seek to establish broad ethical principles for design, development and deployment of AI in India, drawing on global initiatives while grounding them in Indian legal and regulatory context.[58]

52 Binxing, F., Jinqiao, S., Zhongru, W., & Weiqiang, Y. (2021). AI-Enabled Cyberspace Attacks: Security Risks and Countermeasures. Strategic Study of CAE, 23(3), 60. <https://doi.org/10.15302/j-sscae-2021.03.002> last accessed on August 1, 2024.

53 Abdullahi, M., Baashar, Y., Alhussian, H., Alwadain, A., Aziz, N., Capretz, L. F., & Abdulkadir, S. J. (2022). Detecting Cybersecurity Attacks in Internet of Things Using Artificial Intelligence Methods: A Systematic Literature Review. Electronics, 11(2), 198. <https://doi.org/10.3390/electronics11020198> last accessed on August 1, 2024.

54 Truby, J. (2020). Governing Artificial Intelligence to benefit the UN Sustainable Development Goals. Sustainable Development, 28(4), 946–959. <https://doi.org/10.1002/sd.2048> last accessed on August 5, 2024.

55 Stoyanovich, J., Howe, B., & Jagadish, H. V. (2020). Responsible data management. Proceedings of the VLDB Endowment, 13(12), 3474–3488. <https://doi.org/10.14778/3415478.3415570> last accessed on August 1, 2024.

56 Niti Ayog, Approach Document for India, Part 1 – Principles for Responsible AI (2021) <https://www.niti.gov.in/sites/default/files/2021-02/Responsible-AI-22022021.pdf> last accessed on August 1, 2024.

57 NITI Ayog, National Strategy for Artificial Intelligence (June 2018) <https://www.niti.gov.in/sites/default/files/2023-03/National-Strategy-for-Artificial-Intelligence.pdf> accessed 1 August 2024

58 Ibid

Principles for Responsible Management of AI Systems

Principle of Safety and Reliability: AI should be deployed reliably as intended and sufficient safeguards must be placed to ensure the safety of relevant stakeholders. Risks to all stakeholders should be minimised and appropriate grievance redressal, care and compensation structures should be in place, in case of any unintended or unexpected harm. The AI system needs to be monitored through its lifecycle so it performs in an acceptable manner, reliably, according to the desired goals.

Principle of Equality: AI systems must treat individuals under same circumstances relevant to the decision equally

Principle of Inclusivity and Non-discrimination: AI systems should not deny opportunity to a qualified person on the basis of their identity. It should not deepen the harmful historic and social divisions based on religion, race, caste, sex, descent, place of birth or residence in matters of education, employment, access to public spaces, etc. It should also strive to ensure that unfair exclusion of services or benefits does not happen. In case of an adverse decision, appropriate grievance redressal mechanisms should be designed in a manner affordable and accessible to everyone irrespective of their background.

Principle of Privacy and Security: AI should maintain privacy and security of data of individuals or entities that is used for training the system. Access should be provided only to those authorised with sufficient safeguards.

Principle of Transparency: The design and functioning of the AI system should be recorded and made available for external scrutiny and audit to the extent possible to ensure the deployment is fair, honest, impartial and guarantees accountability.

Principle of Accountability: All stakeholders involved in the design, development and deployment of the AI system must be responsible for their actions. Stakeholders should conduct risk and impact assessments to evaluate direct and indirect potential impact of AI systems on end- users, set up an auditing process (internal and if required external) to oversee adherence to principles and create mechanisms for grievance redressal in case of any adverse impact.

Principle of protection and reinforcement of positive human values: AI should promote positive human values and not disturb in any way social harmony in community relationships.

In addition to this, numerous international organisations such as the United Nations, several international organisations, Organisation for Economic Cooperation and Development (OECD), and industry bodies including NASSCOM have outlined principles, guidelines and policy documents that could be valuable for public officials.

2.5. Resources for Further Learning Designed for Public Officials

The government of India and other organisations have established the following resources/ support structures which are of relevance for public sector officials:

- Certification Programme in Applied Artificial Intelligence[59]
- Artificial Intelligence_L2[60]
- Certificate Programme in Artificial Intelligence Fundamentals[61]
- Foundation Course in Artificial Intelligence Applications[62]
- AI for Digital Transformation: Computer Vision[63]
- Introduction to Emerging Technologies[64]
- AI for Digital Transformation: Machine Learning and Deep Learning[65]
- Elements of AI[66]
- Introduction to Artificial Intelligence[67]
- Artificial Intelligence courses on Coursera and edX[68]

59 Ministry of Electronics & Information Technology, 'Certification Program in Artificial Intelligence' <https://futureskillsprime.in/artificial-intelligence-and-machine-learning/certification-program-applied-artificial-intelligence> accessed 5 August 2024.
60 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 5 August 2024.
61 Ministry of Electronics & Information Technology, 'Certification Program in Artificial Intelligence Fundamental' <https://futureskillsprime.in/artificial-intelligence-and-machine-learning/certification-program-artificial-intelligence-fundamental > accessed 5 August 2024.
62 Ministry of Electronics & Information Technology, 'Artificial Intelligence Foundation <https://futureskillsprime.in/artificial-intelligence-and-machine-learning/artificial-intelligence-foundations> accessed 5 August 2024.
63 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 5 August 2024.
64 Ibid.
65 Supra note 52
66 Elements of AI is a six-part online free course on AI developed jointly by the University of Helsinki and Reaktor, a consultancy and agency services organisation. This course serves as an introduction to AI for non-experts. Available at: http://course.elementsofai.com
67 Introduction to Artificial Intelligence is an online free course provided by Udacity. Available at: https://eu.udacity.com/course/intro-to-artificial-intelligence--cs271.
68 These platforms provide free access to online courses catered to a more advanced audience. Some courses offer certifications, which may come with a cost. Coursera. Available at: www.coursera.org/courses?query=artificial%20intelligence. See also: Edx. Available at: www.edx.org/course?search_query=artificial+intelligence

CHAPTER 3

The Artificial Intelligence Competency Framework for Public Sector Officials

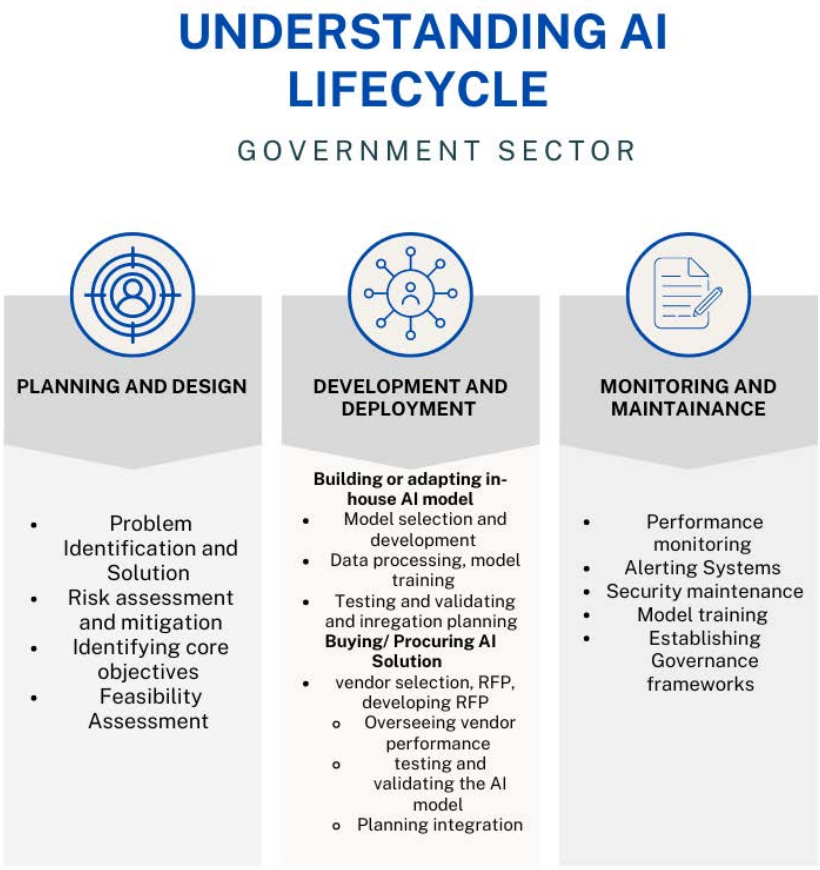
3.1. Introduction to AI Competency Framework

The AI Competency Framework (Framework) structures an approach to enhance public officials' understanding of AI tools and technologies, promoting their ethical and responsible use. The Framework defines behavioural, functional and domain-specific competencies tailored to public officials' roles throughout the AI lifecycle.[69]

The initial step to build an AI competency framework for public officials, involves mapping the AI lifecycle and identifying the diverse roles of officers across government departments, organisations, and ministries at both the state and central levels. This foundation enables identifying the roles and responsibilities of these public officials to each stage of the AI lifecycle, thus establishing a clear framework for how government officials' roles intersect with the same AI journey. In the succeeding chapters, this understanding is leveraged to develop and roll out behavioural, functional, and domain-specific competencies tailored for public officials.

69 This approach builds on past and ongoing work done by the various Ministries, Departments and Organisations. This includes initiatives undertaken by the Capacity Building Commission (CBC), National Programme for Civil Services Capacity Building (Mission Karmyogi); National e-Governance Division (NeGD), and the Ministry of Electronic and Information Technology (MeitY).Furthermore, the Framework has also leveraged numerous consultations with industry partners, start-ups, academia, civil-society, international organisations and multiple government ministries, departments and organisations. The framework is a result of collaborative efforts with these premier government institutions to align with needs and challenges government officials face in understanding complex technologies. The Framework is designed to integrate seamlessly with training programmes and monitoring and evaluation systems established by government institutions.

3.2. Understanding the AI Lifecycle: Building Public Service Tools in Public Sector



This diagram illustrates the iterative process government agencies follow to design, develop, and deploy AI solutions for public good. Each stage informs the next, ensuring responsible and effective AI use in the public sector.

Developing AI tools in the public sector involves a systematic and multi-stage process to ensure that the resulting AI solutions are safe, secure, transparent, inclusive and accountable. The following are key stages of the AI lifecycle that are highly relevant for public officials and organisations:

I. **Planning and Design:** Planning and Design is a critical stage in the AI lifecycle. It involves carefully defining the problem statement and assessing whether a given problem can be addressed using AI.[70] At this initial stage, Public Officials must avoid the appeal of a techno-solutionist approach.[71] A techno-solutionist approach relies heavily on technological fixes for complex societal challenges and often overlooks the multifaceted nature of social issues, which often require holistic solutions that integrate social, economic, and political considerations.[72] Adopting such an approach may often lead to disconnected, inequitable and unsustainable solutions. The public officials should instead have a balanced approach that combines technological innovation with human-centred, context-sensitive strategies.

70 Daswin De Silva and Damminda Alahakoon, 'An Artificial Intelligence life cycle from conception to production' (2021) 3(6) Patterns <https://arxiv.org/pdf/2108.13861> accessed 7 August 2024

71 Maia Levy Daniel, 'How Does the Public Sector Identify Problems It Tries to Solve with AI?' (Tech Policy. Press, 5 July, 2022) <https://www.techpolicy.press/how-does-the-public-sector-identify-problems-it-tries-to-solve-with-ai/> accessed 7 August 2024

72 Ibid

Current applications of AI are equipped to perform a narrow set of tasks. AI systems, despite their potential, face inherent limitations due to data quality, incompleteness and lack of transparency.[73] This can manifest into exposing individuals/ citizens to potential risks to privacy, security, algorithm biases, among others.[74] Additionally, public officials should also factor in development and implementation costs, and compare them to non-AI alternatives to optimise efficiency and cost-effectiveness. A grounding on these issues will allow public officials to develop a vision for AI projects and define how the outcomes will benefit society.

This stage also involves an evaluation of the social, economic and ethical impact of the AI solution.[75] By assessing how an AI system might impact employment, privacy, bias, and accountability, officials can develop strategies to mitigate negative outcomes and maximise societal benefits. The stage concludes with a feasibility study to determine suitability of a proposed AI system with available resources and potential partnerships. This involves considering options such as building an in-house AI solution or adapting an existing model, or procuring an off-the-shelf AI product.[76] Conducting a feasibility study allows better resource allocation, informed decision making and effective management of AI projects undertaken by the government.

II. Development and Deployment:

This stage includes development and deployment of AI systems. This can be accomplished in two ways:

- *Building/ adapting in-house AI models:* This process involves the following steps:
  - establishing an in-house team consisting of data scientists, engineers, and domain experts;
  - gathering, cleaning and preparing data for the AI model;

73 Office for Artificial Intelligence, A guide to using artificial intellignece in the public sector (June 2019) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/964787/A_guide_to_using_AI_in_the_public_sector__Mobile_version_.pdf> accessed 7 August 2024

74 Bernard Marr, 'The 15 Biggest Risks of Artificial Intelligence' (Forbes, 2 June, 2023) <https://www.forbes.com/sites/bernardmarr/2023/06/02/the-15-biggest-risks-of-artificial-intelligence> accessed 7 August 2024

75 Niklas Berglind, Ankit Fadia and Tom Isherwood, 'The potential value of AI-and how governments could look to capture it' (McKinsey & Company, 25 July, 2022) <https://www.mckinsey.com/industries/public-sector/our-insights/the-potential-value-of-ai-and-how-governments-could-look-to-capture-it> accessed 7 August 2024

76 Ibid.

- choosing an appropriate AI model,
- training the model,
- testing and validating for safety and security, accuracy and fairness and
- deploying the model for use.

Building/ adapting an in-house AI model allows for greater customisation, control and transparency in the technology. However, it can often be cost-intensive, and may take a longer time period.

Buying/ Procuring off the shelf AI Solutions: This approach involves the following:

- Identifying suitable AI-use cases that address government needs;
- formulating a vendor selection criteria,
- drafting Request for Proposal (RFP) outlining goals and technical specifications, drafting contracts, defining deliverables, timelines, data security, and IP rights; and
- Overseeing integration with existing government systems and infrastructure.

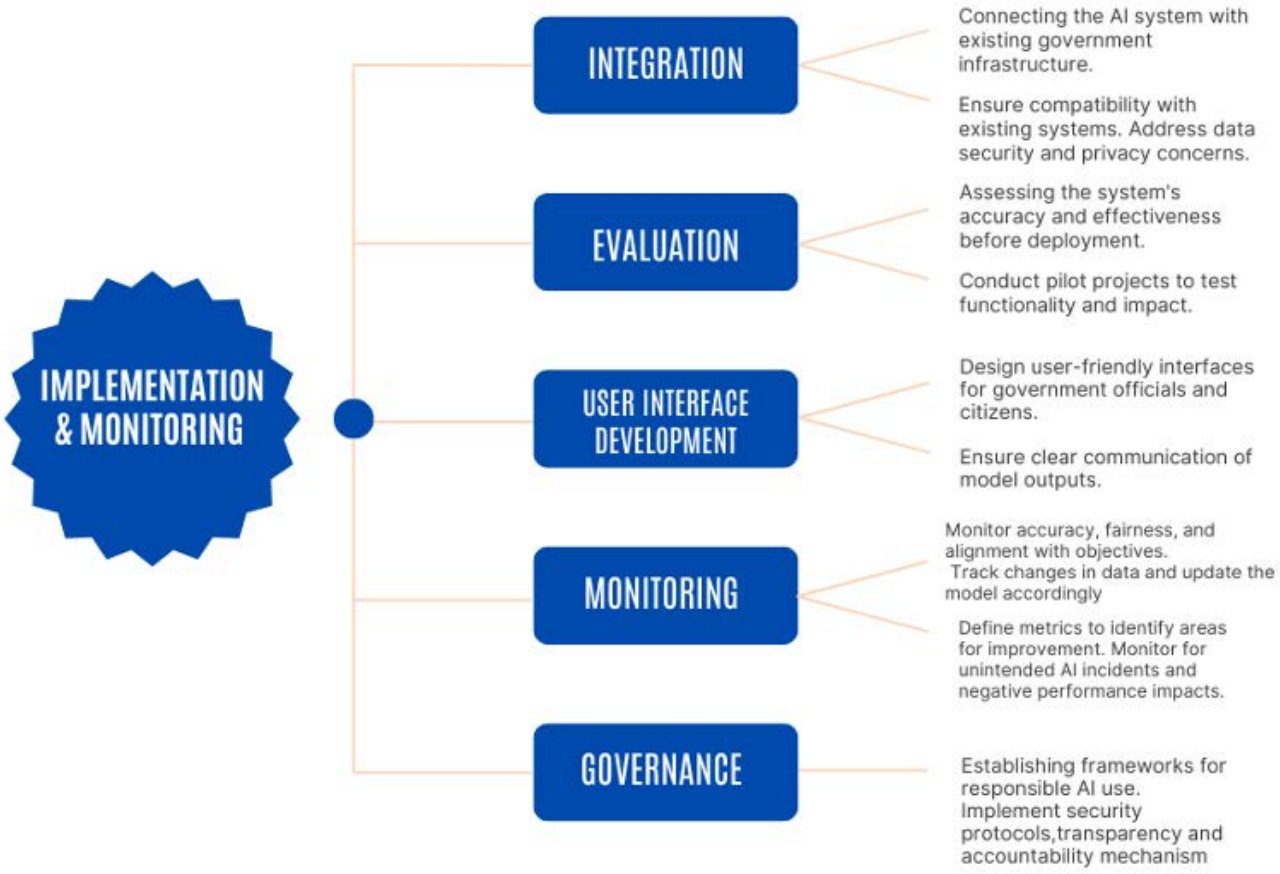
Procurement of AI solutions from third party vendors, offers faster deployment with less technical expertise, cost-effective and less-resource intensive for the government. However, one may encounter challenges due to limited customisation, heavy reliance on vendors for updates and support and less control.

Development and Deployment		
Feature	**Building/ Adapting in-house AI Models**	**Buying /Procuring AI Solutions**
Approach	Develop or customise an AI model specifically for the government's needs.	Purchase a pre-trained AI model from a vendor.
Requirements	In-house team of data scientists, engineers, and domain experts.	Market research, vendor selection, data integration.
Steps Involved	Formulate team, gather and prepare data, choose/develop model, train, test & validate, deploy & maintain.	Identify use cases, select vendors via RFP, draft contracts, oversee integration.
Advantages	High customization, control & transparency, long-term flexibility.	Faster deployment, less expertise needed, cost-effective, lower resource burden.
Disadvantages	Cost-intensive, time-consuming, skill gaps may exist.	Limited customization, vendor lock-in, lack of transparency.

III. Implementation and Monitoring:

This stage involves integration of the AI system with the government existing infrastructure and system. It includes evaluating systems accuracy and effectiveness using real-time data before deployment. It also involves developing a user interface to allow government

officials and citizens to interact with models and understand outputs generated. It translates into continuous tracking of models accuracy, fairness and alignment with the core objectives identified in the planning and design stage.[77] It involves monitoring changes and updating the underlying data, defining clear metrics to identify areas of improvement, setting up or tracking unintended AI incidents that can negatively impact the performance of an AI system.[78]In order to ensure the AI model remains functional and accurate, clear governance frameworks and standard operating procedures are put in place in relation to ownership, security, transparency and accountability.[79]



3.3. Classification of Public Sector Officials by Levels and Organisations

Due to the complex and multifaceted nature of government organisations, successful AI implementation relies on contributions from officials at various levels. For better understanding, this guide separates the roles within central and state government structures. The following section details how these roles map to the AI lifecycle, highlighting their key functions and responsibilities in bringing responsible AI solutions to the public sector.

77 Jess Whittlestone and Jack Clark, 'Why and How Governments Should Monitor AI Development' (31 August 2021) Center for the Study of Existential Risk, University of Cambridge <https://arxiv.org/pdf/2108.12427> accessed 7 August 2024
78 Merlin Stein and Connor Dunlop, 'Safe beyond sale: post-deployment monitoring of AI' (Ada Lovelace Institute, 28 June, 2024) <https://www.adalovelaceinstitute.org/blog/post-deployment-monitoring-of-ai/> accessed 7 August 2024
79 Ibid

	Senior Level Officers/ Level 1	Mid Level Officers/ Level 2	Junior Level Officers/ Level 3
Ministries	Secretary, Additional Secretary, Joint Secretary, Scientist G Director Generals, Commissioners, Additional Commissioners at Central Level and equivalent	Director, Deputy Secretary, Joint Director, Additional Director, Scientist F, D, E, Chief Engineer	Under Secretary, Assistant Secretary, Deputy Director, Assistant Director, Scientist C, Scientist B, Section Officer, Programme Directors, Programme Managers Assistant Section Officers Other staff of Directorates/ commissions, Members of PMUs
State Ministry/ UTs/ Public Sector Undertaking (PSUs)	Chief Secretary/ Principal Advisor to the Chief Minister, Add. Chief Secretary, Principal Secretary/ Secretary, Commissioners, Additional Commissioners	Additional Secretary, Joint Secretary, Head of Department, District Collectors, Deputy Commissioners	Deputy Secretary, Under Secretary, Section Officer, Assistant Section Officer, Chief Engineer SeMTs, PeMTs, Project Managers (hired/tendered for a project by Dept), other staff of Directorate/ commission, Members of PMUs

Fig 2: Categorisation of government officials across different levels (1-3) at Central Ministries, State Ministries, and PSUs.

3.4. AI in Government: A Functional Breakdown by Lifecycle Stage and Official Level

Leveraging the insights from the government AI lifecycle and the categorization of officials at both central and state levels, following table provides mapping of their core functions across the crucial stages of AI planning and design, development, and deployment:

AI Lifecycle	Level 1	Level 2	Level 3
Planning and Designing	• Define project need, purpose, and desired outcomes. • Allocate budget and resources. Approve final RFP and vendor selection.	• Conduct research on existing AI solutions. • Develop evaluation criteria for vendor selection. • Draft RFP outlining goals and technical specifications. • Manage vendor selection process (presentations, Q&A). • Draft contract defining deliverables, timelines, data security, and IP rights.	• Gather data on potential benefits and risks. • Prepare initial cost estimates. • Assist with vendor communication and contract finalisation. • Manage RFP document distribution and vendor responses. • Facilitate vendor communication (scheduling calls, sending emails).

Development and Deployment	• Receive regular project updates. • Address major roadblocks and concerns. • Ensure alignment with project goals and government priorities. • Approve final deployment. • Oversee impact assessment and future iterations.	• Supervise vendor work and contract adherence. • Provide technical guidance and clarify project requirements. • Monitor progress and budget expenditure. • Oversee deployment within government infrastructure. • Develop training materials and user guides. • Conduct impact assessments.	• Collect and analyse project data to track progress. • Liaise with the vendor for data access (if applicable). • Maintain project files and documentation. • Schedule meetings and take minutes. • Coordinate travel arrangements for project personnel (if applicable).
Implementation and Monitoring	• Negotiates contracts and service level agreements (SLAs) with the vendor. Oversees system integration with existing infrastructure. • Ensures data security and privacy compliance. • Establishes performance metrics for the AI model. Monitors data quality and identifies anomalies. Reviews model outputs and identifies potential bias. • Initiates corrective actions for data or model issues. • Analyses the impact of the model on building performance. • Identifies areas for model improvement • Presents findings to stakeholders and develops future strategies.	• Conducts user training sessions for mid-level and junior officers. • Oversees data migration and system configuration. • Generates reports on model performance and building efficiency. • Performs data cleaning and validation tasks. • Escalates data quality concerns to senior officers. • Conducts statistical analysis of model performance data. • Creates data visualisations and reports for senior officers. • Research cost-benefit analysis of the model implementation.	• Collect and analyse data on AI tool performance and impact. • Prepare reports on deployment and ongoing evaluation. • Assist with user support and troubleshooting (basic tasks). • Monitors dashboards and alerts for potential problems. • Gather user feedback on the deployed model. • Documents data quality issues and model outputs. • Monitors dashboards and alerts for potential problems. • Extracts relevant data and prepares reports for mid-level officers. • Assists in the development of presentations for stakeholders.

CHAPTER 4

Behavioural Competencies

4.1. Background

This section lists down behavioural competencies essential for public officials to assist them navigate challenges that may arise while integrating AI into their work. The behavioural competencies can be understood as, "*a set of benchmarked behaviours displaced (or observed or felt) by individuals across a range of roles within Ministries, Departments, and Organisations*".[80]

These competencies are divided into **core competencies,** applicable to all government officials regardless of their role and position, and **leadership competencies,** for those in supervisory roles. Each of these competencies are further delineated into various levels capturing the increased complexity with rising challenges, scope of responsibilities and strategic thinking required at higher seniority levels. These competencies are derived from Government of India, United Nations Development Programme Project, Civil Services Competency Dictionary[81] and numerous consultations with the National Programme for Civil Services Capacity Building (Mission Karmayogi).

4.2. Core Behavioural Competencies

4.2.1. Innovative Thinking

Public officials should embrace a forward-thinking approach, and constantly explore ways on how AI can be used to solve existing problems. It enables them to anticipate

80 Capacity Building Commission, Annual Capacity Building Plans Approach Paper (2022) <https://cbc.gov.in/sites/default/files/ACBP_Approach-Paper.pdf> accessed 7 August 2024

81 Government of India and United Nations Development Programme, Civil Services Contemporary Dictionary (2014) <https://dopt.gov.in/sites/default/files/Competency%20Dictionary%20for%20the%20Civil%20Services.pdf> accessed 7 August 2024

and address future challenges, adapt to rapid technological changes, and ensure that governance remains relevant and effective. By looking ahead and embracing innovation, they can proactively solve problems, enhance public services, and better meet the evolving needs of society. This approach also positions them to leverage new opportunities, build resilience against emerging risks, and maintain public trust and confidence.[82]

Innovative Thinking		
Level 1	**Level 2**	**Level 3**
Critically examine the proposed AI solutions and ensure that they align with ethical ethical principles, responsible resource allocation, and the best interests of the public. Seek and promote disruptive ideas that radically improve the quality of public service delivery. Create a culture of innovation, flexibility and responsiveness, steer the ministry, department, organisation to be responsive in the rapidly changing priorities.	Seek innovative ways to leverage AI to enhance public service delivery. Champion innovative or out-of-box solutions with the use of AI to solve existing challenges. Encourage a culture of innovation within the team.	Embrace the potential of AI in transforming their domain and continuously examine their work areas for opportunities to leverage AI for enhancing efficiency, accuracy, and overall improvement in the quality of public services. Analyse the impact of AI use cases and use learning to refine and improve workflow.

4.2.2. Systems Thinking

Systems thinking encourages public officials to understand the intricate and multifaceted nature of problems encountered by the government. It involves understanding that issues/ problems are not isolated but are part of a larger, dynamic system where action in one area may have ripple effects throughout the entire system. Thus, a holistic approach is crucial for public officers because it allows them to address the issue effectively by considering the broader perspective and diverse impact on various stakeholders.

Systems Thinking		
Level 1	**Level 2**	**Level 3**
Looking beyond immediate fixes and developing and recognizing how different departments, policies, and external factors influence each other. Develop long term strategies that account for unintended consequences and ensure sustainable progress. Overcoming silos and fostering collaboration across departments and with external stakeholders.	Deeper understanding of complexity and interconnectedness of problems in the government sector. Ability to engage with multiple stakeholders. Fosters a culture of systems thinking within the organisation.	Understands the complex and interrelated nature of problems faced by the government. Understands the importance of considering the 'whole of the government approach' when addressing challenges or conceptualising an AI-driven solution.

82 Government of India and United Nations Development Programme, Civil Services Contemporary Dictionary (2014) <https://dopt.gov.in/sites/default/files/Competency%20Dictionary%20for%20the%20Civil%20Services.pdf> accessed 7 August 2024

4.2.3. Curiosity and Experimentation

Public officials should keep themselves up-to-date with the latest developments and AI advancements, best practices and other industry practices relevant to their domain area. It enables them to make informed decisions and implement effective policies. Keeping abreast of developments also allows them to address emerging challenges, ensuring that the strategies are aligned with current technological needs and capabilities. Staying current and actively engaging with AI developments positions public officials to be proactive leaders in the evolving landscape of governance.

Curiosity and Experimentation		
Level 1	**Level 2**	**Level 3**
Aspire to be a thought leader in their professional and technical field. Encourage and facilitate acquisition of knowledge in their respective Ministry, Department and Organisation.	Seek to enhance their knowledge and understanding of the AI led advancements and how it can be leveraged for improving public services. Develop and external orientation, consult closely with other government ministries, departments and organisations, key stakeholders to develop broader conceptual understanding. Encourage knowledge and experience sharing.	Maintain up-to-date knowledge regarding AI advancements in their domain areas. Seek to understand knowledge of perst practices, code of conducts and other procedures in relation to their work areas. Seek learning opportunities to improve knowledge through courses, conferences, seminars, training programmes and work assignments etc.

4.2.4. Adaptability/ Change Management

Adaptability or change management can be understood as the ability to develop long-term vision/ plan/ initiatives while maintaining the ability to maintain flexibility to adapt to unexpected circumstances. This approach emphasises the importance of being able to pivot or adjust strategies rapidly during their implementation phase, in response to new information, changes in the environment, or unforeseen challenges. This agility can be strengthened by ensuring that plans are flexible to accommodate modifications without compromising on the quality.

Adaptability/ Change Management		
Level 1	**Level 2**	**Level 3**
Formulates visions, strategies, projects, and initiatives with a long-term perspective, while incorporating the capacity to adapt flexibly to unforeseen events. Swiftly adjusting course during the execution phase in response to any emergent changes.	Understands the benefits of agile over traditional planning, and breaks down projects into manageable tasks for short iterations. Coaches team members in their application. Applies agile methodologies to experimental projects for early testing and adjustment, ensuring flexibility.	Emphasises the importance of flexibility and adaptability in planning and developing AI solutions for the government.

4.2.5. Collaboration and Communication

Public officials are required to work together to understand how AI can be used effectively across various aspects of governance. Collaboration and communication also extends to working closely with citizens to understand their priorities, concerns and feedback on AI solutions. This allows public officials to ensure AI solutions are aligned well with public expectations and needs. Collaboration and open communication among officials lead to better informed decisions, and ethical and responsible use of AI in the Public Sector.

Collaboration and Communication		
Level 1	**Level 2**	**Level 3**
Promote good working relationships. Collaborate with the departments to work towards a shared goal. Capitalised on opportunities and effectively leverages the diverse talents and skill-sets of the team-members.	Engages in open-discussion with team members while formulating detailed plans on AI projects. Incorporate team suggestions and ideas into planning and decision making. Encourage and empower team-mates. Build relationships with team mates and other intra-inter department units. Encourage the team members to share ideas, knowledge and best practices with the team.	Have a positive attitude towards team members. Share experiences, knowledge, and best practices with team members. Solicits ideas and opinions to help form specific decisions or plans.

4.2.6. Citizen Centricity or People First Approach

Citizen centricity/ people first approach requires the government officials to prioritise the needs of citizens with a strong emphasis on the concerns of marginalised and vulnerable groups. Public services often deal with sensitive information which can have a serious impact on the citizens. Inaccurate or biassed AI systems can lead to discriminatory outcomes, social injustice and distrust among users. Public officials also need to ensure that the AI tools are transparent, meaning their decision-making process can be explained to citizens in clear and understandable terms. It includes identifying potential bias in data-sets used for decision making, or other scenarios wherein the rights and interests of marginalised and vulnerable groups get affected. It should be noted that identifying bias is a complex task, even for the most experienced and sensitised individuals. It is thus essential that that public officials receive enhanced sensitization on issues affecting marginalised sections and their interactions with AI, as well as the potential areas where biases may arise.

Citizen Centricity/ People First Approach		
Level 1	**Level 2**	**Level 3**
Possesses an in-depth understanding of a broad range of end-user requirements in the Ministry, Department and Organisation. Collaborates across government departments, ministries and non-state actors to deliver best quality services with a strong focus on marginalised and disadvantaged groups. Incorporates elements of affirmative action into planning and strategy formulation.	Promotes a culture focused on serving the needs of citizens. Focuses on the decision making around the excluded sections; designs and monitors these initiatives. Uses multiple mechanisms to obtain insights from the community, in order to drive proposals, outcomes and quality in the area. Constantly improves service by managing risks and ensuring service delivery within defined outcomes	Understand the requirements of the vulnerable and marginalised sections of the society, along with the other citizens. Documents and report issues that impact public delivery systems Understands the value of affirmative action towards marginalised and disadvantaged groups. Actively seeks information from all sections of the society, understanding their needs and expectations. Establishes a mechanism to seek feedback about the services provided.

4.2.7 Integrity and Accountability

Integrity requires a public official to perform their duties in an open, fair, and transparent manner. It also includes honouring one's commitments and upholding the Public Service Values. Accountability involves taking responsibility for the outcome while addressing performance issues fairly and promptly. These tenets help to build citizens' trust, and ensure ethical AI deployment.

Integrity and Accountability		
Level 1	**Level 2**	**Level 3**
Maintains a high level of professionalism and impartiality. Creates a culture that encourages open, honest and ethical behaviour Takes accountability for achieving the ministry, Department or Organisation in achieving its strategic priorities. Drives a performance culture across the organisation to achieve concrete results. Resolutely holds other entities accountable for outcomes to citizens.	Enforces laws, public service values and rules of conduct even in difficult situations. Exhibits courage and conviction to stand by right decisions. Provides honest and frank advice to uphold public interest. Provides feedback to support performance improvement. Reviews, challenges, and adjusts performance levels to ensure quality outcomes are delivered on time. Takes accountability for team performance especially in case of failure.	Exhibits openness, and honesty in dealing with others; and acts in a way to avoid conflict of interest. Follows rules and regulations and is guided by Public Service Values Treats people impartially regardless of political, social, demographic, geographic background or bias. Exhibits strong work ethics: sincerity and commitment to the job/duty, taking ownership of quality of work, regularly reviews performance priorities and fine tunes to achieve results.

4.3. Leadership Behavioural Competencies

4.3.1. Outcome Orientation/ Result Orientation

Outcome orientation or result orientation in AI requires senior public officials to display a high drive to achieve targets and compete against a standard of excellence. Given their sensitive role and often act as a bridge between the government and the citizens, senior public officials hold unique responsibilities. They must ensure that metrics for designing, development and deployment of AI tools and technologies are not just ambitious but demonstrably linked to positive social outcomes: marginal improvement in the efficiency and quality of public services, promoting well-being of citizens and fulfilling long term needs of the communities. While setting these benchmarks, senior officials should also ensure adherence to ethical principles of inclusion, transparency, fairness and accountability. Furthermore, the senior officials should pay attention that AI tools and technologies do not exacerbate structural inequalities and are mindful of the needs and challenges faced by the marginalised and disadvantaged groups of the society.

Outcome Orientation
Level 1 & Level 2
• Aligns AI development metrics with demonstrable positive social impact • Prioritises metrics that showcase increased efficiency in public services • Integrates metrics that ensure long-term equity across the community, preventing AI from exacerbating social inequalities. • Able to embed principles of transparency throughout development, ensuring citizens understand how AI is used in government decisions. • Focus on metrics that demonstrate responsiveness to the diverse needs of the population.

4.3.2. Team Leadership/ Leading others

Team leadership is the ability to engage, energise and enable the team to excel. A senior official leading an AI development team requires a distinct set of skill sets. The senior public officials are expected to act as visionary leaders and architects who have a strong vision for the AI project and are able to build a diverse team with expertise in AI policy, ethics, law, and public service delivery. They should be able to clearly convey the potential and importance of AI projects in improving public services. This involves: building an open channel for communication and information, securing the necessary resources, including budget, data, and access to technology, investing in training and development opportunities, and acknowledging and celebrating milestones to maintain high team morale and motivation.

Team Leadership
Level 1 & Level 2
• Ability to build a team consisting of experts in AI, policy, ethics, and public service delivery for a well-rounded approach. • Ability to to clearly outline the project's purpose and desired impact, ensuring team alignment. • Encourages information sharing to leverage everyone's knowledge and ideas. • Motivates the team by highlighting the project's potential to improve public services. • Acknowledges milestones to maintain team morale and motivation.

4.3.3. Initiative and drive

Initiative and drive can be understood as the ability to contribute more than what is expected of the role. Senior officials leading AI initiatives in the public sector are required to proactively identify newer problem areas which can be addressed by usage of AI. They are expected to embrace new and creative ways to leverage AI for public good. Embracing innovative AI solutions helps them to address emerging challenges, improve public services and stay ahead in the rapidly changing technological landscape. By proactively demonstrating the positive impact of AI projects, officials can build public trust and inspire continued investment in AI for a more efficient, equitable, and citizen-centric public service landscape.

Initiative and Drive
Level 1 & Level 2
• Identifying public service challenges where AI can offer solutions. • Exploring new and creative ways to leverage AI for public good. • Anticipating and navigating challenges related to technology, ethics, and public acceptance.

4.3.4. Decision Making

Decision making involves making timely decisions that takes into account relevant facts, tasks, goals, constraints, risk and conflicting points of view. Senior public officials steering the AI project development and deployment are required to weigh potential benefits and risks of AI and make decisions based on evidence gathered through data analysis and pilot projects. This competency also requires senior officials to account diverse perspectives of key stakeholders to ensure that final decisions are taken considering potential impact on vulnerable and marginalised sections of the society. Given that the AI technology landscape is constantly evolving, these officials should also be able to adapt and improvise decisions based on new information or emerging challenges.

Decision Making

Level 1 & Level 2

- Weigh the potential of AI against ethical concerns, data privacy, and unintended consequences.
- Base choices on evidence from data analysis and pilot projects.
- Involve stakeholders (citizens, AI experts, researchers and industry bodies) for well-rounded decisions.
- Explain the rationale behind AI implementation decisions.

4.3.5. Trust

Trust is a critical skill for senior officials leading the design and implementation of AI projects in the public sector. It involves placing confidence in technical expertise, decision making and management abilities of the team. This trust-based approach not only encourages collaboration but also ensures a more successful AI development and implementation process, as team members feel supported and confident in their roles.

Delegation

Level 1 & Level 2

- Trusting the technical and decision-making abilities of the team, fostering an environment where independent problem-solving is encouraged.
- Trusting the team to adhere to ethical standards and responsible AI practices, ensuring the integrity of AI solutions.

4.4. Support Structure to Support Behavioural Competencies

Public officials may access the following support programmes/ training programmes designed by the government and international bodies to upskill themselves in harnessing the benefits of AI.

Support Programmes/ Government Initiatives

- Introduction to Emerging Technologies[83]
- Basics of Public Policy Research[84]
- Evidence-based Policy Making[85]
- Problem Solving and Decision Making[86]
- Efficiency: Competency Framework[87]
- Design Thinking for Excellence in Public Services[88]
- Leadership
- People, Politics and Change

83 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
84 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
85 iGOT Karmayogi, 'Homepage' (2024)<https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
86 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
87 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
88 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024

CHAPTER 5

Functional competencies

5.1. Introduction

Functional Competencies in AI refers to a broad range of practical skills, knowledge and understanding required to effectively engage with and leverage Artificial Intelligence technologies. These competencies address the operational needs of a government and are universally applicable across all government ministries, and departments. For example, financial management, project management, data analysis, and government procurement are essential skills in various government organisations.[89] Incorporating these Competencies could help public officials in recognising opportunities, evaluate feasibility and risks, work with experts, interpret and utilise AI findings, ensure responsible AI usage, and stay informed about the latest advancements and trends in the rapidly evolving landscape of AI. Thus, these competencies feed into the border objective of harnessing the transformative potential of AI to enhance public service provision, improve policy development, and foster a fair and inclusive society.

5.1.1. AI Literacy:

AI literacy is a set of competencies that enables an individual to understand and critically evaluate AI technologies; communicate and collaborate with AI; and use it as a tool for various applications.[90] In the context of government officials, AI literacy involves having sufficient levels of understanding of technical capabilities, limitations and societal implications of AI.[91] This depth of their knowledge could be based on numerous factors,

89 Capacity Building Commission, Annual Capacity Building Plans Approach Paper (2022) <https://cbc.gov.in/sites/default/files/ACBP_Approach-Paper.pdf> accessed 7 August 2024

90 Duri Long and Brian Magerko, 'What is AI Literacy? Competencies and Design Considerations' (23 April 2020) Association for Computing Machinery <https://doi.org/10.1145/3313831.3376727> accessed 7 August 2024

91 Davy Tsz Kit Ng and others, 'Conceptualizing AI literacy: An exploratory review' (2021) 2 Computers and Education: Artificial Intelligence <https://www.sciencedirect.com/science/article/pii/S2666920X21000357> accessed 8 August 2024

namely, individual roles, technical expertise, educational background, practical experience, and the specific AI systems employed within a given context. [92]

AI literacy enables the government officials to identify realistic applications of AI, make informed decisions on automating decisions, analysing datasets and adopting suitable AI solutions. Having an understanding of limitations and societal implications of AI allows them to monitor and address potential biases, ensuring fairness and equity in AI-driven decisions. Furthermore, by implementing transparent and accountable AI systems, they can uphold ethical standards and foster public trust. It also empowers them to contextualise AI within their operations or mandate which contributes to the longevity, and effectiveness of the AI solution.

AI Literacy		
Level 1	**Level 2**	**Level 3**
Basic knowledge of what AI is, including key concepts like machine learning, deep learning, natural language processing, and data analytics. Awareness of what AI can and cannot do, including its strengths in pattern recognition and automation, as well as its limitations. Awareness of how AI is being used in government services, such as automating administrative tasks, improving citizen services, and supporting decision-making. How AI can enhance decision-making, improve efficiency, and provide insights in public policy and governance. Knowledge of global trends in AI development, adoption, and the competitive landscape in various sectors. Commitment to ongoing learning and staying updated on AI advancements and their implications for governance.	Basic knowledge of AI, including machine learning, deep learning, algorithms, and data analytics. Familiarity with AI technologies, tools, and platforms commonly used in the public sector. Understanding of specific AI applications in government specifically benefiting directly to citizens, such as predictive analytics, automation of routine tasks, and citizen services enhancement. Knowledge of the AI project lifecycle, including planning, development, deployment, and monitoring. Understanding ethical considerations in AI deployment, such as avoiding bias, ensuring transparency, and maintaining accountability. Keeping up with the latest developments in AI technologies, methodologies, and their implications for government operations.	Basic knowledge of AI technologies and their practical applications. Familiarity with common AI-related terms used in the workplace. Ability to assist in the planning, coordination, and execution of AI projects, including gathering data, preparing reports, and managing documentation. Awareness of the basic ethical considerations related to AI, such as avoiding bias and ensuring fairness in AI outputs. Staying updated with basic AI developments and understanding how these might affect their role and responsibilities.

5.1.2. Public procurement for AI solutions:

Public Procurement refers to the process by which government organisations/ departments/ ministries purchase goods of services from the private sector.[93] It is a crucial pillar of service

92 UNESCO, Broadband Commission for Sustainable Development and International Telecommunication Union, 'Artificial intelligence and digital transformation: competencies for civil servants' (2022) Working Group Report on AI Capacity Building <https://unesdoc.unesco.org/ark:/48223/pf0000383325> accessed 8 August 2024

93 Startup India, Ministry of Commerce and Industry <https://www.startupindia.gov.in/content/sih/en/public_procurement.html> accessed 7 August 2024

delivery and an essential component of the government operations framework. The Public Procurement is an important channel for resource allocation, and achieving policy objectives to meet public needs. Public procurement accounts for a significant portion of taxpayers money. Thus, an efficient and effective procurement system is indispensable to meet timelines and ensure success of various government initiatives. A poorly designed and managed public procurement process can lead to inefficiency, mismanagement of funds, rent-seeking behaviour and undermine public trust in the government services.[94] Numerous jurisdictions and international organisations[95] have introduced guidelines[96], best-practices and recommendations on AI procurement. In India, Government procurement of AI goods and services is governed under General Financial Rules (GFR) and additional guidelines set by individual agencies. The process typically involves government agencies publishing Request for Proposal (RFP) outlining their requirements and invites companies to submit their proposals outlining their capabilities. GFR currently lacks specific regulations for AI procurement. Despite the lack of explicit rules on AI procurement, the government agencies and officials can promote responsible AI by outlining clear requirements and ensuring its implementation.[97]

Given AI solutions are socio-technical systems and require careful consideration due to their complexity, reliance on vast datasets. Government officials should ensure that procured AI systems are unbiased, align with ethical guidelines, and avoid unintended consequences. They should be aware of technical capabilities, data requirements, scalability, and potential risks to ensure value for money and public trust. Government officials should also understand the evolving AI landscape, identify innovative solutions, and engage with diverse vendors, including startups and Small and Medium Enterprises (SMEs), to foster innovation and competition.[98] The public official should ensure that they understand and document key information such as training and testing data, performance metrics, algorithmic bias, inputs, and outputs. This would allow the public official to understand if the given AI system is well-suited for the intended task and its alignment with the needs of the organisation. This could also be helpful in early detection of potential bias that can lead to unfair and discriminatory bias, ultimately enhancing the government officials' accountability towards the citizens.

94 Karan Gulati and Anjali Sharma, 'An evaluation framework for public procurement processes' (2024) Working Papers 6, Trustbridge Rule of Law Foundation <https://ideas.repec.org/s/bjd/wpaper.html> accessed 8 August 2024

95 World Economic Forum, 'AI Procurement in a Box' (2020) <https://www.weforum.org/publications/ai-procurement-in-a-box/> accessed 8 August 2024

96 Office for Artificial Intelligence, Guidelines for AI procurement (June 2020) <https://assets.publishing.service.gov.uk/media/60b356228fa8f5489723d170/Guidelines_for_AI_procurement.pdf> accessed 8 August 2024

97 Diya Uday, 'Reinventing India's procurement laws: a global perspective' (November 2023) XKDR Working Paper 28 <https://papers.xkdr.org/papers/Uday2023_reinventingIndiasProcurementLawsAGlobalPerspective.pdf> accessed 8 August 2024

98 SCBW-Artificial Intelligence (AI) for Digital Transformation & Generative AI Tools for Digital Transformation, Kerala, 19-20 October, 2023

Government Procurement of AI Solutions		
Level 1	**Level 2**	**Level 3**
Understanding of the strategic importance of AI in public procurement and its role in achieving policy objectives. Ability to oversee the entire procurement process, ensuring compliance with General Financial Rules (GFR) and additional guidelines, and promoting transparency and accountability. Competence in identifying and mitigating risks associated with AI procurement, including ethical concerns, data privacy, and potential biases. Skills in making high-level decisions regarding budget allocation, final RFP approval, and vendor selection. Proficiency in engaging with various stakeholders, including senior government officials, vendors, and the public, to build trust and ensure alignment with government priorities.	Skills in managing the procurement process, including drafting RFPs, managing vendor selection, and ensuring contract adherence. Ability to skillfully negotiate contracts that address aspects related to data ownership, IP rights, liability and performance metrics of AI. Competence in evaluating technical proposals from vendors, understanding AI capabilities, data requirements, and scalability. Ability to oversee the deployment and impact assessment of AI solutions. Proficiency in analysing data related to AI procurement and implementation, identifying potential biases, and ensuring data quality. Staying informed about the latest trends in AI, vendors and best practices on government procurement of AI.	Fundamental knowledge of AI technologies and their practical applications. Skills in supporting the procurement process, including facilitating vendor communication, managing RFP document distribution, and assisting with contract finalisation. Ability to document key information such as training and testing data, performance metrics, and algorithmic bias, and prepare reports for mid-level and senior officers.

5.1.3. Understanding AI Policy Architecture

Understanding AI Policy Architecture for public officials can be understood as the ability to comprehend and navigate the complex framework and regulations that govern the development and deployment of AI systems. This competency requires a unique blend of foundational understanding of AI (as described above), ethical considerations, and policy development expertise.

Acquiring this competency allows the government official to ensure AI systems align with existing laws, regulations, and ethical standards, and serve the citizen interests. While crafting policies or policy recommendations related to AI, public officials can benefit from understanding the technical architecture and previous implementations of AI systems, which helps them identify potential technical challenges, anticipate unintended consequences, and develop more effective policy solutions.[99] By combining technical understanding of AI with policy expertise, public officials can create more effective, practical, and informed policies and promote responsible AI use in government.

99 Gagan Deep Sharma, Anshita Yadav, Ritika Chopra, 'Artificial intelligence and effective governance: A review, critique and research agenda' (2020) 2 Sustainable Futures <https://doi.org/10.1016/j.sftr.2019.100004> accessed 8 August 2024

Understanding AI Policy Architecture		
Level 1	**Level 2**	**Level 3**
Basic understanding of AI concepts and technologies. Awareness of ethical implications such as bias, fairness, transparency, and accountability. Basic understanding of existing policies and regulations. Ability to identify gaps and assist in formulating evidence-based policy recommendations. Awareness of current trends and future challenges in AI. Basic ability to adapt to changes in AI technologies.	Understanding of AI concepts and technologies. Ability to identify and address ethical implications of AI deployment. Strong analytical and research skills to understand and develop policies. Flexibility and adaptability in policymaking. Aware of the gaps/challenges and other learnings encountered in similar past projects. Commitment to regularly updating knowledge and skills.	Understanding of AI concepts and technologies. Understanding of ethical implications and ability to implement ethical guidelines. Expertise in policy development and analysis. Analyse the community feedback to support policymaking.

5.1.4. Data Management

Data Management can be understood as a comprehensive process of collecting, organising, storing, accessing, and protecting data to ensure its quality and usability. For government officials, effective data management is essential to ensure efficient delivery of effective and targeted public services. Government agencies have access to vast datasets, unmatched in breadth and granularity, collected through normal functions such as census data.[100] The Indian government has come up with numerous data platforms or data banks to enhance transparency, data-driven decision making and encourage innovation. Key platforms include Open Government Data (OGD) Platform[101] which provides access to diverse government datasets; National Data Analytics Platform (NDAP)[102] to support in-depth data analysis and policy making; India Urban Data Exchange (IUDX) for facilitating data exchange among various data platforms, third party applications, data producers and consumers.[103] Additionally, under the IndiaAI Mission pillar, the IndiaAI Datasets Platform will streamline access to high quality non-personal data-sets for AI Innovation.[104] These platforms collectively aim to make government data accessible, enabling better governance, foster innovation and entrepreneurship in India. Properly managed data enables the government to optimise e-government services, enhanced decision-making processes using predictive modelling, and ensures transparency and accountability in public administration.[105]

In the realm of AI, effective data management is foundational to ensuring the accuracy, reliability and ethical AI systems.[106] It allows public officials to curate high-quality and relevant data sets prerequisite for training AI models, thereby reducing biases and

100 Asian Development Bank and Amazon Web Services Institute, 'Data Management Policies and Practices in Government' (December 2022) <https://dx.doi.org/10.22617/TCS220582-2> accessed 8 August 2024

101 Open government data platform India <https://www.data.gov.in/> accessed 8 August 2024

102 National Data and Analytics Platform <https://ndap.niti.gov.in/> accessed 8 August 2024

103 India Urban Data Exchange, Ministry of Housing and Urban Affairs <https://smartcities.gov.in/India_Urban_Data_Exchange> accessed 8 August 2024

104 Press Information Bureau, 'Cabinet Approves Ambitious IndiaAI Mission to Strengthen the AI Innovation Ecosystem' (7 March, 2024) <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2012355> accessed 8 August 2024

105 Asian Development Bank and Amazon Web Services Institute, 'Data Management Policies and Practices in Government' (December 2022) <https://dx.doi.org/10.22617/TCS220582-2> accessed 8 August 2024

106 Open Access Government, 'Data governance and government: The need for effective and protective data management' (5 December, 2024) <https://www.openaccessgovernment.org/data-governance-and-government-the-need-for-effective-and-protective-data-management/170975/> accessed 8 August 2024

improving fairness and inclusivity aspects of AI systems.[107]

In order to attain this objective, public officials should be able to develop a strategic vision that prioritises data as a valuable government asset. It includes setting up data governance policies that promote data sharing while ensuring privacy and security. Government organisations may also create dedicated agencies or frameworks for data management, implement data classification and protection regulations, and invest in capacity building to develop in-house expertise. Identifying quick wins and scaling up data usage gradually can secure stakeholder buy-in and demonstrate the tangible benefits of well-managed data in public sector initiatives.

Government officials can individually contribute to effective data management though multiple ways. This involves enhancing data literacy and promoting data-driven decision making within their teams. This includes advocating for the use of data in decision-making and adhering to data governance policies to ensure data is handled securely and appropriately. Officials can foster collaboration across departments to break down data silos and improve accessibility, while also implementing best practices in their daily tasks, such as proper data classification, secure storage, and regular data purging.[108] Additionally, they can advocate for necessary resources like training and technology to support data management efforts, engage in strategic planning to align data initiatives with public service goals, and stay informed about emerging trends to keep practices relevant.[109]

Data Management		
Level 1	**Level 2**	**Level 3**
Develop and communicate a strategic vision for data management within the AI system development process. Ensure that data governance policies are in place, promoting a culture of data integrity, security, and ethical use. Ensure adequate resources and investments are available for data infrastructure that align with the organisation's strategic goals. Monitor and enforce compliance with data management regulations and policies.	Implement data management policies at the operational level. Facilitate data sharing and integration across departments, ensuring that data is accessible and usable for AI system development. Oversee the processes for data collection, classification, and storage, ensuring data quality and relevance. Implement procedures for regular data audits to maintain accuracy and consistency in AI training datasets.	Execute data collection, organisation, and processing tasks to prepare datasets for AI system development. Ensure that data is properly classified, securely stored, and readily accessible for analysis. Work closely with other departments and stakeholders to facilitate data sharing and integration. Communicate data requirements and constraints to ensure the seamless operation of AI development processes.

107 Aiswarya Raj Munappy and others, 'Data management for production quality deep learning models: Challenges and solutions' (2022) 191 Journal of Systems and Software <https://doi.org/10.1016/j.jss.2022.111359> accessed 8 August 2024

108 Axel Domeyer and others, 'Government data management for the digital age' (McKinsey & Company, 2 September 2021) <https://www.mckinsey.com/industries/public-sector/our-insights/government-data-management-for-the-digital-age> accessed 8 August 2024

109 OECD, 'The Path to Becoming a Data-Driven Public Sector' (2019) OECD Digital Government Studies <https://doi.org/10.1787/059814a7-en> accessed 8 August 2024.

5.1.5. Data Governance

Data Governance refers to a set of framework, guidelines or toolkit encompassing how data is collected, stored, used and shared within various government departments. It also includes defining policies, procedures, roles, and responsibilities to ensure data quality, integrity, security, and compliance.[110] In the context of AI, data governance helps in ensuring that data used for training to AI models is not incomplete, free from bias, ethically and responsibly applied.[111] Transparent and accountable data handling practices foster trust in government organisations, and adherence to data privacy and security regulations ensures that its collection and use is in accordance with legal requirements.[112] Public officials involved in AI development must possess a multifaceted skill set that includes technical understanding, policy awareness, ethical grounding, and strong communication to effectively contribute to data governance.[113]

To this end, public officials should possess a sound understanding of core data governance principles such as accountability, transparency, integrity, inclusivity, data quality, availability, and security.[114] In order to effectively apply these principles, one must also be aware of legal and regulatory landscape, such as the National Data Sharing and Accessibility Policy (NDSAP)[115] and the Data Protection and Privacy Act (DPDP Act)[116], which govern data use in the public sector. In addition, public officials should also be aware of Public officials should be familiar with the evolving landscape of international data governance and standards. For instance, Global data access frameworks provide standardised approaches for data sharing and interoperability across borders, ensuring that data can be used effectively and ethically on an international scale. Understanding other data governance frameworks such as DAMA-DMBOK[117] and COBIT[118] could also be helpful. Understanding data standards, metadata management, and interoperability principles is also crucial to ensuring data quality, consistency, and responsible sharing across AI systems.

110 Ibid.
111 Global Partnership on AI (GPAI), 'The Role of Government as a Provider of Data for Artificial Intelligence: Interim Report' (November 2023).
112 Global Partnership on AI (GPAI), 'The Role of Government as a Provider of Data for Artificial Intelligence: Phase 1 Full Report (May 2024).
113 Ibid.
114 National Academies of Sciences, Engineering, and Medicine, Human-AI Teaming: State-of-the-Art and Research Needs(The National Academies Press, 2022) <https://doi.org/10.17226/26355> accessed 8 August 2024.
115 The National Data Sharing and Accessibility Policy (NDSAP) promotes the sharing of non-sensitive government data with the public, enabling transparency, innovation, and evidence-based policy-making.
116 The Digital Personal Data Protection Act 2023
117 The Data Management Association International (DAMA) is a leading organisation for data professionals by developing a comprehensive body of data management standards and practices.The DAMA International's Guide to the Data Management Body of Knowledge (DMBOK) brings together materials that comprehensively describe the challenges of data management and how to meet them. See here: Data Management Association International (DAMA), 'Homepage' (2024) <https://www.dama.org/cpages/home> accessed 8 August 2024.
118 COBIT (Control Objectives for Information and Related Technologies) is a framework created by ISACA (Information Systems Audit and Control Association) for developing, implementing, monitoring, and improving IT governance and management practices. See here: ISACA, 'COBIT' (2024) <https://www.isaca.org/resources/cobit#1> accessed 8 August 2024. and Parth Patil, 'Data Governance Framework: A Comprehensive Guide to COBIT Implementation' (Medium, 2024) <https://medium.com/@parth.patil20/data-governance-framework-a-comprehensive-guide-to-cobit-implementation-97e06eca779a> accessed 8 August 2024.

Data Governance		
Level 1	**Level 2**	**Level 3**
Align data governance strategies with broader organisational and national frameworks, such as the Global Data Access Framework and NDSAP. Oversee compliance with legal and regulatory requirements such as the DPDP Act, and ensure that ethical considerations are embedded in AI development processes. Lead efforts to identify and mitigate risks related to data governance, including biases, data breaches, and misuse of AI.	Implement data governance policies across departments, ensuring data is managed according to established standards for security, privacy, and quality. Facilitate data sharing and collaboration while maintaining compliance with data protection regulations. Oversee the management of data across its lifecycle, ensuring data integrity, accuracy, and relevance at each stage. Provide training programs to enhance the data governance skills of team members, focusing on AI-specific competencies such as bias mitigation, explainability, and data security.	Execute day-to-day data governance tasks, including the collection, classification, and secure storage of data. Adhere to data governance policies and ensure compliance with relevant regulations during AI system development. Manage sensitive information responsibly, ensuring data privacy and ethical use in line with the organisation's standards and legal requirements.

5.1.6. Data Analytics

Public Officials require technical data skills, AI knowledge, domain expertise and strong communication skills to leverage data analytics in developing and implementing AI systems in the public sector. In order to achieve this, the public officials should have the ability to analyse data, interpret findings, and share insights to support well-informed decisions and enhance public services. It requires proficiency in foundational data skills including understanding data types, structures, and sources, working with large datasets and understanding basic statistical concepts. AI-specific data analytics skills are crucial, such as understanding machine learning basics, performing feature engineering, and evaluating AI model performance. Proficiency in data analysis languages like Python, familiarity with analytics and visualisation tools like Tableau and Power BI, and a basic understanding of cloud platforms like AWS, Azure, and Google Cloud are necessary to handle large datasets efficiently.[119] The government has also established the Centre for Excellence for Data Analytics (CEDA)[120] to enhance government adoption of advanced analytics and machine learning. CEDA supports government organisations in defining analytical needs, identifying relevant datasets, determining access to datasets, and building data analytic solutions.[121] By mastering these competencies, public officials can ensure that AI and data analytics are used responsibly and effectively, leading to enhanced public services and better decision-making for the benefit of society.

119 Jessica Gover, 'How to Do Data Analytics in Government' (2024) government technology <https://www.govtech.com/data/how-to-do-data-analytics-in-government.html> accessed 8 August 2024.
120 Centre of Excellence for Data Analytics, 'Homepage' (2024) <https://ceda.gov.in/> accessed 8 August 2024.
121 National Informatics Centre, 'Data Analytics' (2024) <https://www.nic.in/data-analytics/> accessed 8 August 2024.

Data Analytics		
Level 1	**Level 2**	**Level 3**
Ability to define long-term data analytics goals aligned with broader government strategies.	Proficiency in developing detailed plans for data collection, analysis, and application in AI projects.	Understanding of data types, structures, and sources.
Skills in approving and allocating significant resources for data analytics initiatives.	Ability to manage resources efficiently to support data analytics activities.	Ability to perform basic data analysis and create simple visualisations to support project goals.
Capacity to ensure that data analytics practices comply with regulatory requirements and promote public trust.	Skills in monitoring data quality and ensuring compliance with established data governance policies.	Skills in preparing and maintaining data documentation and reports.
Ability to use data-driven insights to inform policy decisions and advocate for data analytics initiatives.	Ability to lead data analytics teams and coordinate efforts with domain experts and policymakers.	Ability to assist data scientists and analysts with data-related tasks.
Skills in identifying, evaluating, and mitigating high-level risks associated with data analytics, such as data privacy issues and ethical concerns.	Strong skills in communicating data insights and analytics findings to stakeholders.	Basic skills in communicating data findings and updates to team members.
	Skills in conducting detailed risk assessments related to data analytics projects.	Proficiency in managing administrative tasks related to data analytics projects, such as scheduling meetings and maintaining project documentation.

5.1.7. Financial management for AI projects

Effective financial management of AI projects in government necessitates combining conventional financial expertise, comprehension of the distinctive elements of AI development, and a commitment to ethical and accountable AI principles. By acquiring and cultivating these skills, government officials can ensure that AI investments generate maximum value for the public good. It also entails comprehending the benefits of planning resource allocation. The officials should be able to articulate the benefit realisation of planning resource allocation which allows them to ensure that resources are efficiently distributed across different stages of AI development and deployment balancing short term needs and long term sustainability.

The competency requires a deep understanding of AI cost drivers such as data acquisition and data preparation, expenses related to infrastructure and software, salaries, benefits, and training costs for AI specialists (data scientists, engineers, and ethicists), and costs for ongoing maintenance and operations of AI systems. Effective financial management competency requires identifying and evaluating financial risks, such as data breaches, or project failures. It can be accomplished by implementing systems to monitor and manage project expenses, ensuring adherence to budget limits. Additionally, government

officials may also consider establishing clear metrics and reporting methods to track the financial performance of AI projects and identify areas for enhancement. Understanding procurement regulations and best practices for acquiring AI-related goods and services from vendors is crucial, as is ensuring transparency and obtaining value for money. Additionally, officials may also use data analytics and integrate data driven decision making which will help them to facilitate informed decision-making at every stage of the AI project.[122] While doing so, public officials should ensure that AI project budgets align with broader government priorities, strategic goals, and long-term technology roadmaps. This alignment ensures that AI initiatives support overall governmental objectives and contribute to strategic advancements.

AI Financial Management		
Level 1	**Level 2**	**Level 3**
Expertise in defining long-term financial goals and aligning them with broader government strategies.	Ability to develop comprehensive budgets, including understanding AI cost drivers.	Basic understanding of AI cost drivers and project budgeting.
Ability to approve and allocate significant budgets for AI projects.	Skills in resource allocation to balance short-term needs with long-term project sustainability.	Ability to assist in preparing budget documents and estimates.
Skills in identifying, evaluating, and mitigating financial risks at a strategic level.	Proficiency in tracking project expenditures and performance against budget limits.	Skills in tracking project expenses and maintaining financial records. Ability to assist in preparing financial reports and summaries.
Capacity to establish systems for high-level financial oversight and control.	Ability to establish and use clear metrics and reporting methods for financial performance.	Basic skills in analyzing financial data and identifying discrepancies.
Knowledge of procurement regulations and best practices.	Skills in conducting detailed financial risk assessments and implementing mitigation strategies.	Skills in documenting and conveying financial updates and issues.
Proficiency in using financial insights to inform policy decisions.	Knowledge of procurement regulations and practices.	
	Skills in integrating financial insights into project decision-making.	

5.1.8. AI Project Management

AI Project Management competency refers to the ability of public officials to effectively oversee, manage and execute AI projects. It requires a combination of traditional project management skills, specialised knowledge of AI and a strong commitment towards public service. The traditional project management skills involve the ability to plan, organise and manage resources to bring about successful completion of AI projects. This also includes defining project scope, developing detailed project plans, managing budgets and resources, coordinating team activities, monitoring progress, identifying and mitigating

122 Crystal Layland, 'How AI is Transforming Project Financial Planning' (LinkedIn, March 2024) <https://www.linkedin.com/pulse/how-ai-transforming-project-financial-planning-crystal-layland-7tybc/> accessed 8 August 2024.

risks, and ensuring timely delivery of project outcomes. It also involves the public officials to understand the core AI concepts, technologies (such as machine learning, deep learning, and natural language processing), and their applications across various sectors. This technical skill set should be combined with dedication to serve citizens, while maintaining transparency, accuracy and ethical conduct in all the actions.

The AI project management competency can help public officials in ensuring responsible and efficient development, deployment and use of AI tools and technologies. It can improve the quality of public services, enhance operational efficiency and increase public trust in government led AI projects.

AI Project Management		
Level 1	**Level 2**	**Level 3**
• Define project needs, purpose, and desired outcomes. • Allocate budget and resources. • Receive regular project updates. • Address major roadblocks and concerns. • Ensure alignment with project goals and government priorities. • Establish performance metrics for the AI model. • Review model outputs and identify potential biases. • Initiate corrective actions for data or model issues. • Present findings to stakeholders and develop future strategies.	• Conduct research on existing AI solutions. • Gather data on potential benefits and risks. • Prepare initial cost estimates. • Provide technical guidance and clarify project requirements. • Monitor progress and budget expenditure. • Communicate issues and delays to senior officials. • Oversee deployment within government infrastructure. • Develop training materials and user guides. • Conduct impact assessments. • Generate reports on model performance and building efficiency. • Conduct statistical analysis of model performance data.	• Basic understanding of AI concepts and data management. • Proficiency in administrative and support tasks for project management. • Ability to assist in communication and coordination efforts. • Collect and analyse project data to track progress. • Maintain project files and documentation. • Gather user feedback on the deployed model. • Document data quality issues and model outputs. • Extract relevant data and prepare reports for mid-level officers. • Assist in the development of presentations for stakeholders.

5.1.9. AI Stakeholder Engagement and Management

Public officials play an extremely crucial role in promoting trust and ensuring responsible usage of AI by involving a wide range of stakeholders. Effective stakeholder engagement and management requires a combination of robust communication skills, relationship management and conflict resolution expertise. By honing these skills, government officials can foster confidence, build consensus and early buy-in, and ensure that AI technologies are developed and deployed responsibly and beneficially for all.[123]

A fundamental requirement of this competency is identifying and acknowledging diverse stakeholders that are instrumental shaping AI systems.[124] Public officials are often subjected to complex and intricate challenges that necessitate technological interventions/ AI-led solutions. The development and implementation of such AI solutions can impact a wide range of actors. Thus securing buy-in for all relevant actors is necessary to ensure long-term efficacy and sustainability of these AI systems. These stakeholders include, internal entities such as government agencies, policymakers, technical teams, legal advisors, as well as external parties such as citizens, community groups, industry experts, academics, civil society organisations, and media.[125]

Establishing strong communication channels with stakeholders is key to creating a trustworthy and equitable environment for AI projects. Public officials should be able to explain complex AI concepts in easily understandable terms to non-technical audiences, addressing their concerns, and managing expectations effectively. The primary goal of this exercise is to communicate the objective, goal, methods of data collection, data usage, potential risks, and risk mitigation measures of AI projects. The public officials should also be able to integrate the viewpoints and feedback of stakeholders.[126] A range of engagement methods may be adopted for this purpose. This may include public consultation (town hall meetings, online surveys, focus groups), expert workshops (bringing together technical experts, ethicists, and policymakers to discuss specific AI challenges), citizen assemblies (engaging randomly selected citizens in deliberative processes to provide input on AI policy) and using online platforms and social media for information dissemination, feedback collection, and interactive dialogues. Efforts should be made to ensure that these engagement processes are accessible to all stakeholders, regardless of language, literacy level, or technological proficiency.

A crucial aspect of this competency is the ability to resolve disagreements among stakeholders and build consensus. Promoting productive discussions and resolving conflicts between stakeholders with diverse viewpoints on AI will aid in reducing project delays, implementation challenges and public resistance.

123 Tommaso Balbo di Vinadio and others, 'Artificial Intelligence and Digital Transformation: Competencies for Civil Servants' (2022) UNESCO <https://unesdoc.unesco.org/ark:/48223/pf0000383325> accessed 8 August 2024.
124 Gloria J Miller, 'Stakeholder Roles in Artificial Intelligence Projects' (December 2022) 3 Project Leadership and Society <https://doi.org/10.1016/j.plas.2022.100068> accessed 8 August 2024.
125 Ibid.
126 Society Inside and European Centre for Not-for-Profit Law, 'Framework for Meaningful Stakeholder Involvement in the Design of Products and Services Using Artificial Intelligence' (July 2023) <https://static1.squarespace.com/static/5fc12cea2cf09257bd6dcc01/t/64c2a61a714e6a11b537d4d4/1690478119469/Updated+FME+for+AI+-+July+2023.pdf> accessed 8 August 2024.

AI Stakeholder Management and Engagement		
Level 1	**Level 2**	**Level 3**
Expertise in developing and implementing comprehensive stakeholder engagement strategies.	Proficiency in identifying and categorising stakeholders based on their influence and interest.	Basic ability to identify and acknowledge diverse stakeholders affected by AI
Ability to align stakeholder engagement with broader project goals and government priorities.	Ability to analyse stakeholder perspectives and anticipate potential concerns.	Ability to explain basic AI concepts in understandable terms to non-technical audiences.
Advanced communication skills to advocate for AI initiatives and explain their importance to high-level stakeholders.	Ability to communicate complex AI concepts effectively to diverse stakeholder groups.	Assist in drafting and distributing communication materials to stakeholders.
Ability to make strategic decisions based on stakeholder input and align them with project objectives.	Skills in creating clear and concise communication materials that address stakeholder concerns and manage expectations.	Familiarity with various engagement methods such as public consultations, online surveys, and focus groups.
	Ability to use feedback to inform policy recommendations and project adjustments.	Ability to assist in organising and facilitating these engagement activities.
		Basic skills in gathering and documenting stakeholder feedback.

5.2. Support Structure to Support Functional Competencies

The following support structure/ training programmes have been instituted by the government and other international bodies to upskill public officials with the functional competencies needed to harness the benefits of AI.

Support Programmes/ Government Initiatives

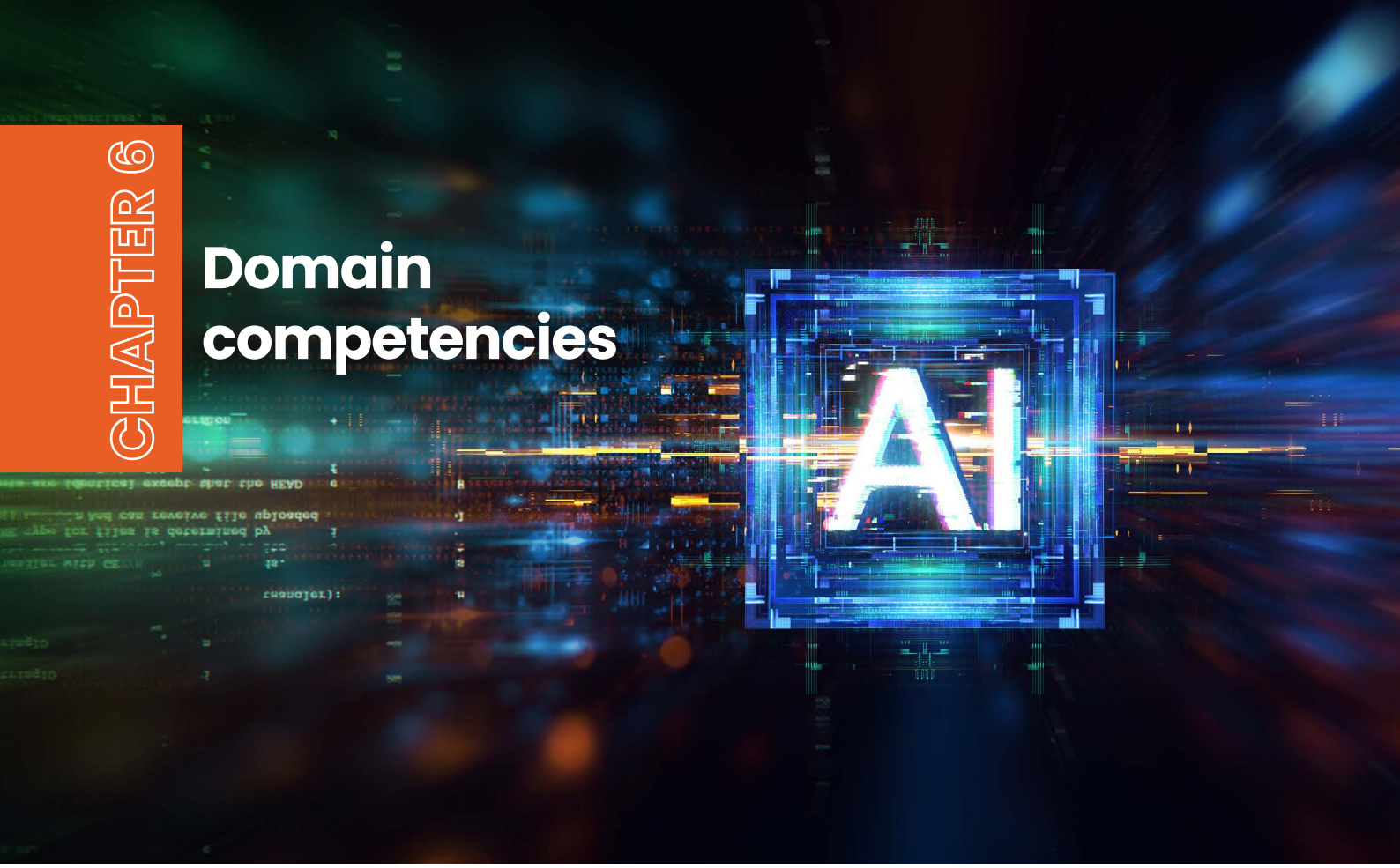
- Exploratory Data Analysis[127]
- Data Structures and Algorithms[128]
- Big Data Foundation[129]
- AI Application with Watson[130]
- Data Driven Decision Making for Government[131]
- Insights from Data for Policy[132]
- AI for Everyone[133]
- Applications of AI/ML (Physical programme)[134]
- Introduction to Emerging Technologies[135]
- Digital Personal Data Protection Act, 2023: An Overview[136]
- AI for Digital Transformation: Machine Learning and Deep Learning[137]
- AI for Digital Transformation: Computer Vision[138]
- ChatGPT and Generative AI tools: An Introduction[139]
- Digital Personal Data Protection Act, 2023: An Overview[140]
- Digital Government Senior Leaders' Programme (Physical course)[141]
- Applications of AI/ML in managing DPG[142]
- Big Data and Data Analytics[143]
- AI Champions & Catalysts in Digital Transformation (Coming up)[144]

- Introduction to Data Analysis for Government[145]

127 FutureSkills Prime, 'Exploratory Data Analysis' (2024) <https://futureskillsprime.in/artificial-intelligence-and-machine-learning/exploratory-data-analysis> accessed 8 August 2024.
128 FutureSkills Prime, 'Data Structures & Algorithms' (2024) <https://futureskillsprime.in/artificial-intelligence-and-machine-learning/data-structures-algorithms> accessed 8 August 2024.
129 FutureSkills Prime, 'Big Data Foundation' (2024) <https://futureskillsprime.in/data-analytics/big-data-foundation> accessed 8 August 2024.
130 FutureSkills Prime, 'AI Applications with Watson' (2024) <https://futureskillsprime.in/artificial-intelligence-and-machine-learning/ai-applications-with-watson> accessed 8 August 2024.
131 iGOT Karmayogi, 'Homepage' (2024) < https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
132 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
133 Coursera, 'AI For Everyone' (2024) <https://www.coursera.org/learn/ai-for-everyone> accessed 8 August 2024.
134 National e-Governance Division, 'Training Calendar' (2024) <https://negd.gov.in/training-calendar/>accessed 8 August 2024.
135 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
136 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
137 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
138 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
139 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
140 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
141 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 8 August 2024.
142 National e-Governance Division, 'Training Calendar' (2024) <https://negd.gov.in/training-calendar/>accessed 8 August 2024.
143 National e-Governance Division, 'Training Calendar' (2024) <https://negd.gov.in/training-calendar/>accessed 8 August 2024.
144 National e-Governance Division, 'Capacity Building' (2024) <https://negd.gov.in/capacity-building/ >accessed 8 August 2024.
145 Udemy, 'Introduction to Data Analysis for Government' (2024)<https://www.udemy.com/course/introduction-to-data-analysis-for-government/>accessed 8 August 2024.

CHAPTER 6

Domain competencies



6.1. Introduction

AI Domain Competencies refers to specific knowledge, skills, and expertise required by government officials to leverage AI within a specialised domain/ field. These domain competencies have been designed to be applicable to core areas of focus of a government ministry, department or organisation tailored to the unique challenges, data, and requirements of the domain in question.[146]

This report focuses on five priority sectors where AI can drive transformative impact, aligning with government policies and initiatives.[147] These include: Agriculture, Health, Education, Smart Cities and Infrastructure, and Smart Mobility.

Notably, domain-specific competencies have been carefully designed and developed for each of these sectors, enabling the effective application of AI solutions to address unique challenges and opportunities. By leveraging these domain competencies, we can unlock AI's potential to drive innovation, improve outcomes, and enhance decision-making in these critical areas

6.1.1 Agriculture

6.1.1.1 Overview

Agriculture is the cornerstone of the Indian economy, employing nearly half of the Indian population and contributes 17.5 to 18 per cent to its Gross Domestic Product (GDP).[148] It is

146 Capacity Building Commission, Annual Capacity Building Plans Approach Paper (2022) <https://cbc.gov.in/sites/default/files/ACBP_Approach-Paper.pdf> accessed 8 August 2024

147 National Strategy on AI, Global Partnership on AI priorities, and Digital India initiatives supported by MeitY

148 'Agri & allied sector contribution to GDP can further rise by strengthening marketing; FPOs are key: Amit Shah' (The Hindu, 14 July, 2023) <https://www.thehindu.com/news/national/agri-allied-sector-contribution-to-gdp-can-further-rise-by-strengthening-marketing-fpos-are-key-amit-shah/article67079679.ece> accessed 8 August 2024

also critical to ensuring food security for 1.3 billion people. Despite global challenges and climate variability, this sector has shown remarkable resilience with record production of 329 7 million tonnes of food grains in FY23, a significant increase from the previous year by 14.1 million tonnes. India has established itself as the world's largest producer of milk, pulses and spices. Besides, horticulture production has reached an all time high, accounting for 355.25 million tonnes, boosting agriculture exports to 4.2 lakh crore in FY23.[149]

Despite India making significant strides, the Indian agriculture sector faced several impediments. The sector is heavily dependent on unpredictable variables such as monsoon rainfall and fluctuating commodity prices in globalised supply chains. Further, it also suffers from unsustainable agriculture practices such as resource-intensive farming, land degradation, over-reliance on inorganic fertilisers, rapidly dropping water tables, and emerging pest resistance. Water usage is sub-optimal with agriculture consuming 89% of extracted groundwater despite only one-third of the gross cropped area being irrigated.[150]

AI has the potential to address a number of challenges and increase productivity, efficiency and sustainability of the Agriculture Sector. For instance, IOT and AI-enabled sensors can be embedded in agricultural equipment to perform spatial and temporal analysis of crops. Image-based insights from satellite and drone imagery can generate real-time alerts for precision farming, increasing safety and reducing human error. AI can also be deployed to generate farm specific recommendations based on soil health, weather forecast, pest infestation, enabling farmers to make well-informed crop choices and management practices. AI-powered crop health monitoring systems use remote sensing and hyperspectral imaging to detect pests, diseases, and weeds, automating their management and predicting future scenarios.[151]

Courtesy: https://iiss.icar.gov.in/eMagazine/v5i2/7.pdf

To this end, the Ministry of Agriculture and Farmer Welfare has implemented several AI initiatives to support farmers and address agricultural challenges. These include the

149 Ministry of Information and Broadcasting, '10 Years of Transformation: Revolutionizing Agriculture' (Press Information Bureau, 5 March, 2024) <https://pib.gov.in/PressNoteDetails.aspx?NoteId=151859&ModuleId=3> accessed 8 August 2024

150 NITI Ayog, National Strategy for Artificial Intelligence (June 2018) <https://www.niti.gov.in/sites/default/files/2023-03/National-Strategy-for-Artificial-Intelligence.pdf> accessed 5 August 2024

151 Nishant K. Sinha and others, 'Application of Artificial Intelligence (AI in Agriculture: An Indian Perspective) (March 2023) 5(2) Indian INstitute of Soil Science <https://iiss.icar.gov.in/eMagazine/v5i2/7.pdf> accessed 9 August 2024.

'Kisan e-Mitra' chatbot, which assists farmers with queries about the PM Kisan Samman Nidhi scheme and other government programs in multiple languages. The National Pest Surveillance System leverages AI and Machine Learning to detect crop issues caused by climate change, allowing timely interventions. Additionally, AI-based analytics are used for crop health assessment and monitoring, utilising satellite, weather, and soil moisture data for rice and wheat crops.[152]

6.1.1.2 Competencies for Public Official working at the intersection of AI and Agriculture

Public Sector officials working on developing and deploying AI systems for the agriculture sector require a solid understanding of agricultural issues such as crop health monitoring, pest control, water usage, need for resource optimisation to help them to design AI systems that are relevant and address the challenges faced by farmers effectively.

Government officials should be able to develop a sound understanding of AI and allied technologies that can be applied to improve agriculture outcomes. They should be able to work with experts and key stakeholders to guide the design and development of AI systems that align with national agricultural goals and policy frameworks. Public officials should be aware of emerging AI trends and landscapes. It would enable them to assess and identify scalable use cases that can be replicated quickly to maximise impact across the sector. While overseeing the deployment of AI systems, public officials should ensure that they are accessible, user-friendly and beneficial for the farmers, particularly those in remote and resource-starved regions. Public sector officials need a strong grip over socio-economic challenges that AI may exacerbate such as deepening the digital divide, particularly in rural areas. They must recognize how unequal access to technology can marginalise small farmers, and ensure that AI deployment promotes inclusivity and equitable benefits across diverse agricultural communities.

Further, the government officials should provide support in the form of training programs and resources that help farmers and local agricultural workers understand and adopt these new technologies. They should ensure that AI initiatives are deployed ethically and sustainably, taking into account the socio-economic impact on farming communities. Government officials should actively collaborate with key stakeholders, including private sector partners, research institutions, and other government agencies to drive the successful adoption and scaling of AI in agriculture. Their focus should be on facilitating the integration of AI in a way that enhances productivity and resilience in the sector while ensuring that the benefits are equitably distributed.

152 Ministry of Agriculture and Family Welfare, 'Use of AI to tackle problems in agriculture' (Press Information Bureau, 2 February 2024) <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2002010> accessed 9 August 2024

AI Domain Competencies for Public Officials in Agriculture Sector		
Level 1	**Level 2**	**Level 3**
Lead the strategic planning for AI initiatives in agriculture, staying informed about emerging AI trends and assessing their potential impact. Ensure AI systems design aligns with national agricultural policies and long-term goals. Make strategic decisions on which AI technologies to develop and scale based on their potential to enhance agricultural productivity.	Apply a deeper understanding of agricultural challenges to guide the design of AI models that address specific needs. Assess various AI use cases to determine which are most scalable and suitable for replication in different agricultural contexts. Work closely with AI developers to ensure the technology is being developed in a way that aligns with the agricultural sector's goals. Oversee the rollout of AI systems, ensuring they are effectively adopted by end-users. Collect feedback from the field to refine and improve AI tools, ensuring they meet the needs of farmers and stakeholders.	Basic understanding of common agricultural issues and how AI might address them. Assist in gathering and organising agricultural data relevant to AI system design. Provide operational support in the development of AI tools by collecting and processing data under guidance. Gain exposure to how AI technologies like sensors and drones are being developed and used in agriculture. Help farmers and local agricultural workers understand and use AI tools, offering basic troubleshooting and support.

6.1.2 Healthcare Sector

6.1.2.1 Overview

The Indian healthcare sector stands as a crucial pillar for national development, given its prominent role in elevating public health outcomes, driving economic growth and achievement of Sustainable Development Goals (SDGs).[153] To this end, the government has crafted and implemented significant policies, including National Health Policy 2017[154] and the Ayushman Bharat Mission.[155] These policy documents emphasise on enhancing preventive and promotive health through intersectoral coordination and a "Health in All" approach, strengthening both primary and tertiary care services, and improving human resources by enhancing medical education and retaining healthcare professionals in remote areas. [156] The sector is increasingly integrating digital health technologies to make it more effective, impactful and inclusive. Despite these efforts, disparities exist. The Indian healthcare sector suffers from a fragmented delivery system, growing burden of communicable and non-communicable diseases, maternal and child health issues, among others.

AI, in this regard, can play a defining role. AI solutions have the potential to revolutionise healthcare by enhancing medical consultations, improving patient history collection, and facilitating direct access to electronic outpatient departments (e-OPD). These technologies

153 EY India, 'Decoding India's healthcare landscape: progress and vision 2047' (EY, 25 June 2024) <https://www.ey.com/en_in/health/decoding-india-s-healthcare-landscape-progress-and-vision-2047> accessed 9 August 2024

154

155 Ayushman Bharat, 'Homepage' (2024) <https://www.india.gov.in/spotlight/ayushman-bharat-national-health-protection-mission> accessed 9 August 2024.

156 Niti Ayog and DEMO, 'Health Sector Report' (June 2021) <https://dmeo.gov.in/sites/default/files/2021-07/7_Sector_Report_Health.pdf> accessed 9 August 2024

are instrumental in providing doctors with differential diagnoses and standardised treatment options, significantly advancing screening and diagnostic processes. It can significantly enhance community health given its ability to simplify test readings and enable home screenings. In conditions like Diabetic Retinopathy (DR), AI can detect early symptoms, directing patients to appropriate specialists for further diagnosis. Additionally, AI's predictive power is evident in its ability to forecast adverse tuberculosis (TB) outcomes, using data from half a million TB patients in India to initiate timely treatments for those at high risk. These applications highlight AI's critical role in enhancing diagnostic accuracy and patient care in diverse healthcare settings.[157]

In order to tap the potential of AI in the healthcare sector, the government is taking crucial steps. The Ayushman Bharat Digital Mission is a leading effort for creating digital health records while prioritising consent and robust data governance.[158] The government has also launched National Public Health Repository[159] and e-Sanjeevani[160] to streamline health data management and improve access to healthcare facilities. AI is being leveraged to address critical health concerns such as Tuberculosis (TB) through automated interpretation of diagnostic tests, prediction of treatment adherence risks, and the development of accessible screening tools.[161]

6.1.2.2 Competencies for Public Official working at the intersection of AI and Health

In order to leverage AI tools and technologies in the healthcare sector, public officials should possess a nuanced understanding of intersections between emerging technologies and the healthcare sector. This includes a broad understanding of AI (AI literacy) and its potential applications in the healthcare sector. AI can significantly enhance healthcare by improving diagnostic accuracy through advanced image analysis, enabling early detection of diseases. It can streamline patient care by predicting outcomes and personalising treatment plans based on individual data. Additionally, AI can optimise administrative tasks such as patient scheduling and resource allocation, reducing operational costs and improving efficiency in healthcare facilities. Public officials also need to understand the critical role played by sensitive personal data to better grasp its application in AI-driven healthcare solutions, ensuring data is handled securely and ethically.

Sensitive personal data is the bedrock of AI systems in the healthcare sector, public officials should be able to manage and interpret healthcare data and at the same time should ensure that data governance practices are followed strictly. By managing this data effectively, they can ensure that AI-driven healthcare solutions are both secure and ethical, ultimately protecting patient rights. Additionally, being skilled in project management enables them to oversee the successful implementation of AI initiatives within the healthcare sector. Public officials should ensure AI aligns with ethical standards and patient privacy regulations. Officials should be skilled in project management, capable of overseeing AI initiatives and ensuring they are executed in line with policy objectives and healthcare needs.

157 Ministry of Electronics and Information Technology, 'Report On GPAI Convening on Global Health and AI Global IndiaAI Summit' (2024) on 3-4 July, 2024 (forthcoming)
158 National Health Authority, 'Ayushman Bharat Digital Mission' (2024) <https://abdm.gov.in/abdm> accessed 9 August 2024
159
160 eSanjeevani, 'Homepage' (2024) <https://esanjeevani.mohfw.gov.in/#/> accessed 9 August 2024
161 Lok Sabha, Starred Question No. 283 (12 July 2019) <https://sansad.in/getFile/loksabhaquestions/annex/171/AS283.pdf?source=pqals> accessed 9 August 2024

Collaboration and communication are crucial, as these officials must work closely with technical teams, healthcare providers, and other stakeholders to ensure that AI solutions are relevant, effective, and well-integrated into existing healthcare structures. Integration of human-in-the-loop (HITL) is another crucial facet here. It helps in ensuring that human oversight is factored in so as to reduce over-reliance on AI, which can otherwise lead to misdiagnosis/ inaccurate screening Their role also involves understanding and navigating the regulatory landscape, ensuring that AI applications comply with national health policies and international guidelines. It is also important to note that AI inteventions in healthcare are administered by various personnels particularly frontline healthcare workers Accredited Social Health Activist (**ASHA**) workers who may not be familiar with advanced AI technologies. Special emphasis should be placed on training them so as to ensure they can handle AI systems and effectively interpret their outputs.

AI Domain Competencies for Public Officials in Healthcare Sector

Level 1	Level 2	Level 3
Ability to set the strategic direction for AI integration in healthcare, aligning AI initiatives with broader health policy goals and organisational objectives. Deep understanding of AI technologies, healthcare systems, and their intersection, including expertise in areas such as natural language processing, image recognition, and predictive analytics. Expertise in shaping policies and advocating for AI adoption in healthcare at the national or organisational level, considering ethical, legal, and societal impacts. Strong capability to engage with a wide range of stakeholders, including government agencies, private sector partners, and international organisations, to drive AI initiatives in healthcare.	Proficiency in applying AI and machine learning techniques to analyse healthcare data, develop predictive models, and interpret results to inform clinical decisions. Ability to work collaboratively with healthcare professionals, data scientists, and IT teams to design and implement AI solutions that meet clinical needs. In-depth understanding of healthcare regulations, data governance, and ethical considerations specific to AI deployment in healthcare, ensuring solutions comply with national standards. Strong analytical skills to identify and address challenges in the implementation of AI technologies in healthcare, including workflow integration and user training.	Familiarity with AI concepts, tools, and their applications in healthcare settings, including an understanding of medical terminologies and patient data. Competence in managing healthcare data, including data entry, basic data analysis, and ensuring data accuracy and confidentiality. Awareness of healthcare regulations and ethical guidelines related to patient data privacy, AI usage, and compliance with national health policies. Proficiency in communicating technical and non-technical information clearly to different stakeholders, including healthcare professionals and patients.

6.1.3. Education

6.1.3.1 Overview

Integration of AI in the Indian education sector can offer numerous benefits and address diverse challenges it faces. AI can personalise learning experience, tailor educational content as per student needs keeping in mind their strengths and weaknesses. It can play

a key role in enhancing access to education in remote and underserved areas therefore improving the quality of education. It is beneficial for automating administrative tasks such as grading, maintaining attendance records, to allow teachers and educators to focus on teaching and mentoring students. AI can be deployed to analyse data on student performance, attendance, teacher qualification, attendance, teacher qualifications, school infrastructure and other demographic factors to identify gaps and challenges in education. AI can also be leveraged to upskill educators. This could involve integrating AI into lesson planning, enhancing student engagement, and personalising learning experiences. The insights from the data can also be utilised by policymakers to target interventions, optimise resource distribution and formulate policies that address the structural issues in education.[162]

In order to leverage AI benefits in the Indian education sector, the Ministry of Agriculture in partnership with Intel and National Educational Research & Training (NCERT), has launched 'AI for All' initiative to create a basic understanding of AI for all citizens.[163] In line with the recommendations of National Education Policy 2020, the NCERT has also introduced AI as a contemporary subject in the educational curriculum. The AICTE-approved institutions are encouraged to offer AI as an elective in B.Tech courses and to start specialised AI and Data Science programs. IITs are also actively offering various AI-related courses and short-term programs to enhance skills and knowledge in this field.[164]

Additionally, the Ministry of Electronics and Information Technology (MeitY) has launched several initiatives to integrate Artificial Intelligence (AI) into education and skill development. FutureSkills Prime, a collaboration between MeitY and NASSCOM, is an online platform aimed at reskilling and upskilling IT professionals in emerging areas like AI and Cloud Computing, making these opportunities accessible to citizens in Tier 2 and Tier 3 cities.[165] The Visvesvaraya PhD Scheme seeks to increase the number of PhDs in emerging technologies such as AI, Robotics, and Blockchain, addressing the need for a skilled workforce with advanced education and training.[166] Additionally, India is establishing three AI Centres of Excellence in top educational institutions to drive AI innovation and align with the vision of "Make AI in India and Make AI work for India." Another initiative, YUVAi, focuses on demystifying AI for school students, preparing them to adapt to a future influenced by AI by creating human-centric designers and users. These efforts collectively aim to build AI expertise and readiness across various levels of education and professional development in India.[167]

6.1.3.2 Competencies for Public Official working at the intersection of AI and Education

Public sector officials working to develop and deploy AI solutions in the education sector are expected to have a deep understanding of existing structural deficiencies

162 Aparajitha Nair, 'Need for leveraging AI in India's education sector' (Hindustan Times, 23 May 2024) <https://www.hindustantimes.com/ht-insight/future-tech/need-for-leveraging-ai-in-indias-education-sector-101716450004610.html> accessed 9 August 2024
163 'Ministry of Education launches AI for All initiative in collaboration with CBSE and Intel (INDIAai, 01 August, 2021) <https://indiaai.gov.in/news/ministry-of-education-launches-ai-for-all-initiative-in-collaboration-with-cbse-and-intel> accessed 9 August 2024
164 Lok Sabha, 'Steps taken by the government to use artificial intelligence for education transformation' (Press Information Bureau of India, 15 March, 2021) <https://www.education.gov.in/sites/upload_files/mhrd/files/ai_sel.pdf> accessed 9 August 2024
165 Ministry of Electronics & Information Technology, 'Schemes/Projects' (2024) <https://www.meity.gov.in/content/schemes-projects> accessed 9 August 2024
166 Ministry of Electronics & Information Technology, 'PhD Scheme' (2024) <https://www.meity.gov.in/phd-scheme> accessed 9 August 2024
167 YuvAi, 'Homepage' (2024) <https://responsibleaiforyouth.negd.in/home> accessed 9 August 2024

such as inequitable access, varying quality of education, teachers shortage and other infrastructural disparities. They should also be aware of the diverse socio-cultural context within which educational institutions operate. Emphasis should be on ensuring AI solutions are accessible and inclusive for all students, especially those coming from marginalised and underrepresented sections of the society.

AI Domain Competencies for Public Officials in Education Sector		
Level 1	**Level 2**	
Ability to set long-term strategic goals for AI integration in education, align AI initiatives with national and regional policies like NEP 2020, and develop comprehensive frameworks for AI governance. In-depth understanding of AI ethics, data privacy laws, and regulatory frameworks to ensure responsible and ethical deployment of AI technologies. Skills in engaging with government bodies, educational institutions, technology providers, and international organisations to foster partnerships and drive AI adoption.	Ability to manage AI projects from inception to deployment, including planning, execution, monitoring, and evaluation of AI initiatives within the education sector. Skills in designing and implementing training programs for educators and administrative staff to effectively use AI tools in their roles. Competence in analysing educational data to provide insights for decision-making, track the impact of AI initiatives, and report outcomes to senior leadership. Ability to identify potential risks associated with AI deployment and ensure compliance with ethical standards and regulatory requirements.	Basic understanding of AI tools and their applications in educational settings, including how to use AI-driven platforms for tasks like student performance analysis, administrative automation, and personalised learning. Ability to collect, manage, and input data accurately into AI systems, ensuring data integrity and security. Capability to train and assist educators and administrative staff in the day-to-day use of AI tools, ensuring they are comfortable and proficient in their use. Gathering user feedback on AI tools' performance, identifying areas for improvement, and reporting these insights to mid-level managers for further action.

6.1.4. Smart Cities and Infrastructure

6.1.4.1 Overview

India is experiencing a surge in urban population. It is expected over 600 million people will reside in urban areas by 2030 and more than 800 million by 2050.[168] The rapid expansion is likely to put an immense strain on public infrastructure and resources to deliver better services, enhance local economic competitiveness, and address congestion and environmental issues. Traditional approaches to urban management are proving to be

168 Ministry of Housing and Urban Affairs, Harnessing the Potential of Artificial Intelligence: AI Playbook for Cities (2019).

inadequate to cope with these demands, making the adoption of smart solutions and infrastructure crucial for the sustainable growth of India's cities.[169]

To address these challenges, the Government of India is undertaking a series of initiatives. These initiatives aim to drive economic growth and improve the quality of life of its citizens. India launched the Smart Cities Mission in 2015 which is a cornerstone of these efforts. The Mission targets 100 Indian cities and its strategic components include, city improvement (retrofitting), city renewal (redevelopment) and city extension (Greenfield development) plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city.[170] Over the years, the Smart Cities Mission has made significant progress with a total of 8,013 projects sanctioned costing ₹1,64,158 crore. Of these, 7,157 projects have been completed, costing ₹1,43,958 crore.[171]

The Atal Mission on Rejuvenation and Urban Transformation (AMRUT) is an initiative supporting Smart Cities Mission and aims at upgrading the infrastructure of existing cities. It primarily focuses on critical sectors such as water supply, sewerage, urban transport, and green spaces. The Mission covers 500 cities with a population of 1 lakh or more with notified municipalities.[172]

The Digital India Mission also plays a crucial role in the smart cities framework. The Digital India Mission has made considerable progress in expanding digital infrastructure and services across the country. The Digital India Mission is instrumental in facilitating Digital Public Infrastructure (DPIs) such as: Unified Payment Interface (UPI), Aadhar Payment Bridge, Aadhar Enabled Payment system (AEPS), among others.[173]

In addition to these initiatives, India is increasingly incorporating emerging technologies like Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT), and robotics to revolutionise urban governance. The availability of vast amounts of data enhanced the potential of these technologies, enabling city administrators to make data-driven decisions that improve efficiency and service delivery. To support this further, the Ministry of Housing and Urban Affairs and the Ministry of Electronics and Information Technology (MeitY) have launched the DataSmart Cities Strategy, which promotes data-driven governance in cities. In addition, Smart Cities ICT Standards developed in collaboration with the Bureau of Indian Standards (BIS); and various open data platforms such as the Open Government Data Portal and the Smart Cities Open Data Portal have also been established.[174]

6.1.4.2 Competencies for Public Official working at the intersection of AI and Smart Cities and Infrastructure

Public officials working to develop and deploy AI systems for smart cities and infrastructure development should have a strong understanding of urban management and operations. They should be able to engage meaningfully with key stakeholders including citizens, industry experts, relevant government bodies to ensure that the AI solutions under consideration are adapted to unique challenges in India. . Public officials should emphasise

169 United Nations Economic and Social Council, Smart Cities and infrastructure: Report of the Secretary General (26 February 2016) Commission on Science and Technology for Development, 19th Session <https://unctad.org/system/files/official-document/ecn162016d2_en.pdf> accessed 9 August 2024

170 https://mohua.gov.in/cms/smart-cities.php

171 https://pib.gov.in/PressNoteDetails.aspx?NoteId=151908&ModuleId=3#:~:text=The%20Smart%20Cities%20Mission%20has,costing%20%E2%82%B91%2C43%2C958%20crore.

172 https://mohua.gov.in/cms/amrut.php

173 https://dea.gov.in/sites/default/files/Report%20of%20Indias%20G20%20Task%20Force%20On%20Digital%20Public%20Infrastructure.pdf

174 Supra note 180.

that AI solutions are secure, sustainable, scalable and ethical. This includes urban-rural disparities, high population density, resource limitations, and financial limitations. It also requires government officials to be well-versed in data governance, and ensure that data used in AI applications is well-representative of marginalised and underrepresented sections. They should also be mindful that data is handled in a responsible and ethical manner and its use is in alignment with legal and regulatory requirements. They are also expected to understand the legal and ethical implications of AI, potential bias and impact on diverse groups. AI solutions should also prioritise sustainability, focusing on green technologies and smart cities to promote long-term development. Lastly, it is of utmost importance that AI-driven infrastructure is sufficiently inclusive and accessible to all the citizens.

AI Domain Competencies for Public Officials in Smart Cities and Infrastructure Development

Level 1	Level 2	Level 3
Ability to set long-term strategic goals for AI integration in urban management, aligning AI initiatives with national and regional policies, and developing comprehensive frameworks for smart city governance. Expertise in engaging with government bodies, private sector partners, and international organisations to foster partnerships and drive large-scale AI adoption. In-depth knowledge of ethical considerations, data privacy laws, and regulatory frameworks to ensure responsible and compliant deployment of AI solutions.	Proficiency in managing AI projects from conception to deployment, including planning, execution, monitoring, and evaluation of AI initiatives within city infrastructure. Intermediate understanding of AI technologies, data analytics, and the ability to oversee the integration and application of these tools in urban management systems. Skills in ensuring data integrity, quality, and governance, managing data pipelines, and maintaining compliance with relevant standards and policies. Ability to design and implement training programs for city staff to effectively use AI tools and understand their implications. Competence in prioritising urban problems that can be addressed through AI and identifying viable AI solutions through consultations, pilot projects, and collaborations with tech providers.	Basic understanding of AI tools and their applications in smart city projects, including day-to-day operations like monitoring and managing AI-driven systems. Ability to collect, manage, and input data accurately into AI systems, ensuring that data is up-to-date, reliable, and properly formatted. Skills in providing technical support for AI systems, troubleshooting issues, and ensuring the smooth functioning of AI-enabled services within the city. Competence in monitoring AI system performance, collecting feedback, and reporting on key metrics to mid-level managers for further analysis and decision-making.

6.1.5. Smart Mobility and Transportation

6.1.5.1 Overview

The Indian Transport and Mobility Sector plays a crucial role in the Indian economy, underpinning both domestic and international trade. However, the sector has its fair share of challenges. These include, traffic congestion, issues surrounding road safety, and lack of adequate public transport infrastructure. With road and rail transport accounting for 87 and 61 percent of passenger and freight traffic, these challenges are likely to exacerbate

with growing urban population and rising number of vehicles. [175] AI technologies can offer powerful solutions in this regard. AI technologies can be utilised to optimise traffic flow, enhancing road safety, and improve overall efficiency and effectiveness. For instance, AI-driven traffic signal control systems can help in containing excessive congestion by adjusting signal timing based on real-time traffic conditions. In logistics, AI can be utilised for warehouse automation, demand prediction, route optimisations, and making supply chain effective and cost-effective.

The Indian government is actively employing AI in the transport sector to enhance its efficiency, effectiveness and sustainability. Kerala state government is implementing AI-based camera surveillance on key roads to reduce road accidents by half by 2024. These cameras automatically detect traffic violations, and the footage is sent directly to the central government's server for enforcement. In Bengaluru, the traffic police have introduced an AI-enabled traffic management system that detects violations and issues challans via SMS without human intervention. Delhi Police has deployed the Intelligent Traffic Management System (ITMS), which uses AI and 3D radar-based cameras to monitor traffic violations like red-light running and speeding at 24 junctions across the city.[176]

In Telangana, the iRASTE project, led by INAI and supported by the state's Department of ITE&C, applies AI to improve road safety through real-time data analysis and predictive technology. This project has been piloted with 14 buses and is set to expand to 200 more, aiming to minimise accidents and enhance passenger safety. The Karnataka State Road Transport Corporation (KSRTC) is also leveraging AI to improve road safety by deploying AI-powered Collision Warning Systems (CWS) and Driver Drowsiness Systems (DDS) across 1,044 buses. Additionally, the government of India's iRaste project in Nagpur, Maharashtra, uses predictive AI to reduce road fatalities by installing collision avoidance technology in municipal vehicles and identifying accident-prone zones for preventive measures.[177]

6.1.5.2 Competencies for Public Official working at the intersection of AI and Smart Mobility

Public Officials working to develop and deploy AI tools and technologies in the transport sector are expected to develop a sound understanding of the sector including the current structural issues plaguing impeding its effectiveness. Public officials should have a strong understanding of AI technologies including concepts of machine learning, deep learning, sensor integration to conceptualise targeted and well-thought AI solutions. A solid foundation in AI is also beneficial, effectively overseeing the development and implementation of AI-driven solutions like traffic management systems, predictive analytics for road safety, and autonomous vehicle technologies. Understanding data governance including data privacy, security, and ethical considerations, is crucial to ensure that AI systems are deployed responsibly and comply with relevant regulations. Public officials should also exhibit project management skills to coordinate with a diverse range of

175 Ministry of Road Transport and Highways, National Road Transport Policy (2006) <https://morth.nic.in/sites/default/files/circulars_document/National_Road_Transport_Policy.pdf> accessed 11 August 2024.

176 IndiaAI, 'AI Initiatives by Indian State Governments for Traffic Management and Road Safety' https://indiaai.gov.in/article/ai-initiatives-by-indian-state-governments-for-traffic-management-and-road-safety accessed 11 August 2024.

177 Ibid.

stakeholders that includes, technology vendors, urban planners, and transport authorities, citizens, among others. Lastly, public officials should be well versed with broader policy goals of the government and align the AI solutions in accordance with those objectives.

AI Domain Competencies for Public Officials in Smart mobility and Transport		
Level 1	**Level 2**	**Level 3**
Ability to set long-term strategic goals for AI integration in the transport sector. Developing comprehensive policies and frameworks that align AI initiatives with national and regional transport objectives. Expertise in engaging with various government bodies, private sector partners, and international organisations to foster partnerships and drive large-scale AI adoption. In-depth knowledge of AI ethics, data privacy laws, and regulatory frameworks to ensure responsible and compliant deployment of AI solutions. Competence in budgeting, securing funding, and allocating resources for large-scale AI projects, ensuring financial sustainability and scalability. Leadership skills to guide the integration of AI technologies within existing transport infrastructures, managing the cultural and operational shifts required for successful implementation.	Proficiency in managing AI projects from conception to deployment, including planning, execution, monitoring, and evaluation of AI initiatives within the transport sector. Intermediate understanding of AI technologies, data analytics, and the ability to oversee the integration and application of these tools in transport management systems. Skills in ensuring data integrity, quality, and governance, managing data pipelines, and maintaining compliance with relevant standards and policies. Ability to design and implement training programs for transport sector staff to effectively use AI tools and understand their implications. Identifying potential risks associated with AI deployment, ensuring compliance with ethical standards, and developing mitigation strategies.	Basic understanding of AI tools and their applications in traffic management, road safety, and transport logistics. Ability to collect, manage, and input data accurately into AI systems, ensuring data is up-to-date, reliable, and properly formatted. Skills in providing technical support for AI systems, troubleshooting issues, and ensuring the smooth functioning of AI-enabled services within the transport sector. Capability to train transport sector staff and other users on the basic functionalities of AI tools and provide ongoing support to ensure effective usage. Competence in monitoring AI system performance, collecting feedback, and reporting on key metrics to mid-level managers for further analysis and decision-making.

6.2. Support Structure to Support Domain Competencies

Following courses, support structures have been instituted by government organisations to equip public officials with necessary domain competencies:

Support Programmes/ Government Initiatives
• Artificial Intelligence in Disaster Management[178] • Artificial Intelligence Powered Grievance Handling Application[179] • AI led Digital Transformation in Healthcare[180] • AI led Digital Transformation in Agriculture[181] • Digital Government Senior Leaders' Programme (Physical course)[182] • AI for Good Specialization (public health, climate change, and disaster management)[183]

178 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
179 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
180 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
181 iGOT Karmayogi, 'Homepage' (2024) <https://igotkarmayogi.gov.in/#/> accessed 7 August 2024
182 National e-Governance Division, 'Training Calendar' (2024) <https://negd.gov.in/training-calendar/>accessed 8 August 2024.
183 Coursera, 'AI for Good Specialisation' (2024)<https://www.coursera.org/specializations/ai-for-good> accessed 8 August 2024.

CHAPTER 7

Conclusion & Recommendations

7.1. Introduction

The complexity and potential risks associated with AI necessitate a comprehensive approach to AI, necessitating Public Officials to exhibit a robust set of competencies. Building on the insights from previous chapters, this chapter proposes a range of broad operational strategies that government bodies may adopt and integrate to institutionalise the behavioural, functional and domain competencies. By establishing strong governance frameworks, enhancing data management practices, fostering collaboration, and promoting public engagement, government institutions can ensure that AI technologies are deployed ethically and responsibly, aligning with broader societal values and objectives. We have organised these strategies into five key categories (i) foundation and governance; (ii) privacy and data management; (iii) development and deployment; (iv) expertise and public engagement; (v) monitoring, transparency, and accountability.

7.1.1 Foundation and Governance

I. Create thorough frameworks for AI governance

- **AI Governance Board:** Establish a dedicated AI Governance Board with the objective of reviewing and authorising AI applications. This Board should make sure that all AI initiatives align with recognised guidelines outlined in domestic and international legal instruments. It could also play a crucial role in providing oversight and guidance throughout the AI lifecycle. The panel will provide nuanced recommendations, guiding projects to not only meet technical benchmarks but also effectively address societal issues and ethical considerations.

- **Integrate AI Ethics Principles by formulating AI Ethics Committee:** In order to design and integrate standard AI practices into all stages of the AI project lifecycle, government bodies may appoint an AI Ethics Committee.

II. Standardise AI Risk Management

Public sector organisations should implement a strong framework for identifying, evaluating, and reducing AI risks in order to improve the safety and transparency of AI systems throughout their lifecycle. Both new and ongoing AI initiatives should be assessed using a standardised evaluation tool in relation to these risk categories. This can be achieved by developing standardised disclosure templates and requiring all public sector AI projects to publish these details on a government portal accessible to the public, thereby ensuring transparency and safety in AI development.

7.1.2. Privacy and Data Management

Integrating 'Privacy by Design' approaches into the development process is crucial to ensuring that privacy and data protection is duly prioritised and assuring the ethical and legal handling of data within AI systems. This approach ensures the implementation of robust privacy and data protection protocols, particularly in projects handling sensitive or personal data. In order to identify and reduce any possible privacy issues connected to AI projects, regular privacy impact evaluations are essential.

Given the critical role data plays in AI, it is essential that every ministry establishes a special vertical to govern the entire data lifecycle. This vertical may oversee data collection, storage, processing, and sharing, ensuring that all stages are managed securely and efficiently. Additionally, the safety and security of data should be prioritised to protect against potential breaches and misuse. This structured approach will enable ministries to harness the full potential of AI while safeguarding the integrity and confidentiality of the data they manage.

7.1.3. Development and Deployment of AI Systems

I. Encourage Collaborative AI Research and Development

A comprehensive approach that prioritises public-private partnerships, international cooperation, and strong governance structures is necessary to spur innovation and guarantee the ethical growth of AI. Promoting partnerships between startups and big businesses can greatly improve the usefulness of AI in public services. Furthermore, encouraging interdepartmental cooperation within government organisations to exchange knowledge, obstacles, and achievements in implementing AI can facilitate work and provide a cogent strategy for AI deployment and governance.

II. AI Procurement and Development:

Ensure that the process of procurement of AI solutions is transparent. Relevant government bodies should provide details on procurement criteria, including ethical considerations, and allow public scrutiny of selected vendors.

III. Implement AI Deployment Playbooks

To guide the ethical journey of AI development, deployment, and monitoring within the public sector, it is imperative to create comprehensive AI deployment playbooks. These playbooks should include step-by-step procedures that address a variety of ethical issues. Key components should include the execution of Algorithmic Impact Assessments to evaluate potential impacts on individuals and society, robust stakeholder engagement protocols to ensure inclusivity and diversity of perspectives, stringent measures for data privacy and security to protect individuals' information, and clear transparency measures to foster trust and accountability. By laying out these crucial steps, public sector organisations will have a workable framework to handle the challenges of implementing ethical AI, ensuring that AI systems are created and applied in a way that is just, responsible, and advantageous to the citizens.

7.1.4. Expertise and Public Engagement

I. Promote the development of AI Literacy and Skills

It is imperative to establish comprehensive programmes for AI literacy and skills development in order to equip public sector officials with the information and abilities needed to navigate the rapidly changing AI landscape. These programs could offer a blend of targeted training, workshops, and online courses. The curriculum could include a range of essential topics, including ethical AI use, data governance, effective project management within AI projects, and a deep understanding of AI technologies and their applications. Through collaboration with academic institutions and utilisation of insights from private sector innovations, these programmes can furnish public sector workers with up-to-date information and resources.

II. Establish Platforms for Public Engagement

Engaging stakeholders through digital platforms and public forums is essential to promoting openness and fostering public trust in AI initiatives. This involves facilitating meaningful inputs and comments on AI policies and projects. It is also essential to implement mechanisms for ongoing feedback and system improvement, such as the development of an AI system dashboard. This tool would enable public sector agencies to track AI system performance, handle incident reporting, and enable real-time improvements, and align with best practices for incident management and continuous system enhancement. In addition, holding open AI innovation challenges could prove to be a creative way to tackle social problems by allowing practitioners, academics, industries and startups to submit solutions. Through the identification of problem areas that align with the demands of the public sector and societal values, as well as the provision of financing and support for the creation of winning solutions, these projects serve to both harness collective intelligence and encourage community engagement and AI innovation.

7.1.5. Monitoring, Transparency, and Accountability

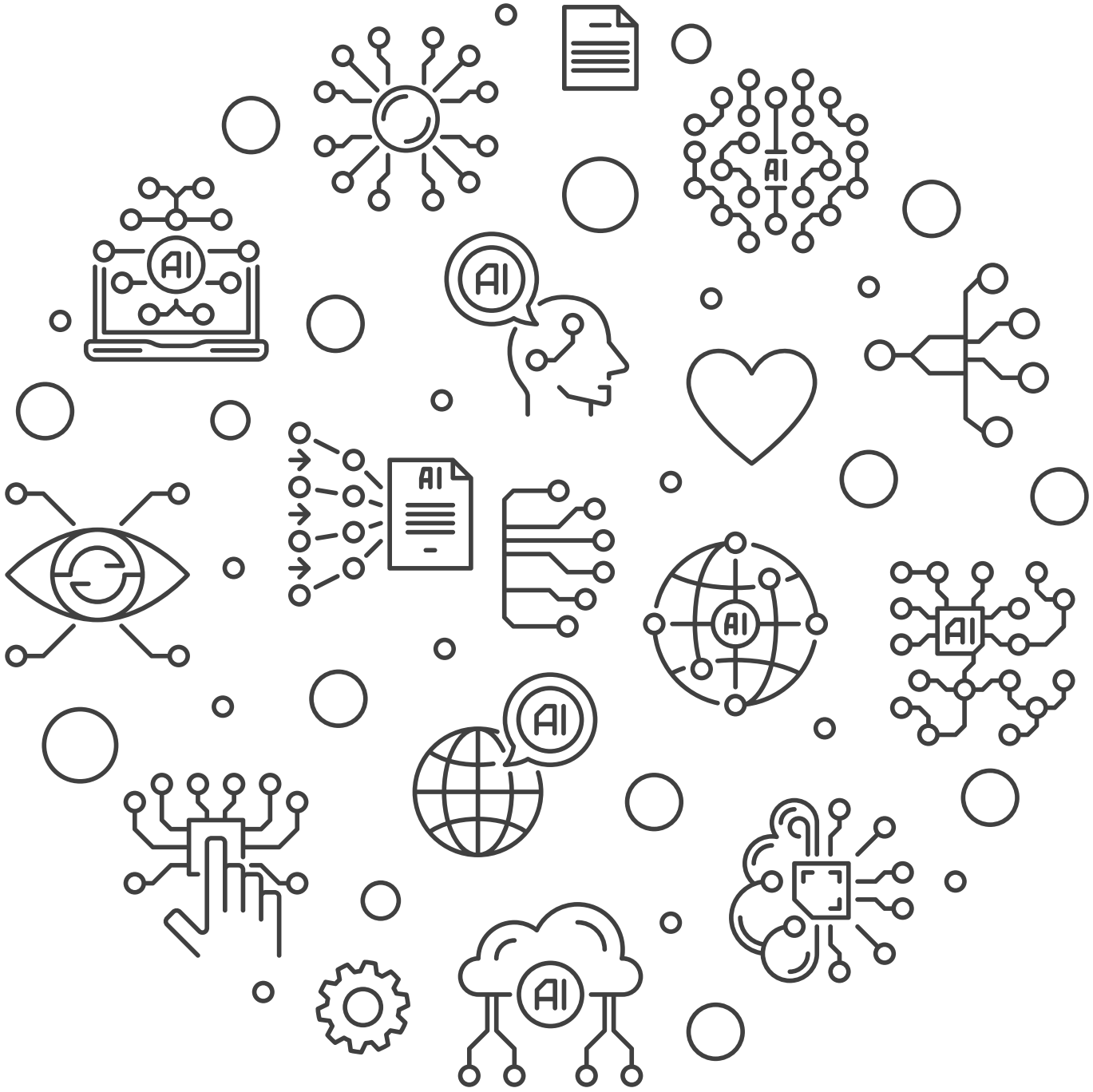
To ensure AI systems are ethically aligned and uphold societal values, it is crucial to implement a comprehensive approach that includes continuous monitoring, and taking measures that enhance transparency and accountability. Several initiatives can be taken in this regard:

I. **Comprehensive Documentation of AI Systems**: Ensure a comprehensive documentation of AI models, outlining how algorithms are designed, what datasets have been used, and how decisions are made. This should include the inputs, outputs, and any assumptions or biases that could impact results. It is also important to ensure that AI decisions are explainable to non-technical audiences, including citizens and government oversight bodies. Develop tools that provide explanations in a way that stakeholders can understand how decisions are made.

II. **Independent AI Audit:** This involves engaging independent auditors or experts to assess the performance, fairness, and ethical implications of AI systems. The audit results should be shared with the public and provide actionable recommendations. Relevant government organisations may also release reports that outline the performance of AI systems, including any errors, biases, or areas for improvement identified during audits or assessments.

III. **Human-in-the-Loop (HITL) Mechanisms:** Adequate measures should be undertaken to ensure that AI systems , especially those affecting public services or rights, account for human oversight. Humans should be able to intervene and review AI decisions, particularly in critical areas like law enforcement, healthcare, or social benefits.

IV. **AI Impact Assessments:** This involves conducting regular AI impact assessments before deploying AI systems. It requires a thorough evaluation of potential social, economic and ethical impact of AI systems especially considering its impact on the marginalised and vulnerable sections of society. Post deployment, measures should be undertaken to review the risk profiles of deployed AI systems, especially those in high-stakes environments (e.g., criminal justice, healthcare).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