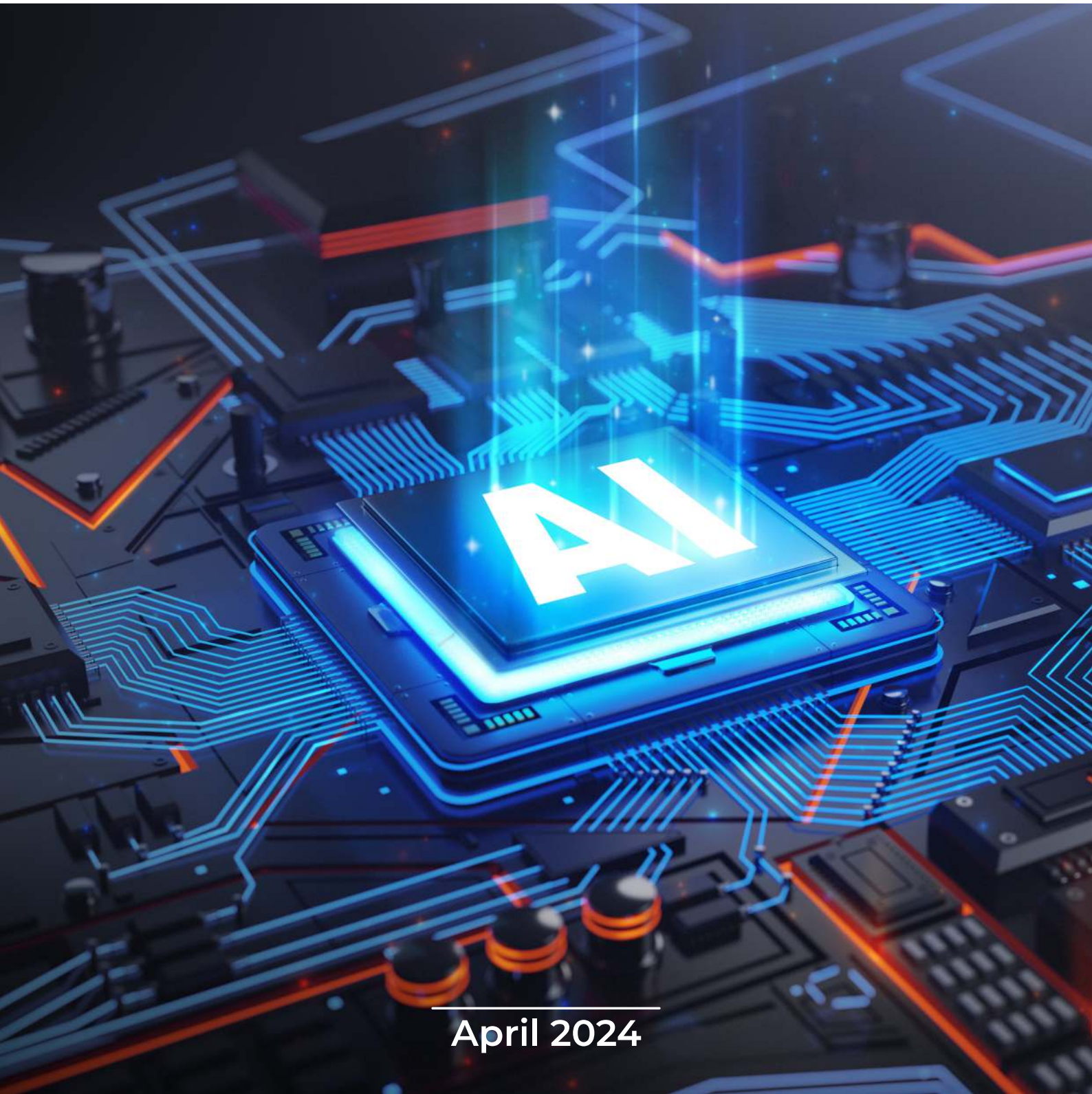


# Advancing AI Adoption for Citizen Centric Governance

Part-1



April 2024

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# Abbreviations

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AI	Artificial Intelligence
PSA	Principal Scientific Adviser
PM-STIAC	Prime Minister's Science, Technology, and Innovation Advisory Council
PAIU	Policy Analytics and Insights Unit
ETG	Empowered Technology Group
R&D	Research and Development
MSDE	Ministry of Skill Development and Entrepreneurship
DPDP	Digital Personal Data Protection
DoCA	Department of Consumer Affairs
DST	Department of Science and Technology
SERB	Science and Engineering Research Board
FIRE	Fund for Industrial Research Engagement
ML	Machine Learning
IoT	Internet of Things
SDGs	Sustainable Development Goals
GPAI	Global Partnership on Artificial Intelligence
NEST	New, Emerging and Strategic Technology
CCPA	Central Consumer Protection Authority
CWP	Consumer Welfare Fund
CoE	Centre of Excellence
MEA	Ministry of External Affairs
USA	United States of America
UK	United Kingdom
OECD	Organisation for Economic Co-operation and Development
WHO	World Health Organization
UN	United Nations
G7	Group of Seven
G20	Group of Twenty
NITI Aayog	National Institution for Transforming India
TEC	Telecommunications Engineering Centre

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## Executive Summary

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This compendium, the first in a series, serves as a meticulous exploration of the strategic initiatives embraced by key government ministries and departments, propelling the nation into a leading position within the global Artificial Intelligence (AI) landscape. Each department's roadmap, outlined with precision, contributes to a unified narrative of India's unwavering commitment to AI innovation, ethical practices, and the development of a skilled workforce.

The chapter, 'Beyond the Horizon: Charting India's AI Future with the Office of Principal Scientific Adviser (PSA)' serves as a catalyst for innovation across sectors. By leveraging AI to address societal needs, this roadmap envisions transformative changes that align technological advancements with the betterment of society. It underscores a commitment to harnessing AI not just for technological prowess but as a tool for positive societal impact. Emphasizing responsible AI, this roadmap aligns technological advancements with the betterment of society, showcasing a commitment beyond mere technological prowess.

The chapter, 'Advancing Global Cooperation in Building AI Governance Framework' for the Ministry of External Affairs charts an innovative course, navigating the intersection of AI and international relations. By harnessing AI's potential, the roadmap envisions enhancing diplomatic efforts, fostering collaboration across borders, and effectively addressing complex geopolitical challenges. This roadmap reflects a forward-thinking approach to diplomacy in an era where technology plays a pivotal role in shaping global relations.

Focusing on India's emphasis on innovation, research, and nurturing of AI talent, the chapter 'Promoting Innovation, R&D and Addressing Risks in AI' focuses on interventions that can be made by Department of Science and Technology in the field of AI. In this chapter, special attention is directed towards encouraging women scientists and exploring emerging technologies, reinforcing India's aspiration to be a hub for cutting-edge advancements. The roadmap is a strategic blueprint that intertwines scientific progress with inclusivity, acknowledging the diverse contributions of women scientists in shaping the future of AI.

To address the concerns related to consumers, the chapter, 'Ensuring Responsible Adoption of AI for Consumer Protection' takes a consumer-centric approach and delves into AI's impact on customer experience, data privacy, and ethical considerations. This roadmap for the Department of Consumer Affairs, envisions a future where AI augments consumer interactions, ensuring personalized experiences while upholding ethical standards and safeguarding data privacy—a crucial aspect in an era where digital interactions dominate.

The fifth chapter, 'Catalyzing India's Future: A Strategic Roadmap for AI Skilling for MoSDE' recognizes the burgeoning demand for AI-skilled professionals and focuses on bridging the talent gap. Simultaneously, initiatives are outlined to position India as a global leader in AI, highlighting a comprehensive approach that not only addresses immediate needs but also envisions long-term sustainability and growth.

Collectively, these roadmaps paint a vivid picture of India's trajectory towards a technologically advanced and socially responsible future.

In subsequent series, we will explore the roadmaps of other government stakeholders. As the nation progresses, this compendium emerges as a guiding light, steering towards a future where AI is a force for collective progress, supporting startups, innovators, and ensuring the well-being of citizens.

# Beyond the Horizon: Charting India's AI future – Roadmap for Office of Principal Scientific Advisor

*By: Avnika Nagar, Dhawal Gupta, Kaushal Mahan*



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## Background

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Artificial intelligence (AI), known by some as the industrial revolution (IR) 4.0, is going to change not only the way we do things, how we relate to others, but also what we know about ourselves. Rapid advances in the field of AI have profound implications for the economy and society at large. These innovations have the potential to directly influence a wide range of products and services, with important implications for productivity, employment, and competition. However, challenges such as lack of specialized talent, limited investments in AI research, and unclear regulations often serve as barriers in ensuring ethical, secure, transparent, and human-centric implementation of AI. It is thus critical that governments proactively consider and accommodate the fast-changing universe of AI to leverage the potential of the technology to its fullest.

The Principal Scientific Adviser to the Government of India (PSA's) has been providing pragmatic and objective advice to the Prime Minister and the cabinet on matters of Science and Technology (S&T) since 2018 and AI enabled technology continues to be an important part of it. PSA's AI mission is focused on efforts that will benefit India in addressing societal needs in areas such as healthcare, education, agriculture, smart cities, and infrastructure. This mission is to operate on extensive academia-industry interactions on developing core research capability at the national level.

PSA is thus helping in AI deployment through the creation of new knowledge and development and deployment of new applications. It is thus driving innovation and technology delivery to solve socio-economic challenges for sustainable growth. Its interventions through applied research and in collaboration with multiple stakeholders can help in leveraging the benefits of AI within the country. The PSA thus can prepare the government to adapt AI by providing and creating a conducive ecosystem for innovations and entrepreneurial endeavors.

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## Scope for PSA Contribution towards AI

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The PSA is comprised of four teams which directly look into the formulation and implementation of initiatives associated with AI. Each of these teams have a niche focus area and can be leveraged differently to optimize the benefits of AI in India.

The teams focused on AI centric research and application within the PSA are:

- The Prime Minister's Science, Technology, and Innovation Advisory Council (PM-STIAC)
- Policy Analytics and Insights Unit (PAIU)
- Empowered Technology Group (ETG)
- Ecosystem Initiative

An overview of the focus areas of the team has been provided in Figure 1.

The Prime Minister's Science, Technology, and Innovation Advisory Council	Policy Analytics and Insights Unit	Empowered Technology Group	Ecosystem Initiative
<ul style="list-style-type: none"> <li>• Focused on addressing societal needs in areas such as healthcare, education, infrastructure etc.</li> <li>• Extensive academia-industry interactions on developing research capability.</li> <li>• Creation of new knowledge base and in developing, deploying applications</li> </ul>	<ul style="list-style-type: none"> <li>• Provide analytical and policy management support to various initiatives around Critical and Emerging Technologies (iCET)</li> </ul>	<ul style="list-style-type: none"> <li>• Focused on procurement and induction of technology</li> <li>• R&amp;D in technologies demanding large financial outlays</li> <li>• Advisory for technology centric advisory programs</li> </ul>	<ul style="list-style-type: none"> <li>• Facilitates partnerships between Industry, foundation, academia etc. through coalitions, consortia both at the national and international level.</li> <li>• Developing innovative solutions through collaborations and deliberations initiated by the division.</li> </ul>

## Roadmap for PSA

The PSA can initiate multiple activities focused on the institutionalization of AI in India. The activities should largely be focused on building new policy insights, creation of a knowledge base through systematic research and capacity building of key stakeholders.

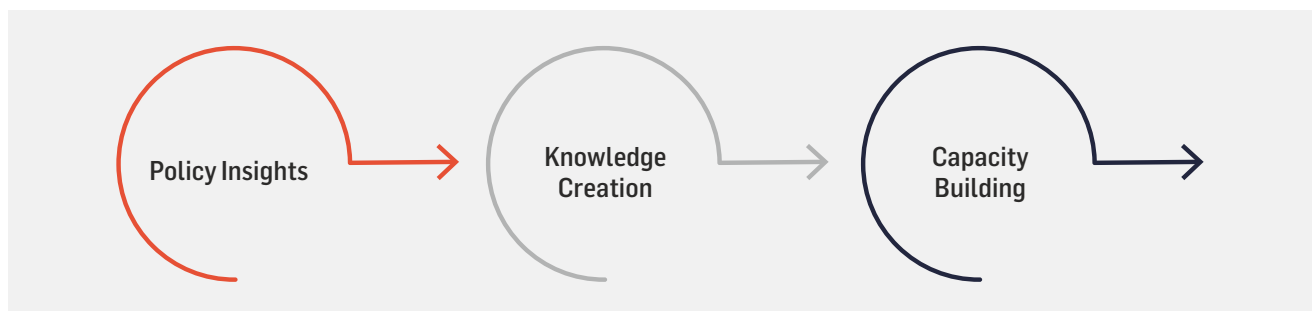


Figure 1: Focus Areas for PSA Intervention

In this context, some of the initiatives which the PSA can undertake to catalyze the systemic adoption of AI have been elaborated in **Table 1**. The table details out the activity to be undertaken, the potential team to be engaged with within PSA, objective of the intervention and potential partnerships for the successful implementation of the activities.



Table 1: Potential Initiatives for PSA

PSA Team for Engagement	Intervention Detail	Suggestive Partners and Responsibilities
<b>Focus Area 1: Policy Insights</b>		
<b>Activity: 1 Procurement Standards/ Framework for AI Centric Deployments</b>		
ETG or PAIU	<ul style="list-style-type: none"> <li>The activity will involve formulation of relevant benchmarks and standards for procurement processes in AI centric deployments.</li> <li>The benchmark and standards will detail the procurement processes, technical specifications for vendors, RFP design, evaluation system and so on.</li> <li>Overall, the activity will help in establishing a risk assessment mechanism, judicial oversight, and accountability in AI deployment.</li> </ul>	<p><b>PSA:</b> Lead the process of standards and benchmark creation by providing its expertise and collaborating with external stakeholders providing technical and managerial support.</p> <p><b>Wadhvani AI/ Centre for Development for Advanced Computing:</b> Technical expertise for benchmark/ framework creation.</p> <p><b>Chase:</b> Execute the partnership process, facilitate stakeholder coordination, consultations, provide primary/ secondary research support and final documentation and dissemination of the standards created through expert consultation and discussions.</p>
<b>Activity 2: Stakeholder Consultation on Intellectual Property Framework for AI in India</b>		
ETG or PAIU	<ul style="list-style-type: none"> <li>The stakeholder workshop will address the ambiguities around AI copyright and patents. It will discuss the principles which an AI Intellectual Property Framework should focus upon to develop a balanced approach where AI innovation takes place, deep tech centric institutions flourish and the human expression stands protected.</li> <li>The next step should focus upon the development of the AI Intellectual Property Framework.</li> </ul>	<p><b>PSA:</b> Lead the process of standards creation by providing its expertise and collaborating with external stakeholders providing technical and managerial support.</p> <p><b>DPIIT/IndusLaw/ Vidhi Legal Centre/NLUD:</b> Technical expertise and legal expertise for determining the principles and framework for intellectual property in India.</p> <p><b>Chase:</b> Execute the partnership process, facilitate stakeholder coordination, consultations, provide primary/ secondary research support and final documentation, dissemination of the standards created through expert consultation and discussions.</p>
<b>Focus Areas 2: Knowledge Creation</b>		
<b>Activity 3: Report on AI for Advancing Development Goals (SDGs) in India</b>		
PM-STIAC	<ul style="list-style-type: none"> <li>The report will be a comprehensive documentation of opportunities offered by AI in attaining SDGs in India.</li> <li>It will identify prominent AI methods and models that can help in achieving SDG targets for India at the soonest.</li> <li>Recommendations and course of action to advance SDG advancement in India will also be provided in the report.</li> </ul>	<p><b>PSA:</b> PSA will oversee the entire process of report formulation.</p> <p><b>Indian Institute of Sustainable Development/ Centre of Excellence for Sustainable Development:</b> The organization shall endorse the report and provide expertise wherever necessary.</p> <p><b>Chase:</b> Execute the partnership process, facilitate consultations, provide research support and documents, disseminate the report based on the views provided by other partners.</p>
<b>Activity 4: Report on Global Best Practices to Mitigate AI Centric Risks</b>		
PM-STIAC	<ul style="list-style-type: none"> <li>The report will lay focus on the notable initiatives undertaken across the globe to institutionalize responsible AI formally.</li> <li>The report will serve as evidence on feasibility of responsible AI technology in the public and private systems.</li> </ul>	<p><b>PSA:</b> PSA will oversee the entire process of report formulation.</p> <p><b>Wadhvani AI/ Centre for Development for Advanced Computing:</b> The organization shall endorse the report and provide expertise wherever necessary.</p> <p><b>Chase:</b> Execute the partnership process, facilitate consultations, provide research support and document, disseminate the report based on the views provided by other partners.</p>

Activity 5: Online/Offline AI Training Module for Public Sector Employees		
ETG or PM-STIAC	<ul style="list-style-type: none"> <li>AI-based tools are currently in use by most of the government agencies and there is a need to sensitize the employees about the fundamentals of technology, its uses and capability to make a difference in the administrative space.</li> <li>Online/ Offline Training sessions can be significantly helpful on this front.</li> </ul>	<p><b>PSA:</b> PSA will collaborate with IIT Delhi and design an online/ offline training module for public officials.</p> <p><b>IIT Delhi:</b> The institution shall provide its expertise and work closely with PSA and Chase to create an online/ offline training module.</p> <p><b>Chase:</b> Execute the partnership process, facilitate meetings and provide support in every capacity.</p>
Activity 6: Compendium of Basic AI Concepts and Applications for the Public Sector Consultation		
ETG or PM-STIAC	<ul style="list-style-type: none"> <li>AI-based tools are currently in use by most of the government agencies and there is a need to sensitize the employees about the fundamentals of technology, its uses and capability to make a difference in the administrative space.</li> <li>A readily available compendium with basic concepts and explanations on AI can be significantly helpful on this front.</li> <li>A readily available compendium with basic concepts and explanations on AI can be significantly helpful on this front.</li> </ul>	<p><b>PSA:</b> PSA will oversee the entire process of report formulation.</p> <p><b>IIT Delhi/IISP/NPIFP/Carnegie India:</b> The organization shall endorse the report and provide expertise wherever necessary.</p> <p><b>Chase:</b> Execute the partnership process, facilitate consultations, provide research support and document, disseminate the report based on the views provided by other partners.</p>
Focus Areas 3: Capacity Building		
Activity 7: Conference/Workshop on "Leveraging AI to attain Sustainable Development Goals (SDGs) in India"		
PM-STIAC	<ul style="list-style-type: none"> <li>A multi-stakeholder consultation on opportunities offered by AI in attaining SDGs in India.</li> <li>Identifying prominent AI methods and models that can help in achieving SDG targets.</li> <li>Discussing recommendations, collaborations, and future course of action to advance SDG advancement in India.</li> </ul>	<p><b>PSA:</b> PSA will lead the conference/ workshop.</p> <p><b>Indian Institute of Sustainable Development/ Centre of Excellence for Sustainable Development:</b> The Organization shall co-lead the workshop and extend support in organising the event.</p> <p><b>Chase:</b> Execute the partnership process, take the lead in organizing the event and ensure rigorous social media update.</p>
Activity 8: Industrial Consultation on 'Immediate Measures to Capitalize on the Introduction of Deep Tech Policy in India'		
PAIU	<ul style="list-style-type: none"> <li>The 'National Deep Tech Start Up Policy Draft' was recently introduced and in this context a workshop with industry stakeholders will be organized to determine the existing gaps in the deep tap start up space and how to overcome the barriers.</li> <li>The industrial consultation will be focused on aspects such as R&amp;D, Unified IP framework, facilitating long-term funding, scaling solutions, Venture Capitals, Private Equities and so on.</li> </ul>	<p><b>PSA:</b> Lead the industrial consultation.</p> <p><b>Tech Industry Stakeholders:</b> Representations from companies such as Microsoft, Dell, Google etc. will be sought to facilitate constructive discussion of opportunities presented by deep tech start up policy.</p> <p><b>Chase:</b> Take the lead in organizing the event and ensure rigorous social media dissemination.</p>

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## Conclusion

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The departments across the Office of Principal Scientific Adviser to the Government of India (PSA) have been contributing substantially towards AI through different intervention. The roadmap elucidated above will be significantly useful for PSA in extending its contributions towards AI adoption in India. By laying focus on three crucial aspects of AI, namely Policy Formulation, Capacity Building and Knowledge Creation, it shall meaningfully contribute towards the nations agenda of emerging as the leader in the AI adoption game and make a mark in the field of technology innovation.

# Advancing Global Cooperation in Building AI Governance Framework– Roadmap for Ministry of External Affairs

*By: Ravi Mahto, Dhawal Gupta, Kaushal Mahan*



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## Introduction:

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**Context:** This roadmap serves as a guiding framework for the Ministry of External Affairs (MEA), aligning with India's vision of responsible and inclusive Artificial Intelligence (AI) development globally. It outlines a comprehensive strategy to leverage AI for diplomatic efforts, facilitate international cooperation, and contribute to the formulation of a framework for global AI governance. The New and Emerging Technology (NEST) division of MEA is designed to be nodal point to evolve and coordinate India's position on global governance norms for emerging technologies in a multilateral context<sup>1</sup>. The NEST position paper on AI explores its evolving landscape, tracing historical development and defining AI as machines mimicking human cognitive functions<sup>2</sup>. The National Strategy on AI emphasizes its role in elevating machine intelligence<sup>3</sup>. G20 leaders, under India's presidency, declared a commitment to Harnessing AI Responsibly<sup>4</sup>. India's hosting of the global AI partnership signifies a key opportunity. AI's multidimensional impact has made it central to international relations, urging India to collaborate on a governance framework with like-minded nations, aligning values in shaping the global AI paradigm responsibly.

**Intent:** By 2030, AI is estimated to add up to \$ 15.7 trillion to the global economy and the Indian market will be worth \$ 7.8 billion, being the third largest talent pool for AI talent in the world<sup>5</sup>. This roadmap strategically aligns the impact of AI with India's development, economic growth, and national security priorities. It serves as a crucial reference for NEST to leverage AI to catalyse economic growth and address developmental challenges. Engaging in multilateral and plurilateral frameworks, this approach ensures that international collaborations resonate with India's vision and values, strengthening the nation's position in the global AI governance landscape.

**Scope:** The NEST division was created to identify emerging and critical technologies that have strategic and developmental utility and foreign policy implications for India<sup>6</sup>. India possesses one of the world's largest AI talent pool, this framework supports the NEST's vision, emphasizes stakeholder participation, adherence to international standards, and addresses ethical and legal considerations in global AI governance. It provides a comprehensive strategy, guiding the collaboration on AI policies, reinforcing India's commitment to responsible and ethical AI practices on the international stage. The roadmap, aligned with the government of India's vision of open, safe, trust, and accountable AI, covers crucial aspects like responsibility, transparency, standards, multi-stakeholder engagement, and international cooperation<sup>7</sup>.

**Opportunity:** India is at a pivotal juncture to leverage the opportunities presented by the rapidly evolving field of AI. India with its rich pool of talent, growing technology ecosystem, and commitment to ethical AI, India has the potential to emerge as a global leader in shaping the future of AI governance. The Ministry plays a crucial role in facilitating India's engagement on the international stage. By actively promoting India's AI initiatives, fostering collaborations with global partners, and advocating for India's unique approach to responsible AI, the MEA can position the country as a key player in the global AI landscape. This enhances India's influence in shaping international AI norms and opens doors for strategic partnerships and collaborations that contribute to the growth and ethical development of AI technologies worldwide.

## Current Global Landscape

Country <sup>8,9,10,11</sup>	AI governance law and policy	Principles
<b>India</b>	Niti Aayog's National Strategy for AI <sup>12</sup> TEC Draft Standards of Fairness Assessment and Rating of Artificial Intelligence system <sup>13</sup> . Proposed Digital India Act	Fairness/Tackling bias, ensure transparency, Privacy, Security, Safety and reliability, Equality, Accountability, Open, Risk-Based approach, Identifying Potential Harm, Standards for AI, Multi-stakeholder approach, Sectoral Regulators
<b>European Union</b>	EU AI Act: Legal framework governing sale and use of AI <sup>14</sup> .	Risk based approach: Unacceptable risk, high risk, limited risk, and minimal risk; risk management, data governance, recording keeping, reporting obligations.
<b>Australia</b>	Discussion paper on Safe and Responsible AI in Australia <sup>15</sup> . AI Roadmap <sup>16</sup>	Fairness, privacy protection and security, reliability and safety, transparency, accountability. The AI roadmap sets out the focus on AI development in high potential areas, such as natural resources and infrastructure.
<b>Brazil</b>	Brazil proposed comprehensive AI Bill <sup>17</sup>	Human rights, civil liability, prohibit excessive risk, reporting obligations, non-discrimination, rectification of identified biases and due process mechanisms
<b>Canada</b>	AI and Data Act, Bill C-27 <sup>18</sup>	Development of responsible AI, ensure high impact, human rights, prohibit malicious use of AI,
<b>China</b>	Algorithm Recommendation Management provision <sup>19</sup> Interim Measures for the Management of Generative AI services <sup>20</sup>	First country to implement AI regulation, various regulations and policies apply to specific AI uses.
<b>USA</b>	Blueprint for an AI Bill of Rights <sup>21</sup>	Safe and effective system, algorithm discrimination protection, data privacy, Notice and explanation, human alternatives, consideration, and fallback
<b>UK</b>	National AI Strategy <sup>22</sup> , Pro-innovative approach to AI regulation <sup>23</sup>	Pro-innovative approach, cross sectoral principles, safety security, transparency, fairness, accountability, contestability and redress
<b>Multilateral Organizations</b>		
<b>OECD</b>	OECD Council Recommendations on AI	Adopted in May 2019, promote AI that is innovative, trustworthy, respect Human rights and democratic values
<b>GPAI</b>	Responsible development, use and governance of AI working group report <sup>24</sup>	Advocate to implement the OECD principles and UN SDGs agenda
<b>WHO</b>	First Global Report on AI in health <sup>25</sup>	Protect human autonomy, human well-being, ensure transparency, explainability, accountability, inclusiveness, and equality
<b>UN</b>	Inter-Agency Working group on AI <sup>26</sup> , Ethics of Artificial Intelligence (UNESCO <sup>27</sup> )	Do no harm, safety and security, sustainability, privacy, data protection, transparency, accountability etc.

## Building Blocks for Global AI Governance

**International Collaborations:** A strategy for fostering international collaborations in AI governance involves actively engaging with other countries and participating in existing global AI initiatives. This approach allows for the sharing of knowledge, best practices, and resources and promoting harmonization of AI policies across borders. Establishing partnerships with like-minded nations can lead to joint efforts in setting international standards and norms, which is essential for ensuring global compatibility. Such collaborations strengthen India's position on the global stage and contribute to a more coordinated and effective approach to AI regulation.

**Comprehensive Policy Framework:** Our Comprehensive Policy Framework for Artificial Intelligence (AI) should be emphasizing human rights, accountability, and equitable outcomes on the foundation of Safe, secure and trustworthy AI governance model. The framework should focus on core principles to guide responsible AI development. From human-centric design and fair decision-making to bias mitigation, transparency, and user awareness, this framework ensures that AI serves humanity ethically and transparently aligning with India vision on AI.



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## Strategy

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**Adoption of Principles and Values:** India should prioritize the adoption of principles and values such as safe, secure, and trustworthy AI, respect for human rights and democracy, transparency, and accountability among like minded nations. Additionally, a focus on user awareness and information sharing, bias mitigation, risk assessment, and equitable distribution should be emphasized. These foundational elements will pave the way for responsible AI governance in India, ensuring that technological advancements align with ethical considerations and societal well-being.

**South Asian Co-operation on AI:** The need of hour is to have smooth cooperation in the south Asian region. As AI continues to play a pivotal role in emerging technologies, addressing its complex challenges requires concerted efforts among neighboring countries. By enhancing digital partnerships and overcoming digital barriers in the global south, regional alliances can be strengthened. Robust global governance frameworks, particularly in data utilization, are essential for facilitating multilateral collaboration and aligning national strategies with international principles. In the Indian context, promoting collaborations within South Asia can enhance regional capabilities and foster a collective approach to leveraging AI for societal and economic benefits.<sup>28</sup>

**International AI Governance Consortium:** India may take a lead on establishing an International AI Governance Consortium, which will be important and emphasise a multi-stakeholder approach to govern AI development. This consortium would engage experts from diverse disciplines and call upon sectoral regulators to oversee AI-led innovations in their respective domains, reducing compliance complexities.<sup>29</sup> Clear definitions of the purpose, necessity, and proportionality of AI use, along with sustainability considerations, would form the cornerstone of a responsible and ethical AI governance framework. By leading the creation of such a consortium comprising representatives from governments, industry, academia, and civil society, India can foster global collaboration and coordinated efforts on a comprehensive scale.

**Diplomatic Engagements:** India may initiate priority conversations around strategies for AI governance in its diplomatic engagements. Through diplomatic channels, India can address geopolitical differences and lay the groundwork for global AI policies, promoting a collaborative approach to governance. Additionally, India should leverage international organizations as platforms for coordinating AI governance efforts worldwide. By actively participating in multilateral forums and policy discussions, India can contribute to the development of guidelines and ensure that diverse perspectives are considered in shaping AI regulations on a global scale.

**Bilateral Agreements:** India's strategic roadmap for AI governance should include the exploration of bilateral agreements with other nations to enhance global cooperation. These agreements should aim to facilitate information-sharing, exchange best practices, and provide mutual support in the development and implementation of AI governance. By fostering such international partnerships, India and its partner countries can collaboratively address common challenges associated with AI and ensure the responsible and ethical use of AI technologies on a global scale.



**Engagement with Embassies:** We suggest collaborating with embassies as part of India's strategic approach to AI governance and hold an international conference. This conference will invite the participation of embassies from like-minded countries to deliberate on the development of a global AI governance framework. By convening diplomatic representatives, the conference aims to foster collaboration and consensus among nations committed to responsible AI practices. Through collective efforts, we seek to establish a harmonized and comprehensive approach to AI governance, reflecting our shared dedication to shaping the future of AI while upholding fundamental values and principles.

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## Way Forward

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Global cooperation is paramount to addressing the complex challenges posed by AI, from bias mitigation to transparency, accountability, and safeguarding human rights. To ensure the responsible and ethical development of AI on a global scale, alignment with international cooperation, multi-stakeholder engagement, and active participation in global initiatives are imperative. This roadmap outlines a strategic approach to foster international collaborations, leveraging diplomatic channels, and bilateral agreements to create a harmonized AI governance landscape. It calls upon all stakeholders, including governments, the private sector, academia, and civil society, to commit to this shared goal of shaping AI policies that benefit humanity while upholding our common values and principles. The MEA plays a pivotal role in advancing this vision internationally.

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# Promoting Innovation, R&D and Addressing Risks in AI – Roadmap for Department of Science & Technology

*By: Mrinmoy Deori Borah, Dhawal Gupta, Kaushal Mahan*



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## Overview

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Artificial Intelligence (AI) in today's world is transforming all walks of life. In the field of data science, AI technology has been evolving for more than 60 years now. However, there have been tremendous developments recently in innovation, technological advancement, research and development with respect to AI. Stakeholders ranging from governments, industry, academia, among others have been increasingly investing their time and efforts for the enhancement of AI technology by developing multiple AI use cases across diverse application areas like health care, education, transportation, entertainment, and business operations.

The potential of AI technology seems limitless as it allows computers to analyse enormous amounts of data, identify patterns and come to conclusions or predictions, frequently outperforming human capacity. Since 1950s, when researchers and scientists began exploring the idea of creating machines that could exhibit intelligent behaviour, AI technologies have evolved to perform logical reasoning tasks, to developing neural networks and deep learning<sup>1</sup>. Large datasets play a crucial role in training AI models and vast public datasets are available in Government organisations in India. These datasets unfortunately remain largely unused due to lack of proper annotation, associated costs with processing of data and lack of proper mechanisms for acquisition.<sup>2</sup> Therefore, to utilize these large datasets, Government needs to focus on policies for use of these data and capacity-building of human resources in terms of R&D and innovation.

The Science, Technology and Innovation Policy draft released by Department of Science and Technology in December,2020 outlines strategies for strengthening India's Science, Technology and Innovation ecosystem to achieve the larger goal of "Atmanirbhar Bharat" through technology self-reliance and indigenisation. To achieve this goal, the policy highlights that India needs to embrace the culture of work by faculty and students, and new technology tools such as AI, cybersecurity and green manufacturing. The 'India's Climate Research Agenda 2030 and beyond'<sup>3</sup> report by DST along with other Government departments and institutions also highlights the potential use of AI, Machine Learning and Deep Learning techniques to overcome the limitations of earth system models, thus supporting the argument for the need of capacity building in harnessing AI talent.

Though the objectives of the Department of Science and Technology are to catalyse and support research and development and adaptation of need-based technologies, strengthen S&T knowledge capacity and nurturing talent among others, it has been focusing on the enormous potential of emerging technologies such as AI and the opportunities for research and innovation in this field. DST has also been at the forefront of promoting and supporting talent in the field of AI, especially with a focus on nurturing women scientists and establish AI facilities in women universities. With the support of Consolidation of University Research for Innovation & Excellence in Women Universities (CURIE-AI) facility initiative<sup>4</sup> under the 'Knowledge Involvement in Research Advancement through Nurturing (KIRAN)' Scheme, DST has been proactive in bringing gender parity in technological innovation.

DST has also been instrumental in carrying out bilateral collaborations between India and other nations and one of the prominent partnerships has been the launch of U.S.-India Artificial Intelligence (USIAI) Initiative<sup>5</sup> that aims to strengthen the U.S.-India strategic partnership by focusing on AI cooperation in critical areas that are priorities for both countries. Science and Engineering Research Board (SERB), a statutory body of DST has also partnered with industry players to launch first-of-its-kind initiative- 'Fund for Industrial Research Engagement (FIRE)'<sup>6</sup> that will bring together industry and academia on a common platform to exchange ground-breaking ideas and co-promote innovative research in the space of AI/Machine Learning (ML), platform systems, circuits & architecture, Internet of Things (IoT), materials & devices and security from edge to cloud.

This note highlights the priority areas of DST with respect to AI and emerging technologies and suggests indicative intervention strategies for DST to promote innovation, R&D, talent and skilling in emerging technologies.

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## Global developments in AI research, innovation and nurturing talent

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### 1. U.S.A.:

- The U.S. National Science Foundation has announced a \$140 million investment to establish 7 new National Artificial Intelligence Research Institutes in collaboration with other federal agencies, higher education institutions and other stakeholders, to advance foundational AI research that promotes ethical and trustworthy AI systems and technologies, develop novel approaches to cybersecurity, contribute to innovative solutions to climate change, expand the understanding of the brain, and leverage AI capabilities to enhance education and public health.<sup>7</sup>
- The White House Office of Science and Technology Policy (OSTP) released a [National AI R&D Strategic Plan](#)<sup>8</sup> which makes it clear that when it comes to AI, the federal government will invest in R&D that promotes responsible American innovation.<sup>9</sup>

### 2. United Kingdom:

- During the AI Safety Summit held in London, United Kingdom Government, in collaboration with its international partners, has announced an £80 million project designed to finance global AI initiatives, with more emphasis on Africa.<sup>10</sup> The initiative seeks to enhance AI expertise and computational capabilities in Africa, assisting the continent's AI innovators in fostering growth and supporting long-term development.
- Government of U.K. released the National AI Strategy in 2021<sup>11</sup> which include key actions like launching a new National AI Research and Innovation Programme that will align funding programmes under UK Research and Innovation department and support the wider ecosystem. It also provides for ensuring diversity in AI by continuing existing interventions across top talent, PhDs, AI and Data Science Conversion Courses and Industrial Funded Masters.<sup>12</sup>

### 3. **Germany:**

- The Federal Ministry of Education and Research has pledged a €1.6 billion investment in AI and outlined 12 areas for action, including strengthening the entire AI value chain at the national and EU levels, focusing on connecting the dots with education, science and research.<sup>13</sup>

### 4. **Japan:**

- The Japanese government approved the Integrated Innovation Strategy 2023<sup>14</sup>, the third-year implementation strategy of the Sixth Science, Technology, and Innovation Promotion Plan, which focuses on 3 pillars- Strategic Promotion of Advanced Science and Technology, Enhancing the Knowledge Base and Strengthening Human Resource Development, and Formation of an Innovation Ecosystem.
- Ministry of Education, Culture, Sports, Science and Technology (MEXT) is promoting R&D and social applications of AI technologies by comprehensively facilitating R&D on innovative basic technologies centered on the RIKEN Center for Advanced Intelligence Project (AIP Center) and funding for challenging research themes.<sup>15</sup>

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## India's initiatives in AI innovation, R&D and skill development

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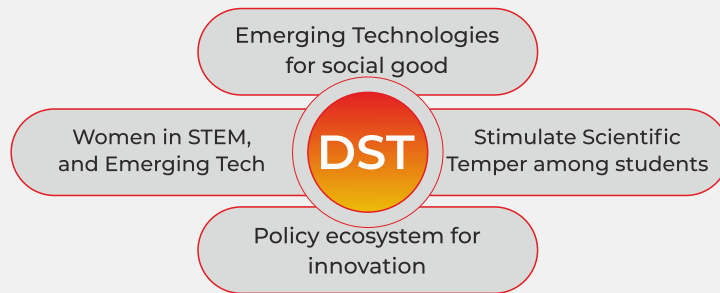
The Government of India has taken concrete steps to encourage the adoption of AI in a responsible manner and build public trust in its use, placing the idea of 'AI for All' at its very core. Also, India has been nominated as the Council Chair of the Global Partnership on AI (GPAI) by winning more than two-thirds of first preference votes which positions India as one of the largest Global South economies leading the AI race. In the G20 Summit 2023 under India's presidency, Prime Minister Narendra Modi has called upon the G20 bloc to establish a framework for AI governance. The G20 members adopted the Delhi Declaration which pledged to pursue a pro-innovation regulatory/governance approach that maximizes the benefits and recognizes the risks associated with the use of AI.<sup>16</sup>

NITI Aayog has formulated the National Strategy for Artificial Intelligence which includes evaluation of various sectors that will be impacted by AI and recommends setting up of a consortium of Ethics Councils at each CORE that will adhere to standard AI practices.<sup>17</sup>

Under IndiaAI programme the expert group report<sup>18</sup> has highlighted several aspects related to AI like (i) establishment of Centre of Excellences to bring together experts from academia, industry, and research entities to work on cutting-edge research to create high-quality AI solutions; (ii) emphasis on future AI skill development through AI Research based model curriculum framework involving K12 interventions and graduate/post graduate level interventions; (iii) establish best-in-class AI compute infrastructure like AI innovation hubs with Secure Distributed Data Grids.

In July 2023, a free AI training programme- "AI for India 2.0"<sup>19</sup>, has been launched by the Ministry of Skill Development & Entrepreneurship, targeted on India's youth like college students, fresh graduates and early professionals on AI and ML for a safe and better tech career in future.

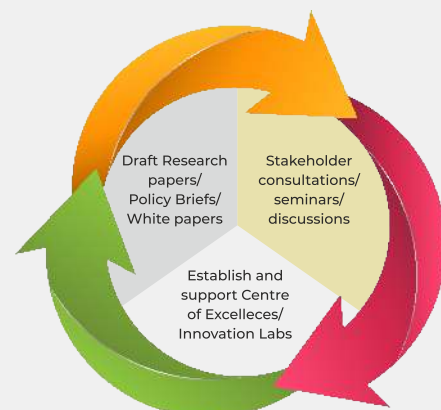
# Mapping of DST priority areas, associated divisions and indicative interventions in AI



\*Key focus areas of DST with respect to AI and emerging technologies

Priorities	DST Division	Objectives of DST Division	Indicative AI interventions for DST (Chase Suggestions)
Emerging Technologies for social good	Frontier and Futuristic Technologies (FFT) Division	To promote innovation in areas of advanced technologies, fund projects and implement mission mode programs.	Initiate AI led missions to address societal challenges and AI risk.
Stimulate scientific and technological temper among students.	National Council for Science and Technology Communication (NCSTC) division	Building capacity for informed decision making in the community and promote scientific thinking.	Promote scientific and technological temper among school students with respect to AI technologies through workshops/ seminars.
Women participation STEM, and emerging technology	Women in Science and Engineering- Knowledge Involvement in Research Advancement through Nurturing (WISE-KIRAN) Division	To provide career opportunities and create an enabling ecosystem for women scientists and technologists.	Promote gender equality in STEM and AI development by enabling women to become catalyst in development of AI.
Policy ecosystem for innovation	Policy Coordination and Programme Management (PCPM) Division	To generate evidence-based input for making the Policy& Panning and create critical mass of policy researchers in the country.	Create a policy framework for promotion of AI led innovation.

## Intervention strategies



**1. Emerging technologies for social good:**

- Create a report in collaboration with independent research organisations/ think tanks on mapping the scientific potential of AI innovation and R&D for critical socio-economic areas such as healthcare, climate action and clean energy.
- Engage with industry players in the AI space to create AI Centre of Excellences that can work on AI innovation to address societal challenges with the help of AI and tackling AI related risks.
- Facilitate knowledge exchange on AI innovation (challenges and opportunities) between new generation of researchers, innovators, and entrepreneurs, and promote collaboration between academia, industry, and research entities. This can be executed through round table discussions/ seminars/ webinars in collaboration with think tanks/ industry associations and industry players.

**2. Women participation in emerging technology:**

- Design workshops in government schools to create AI awareness and create interest for learning AI technologies, especially among girl students.
- Design a program to encourage women researchers to participate in AI innovation and R&D. The need for increasing participation of women researchers can address the challenge of AI bias.
- Curate seminars with women researchers from academia, research institutions and industry as panelist to discuss on opportunities and challenges for women scientists and researchers in the AI and emerging technology space.

**3. Stimulate scientific and technological temper among masses:**

- DST can collaborate with independent policy research organizations/ think tanks to build a roadmap for promoting scientific temper among school students, especially in the field of AI. Also, in collaboration with AI industry players, creation of AI labs in schools can be explored in line with the model of Atal Tinkering Labs.
- DST can partner with technical higher education institutions to organize seminars and workshops on AI innovation and AI risks in schools, particularly designed for school students to build their interest in this emerging technology.
- Partnership with AI Center of Excellences in higher technical education institutions to build collaboration between academia and industry for promotion of R&D and innovation in AI among students and researchers.

**4. Building a conducive policy ecosystem for innovation in AI:**

- Consultation papers/ reports on AI innovation policy can be drafted and released after taking into account different perspectives from all stakeholders including academia, policy enthusiasts, industry players and government institutions.
- Also, discussions with stakeholder can be conducted to create a committee/ working group which can work towards forming conducive policies for promotion of innovation and research in AI and emerging tech, building AI talent and better coordination among different government institutions under DST (like SERB, FIRE, etc.) and non-governmental institutions to address challenges associated with the development of emerging technologies like AI.



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## Way Forward

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DST has progressed over the years, seeding foundational technologies, and has launched several schemes to tackle the challenges that are coming at a faster speed with science, technology, and innovation-based solutions. At a time when artificial intelligence and other emerging technologies are transforming the world and society, the DST as Government of India's platform which is responsible for fostering innovation, R&D and talent in the Science and Technology space can look at the above discussed areas to ensure faster, responsible and inclusive development of AI in the country.

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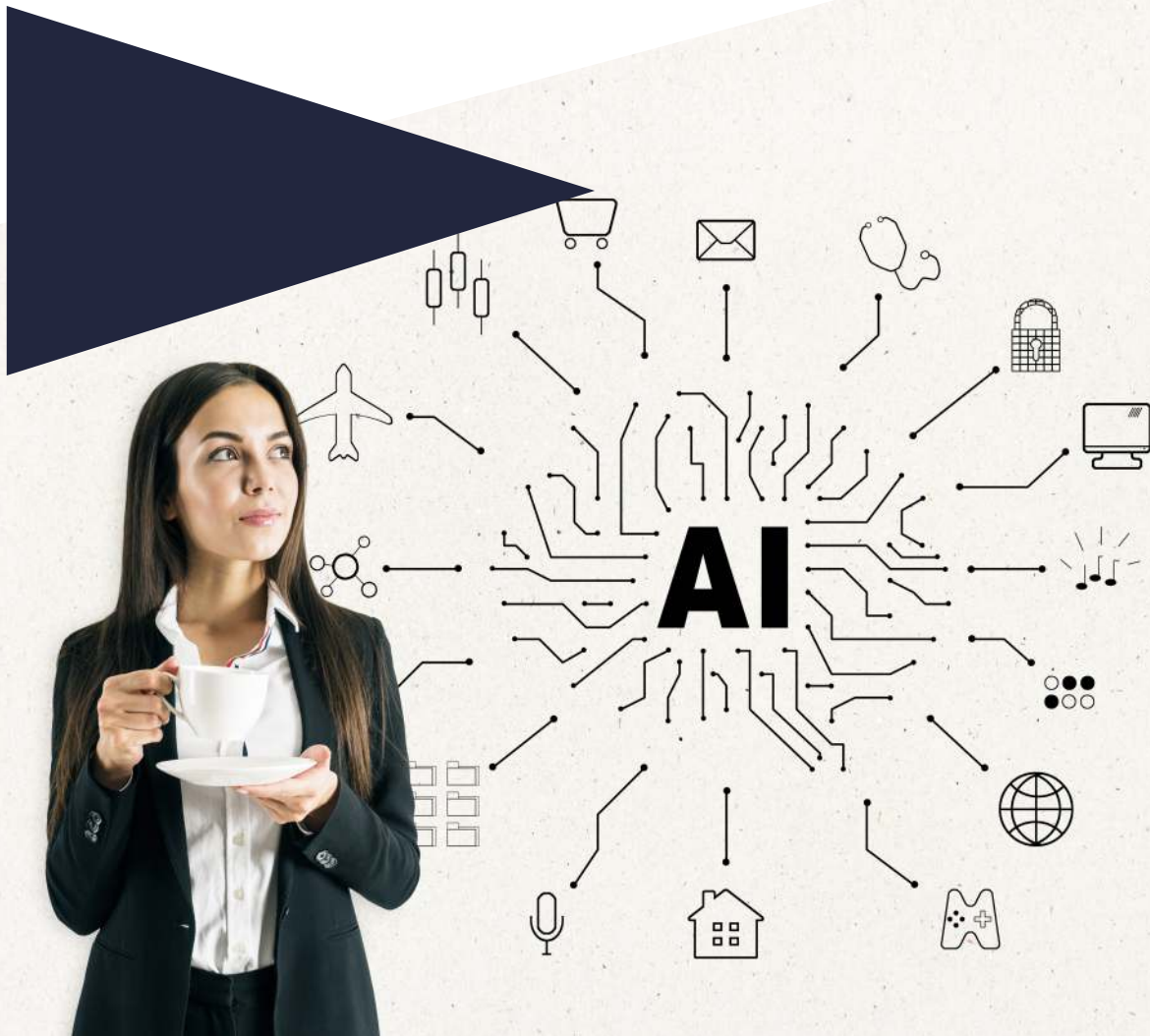
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# Ensuring Responsible Adoption of AI for Consumer Protection – Roadmap for Department of Consumer Affairs

*By: Darshika Gupta, Dhawal Gupta, Kaushal Mahan*



## Background

In recent years, Artificial Intelligence (AI) has undergone a transformative journey, expanding its applications across virtually every field of human endeavor. From healthcare and finance to transportation and entertainment, AI has become an indispensable tool, revolutionizing the way we work, live, and interact with the world. AI technology is now being used by virtually everyone and every sector, from individual consumers to large corporations and governments.

The expansive omnipresence of AI is predominantly felt in commercial markets with changing consumer experiences in their online interactions of buying, grievance redressal, personalized shopping recommendations and targeted advertising. Online commercial platforms have been quick in responding to emerging trends on consumer needs to offer better services to consumers based on consumption behavioral patterns. However, this has led to crucial discussions surrounding its ethical use. Central to this are the critical issues like algorithmic bias, privacy issues and customer profiling.

Industry players being at the forefront of deploying AI, it's crucial that importance is given to safeguard consumer rights and privacy, fortify against cybersecurity threats and eliminating bias in AI algorithms. It is imperative to strike a delicate balance between the boundless possibilities AI and the ethical responsibilities that come with its pervasive use. This roadmap delves deeper into various risks of AI on consumer protection and offers opportunities for Department of Consumer affairs to ensure responsible use of AI while reaping its benefits to deliver services.

## Indian Priorities with Consumer Protection



**Consumer Interests**

The consumer rights in India are protected by the Consumer Protection Act 2019<sup>1</sup> which provides for mechanism for redressing complaints and establishes Central Consumer Protection Authority (CCPA) with the primary objective being to regulate Unfair trade practices, Misleading advertisements, and Violation of consumer rights. It covers all transactions that happen made through online or offline modes by a consumer. However, one characteristic feature of transactions involving consumers is the information and market power asymmetry. Entrepreneurs or market players, being professional entities, possess more knowledge, experience, and market information, giving them a significant advantage in the transaction. This power imbalance is precisely the concern addressed by consumer protection laws, which seek to mitigate the disparities resulting from market asymmetry. The rapid development of AI systems, however, has introduced new dynamics into consumer transactions. AI is increasingly being integrated into consumer-related transactions, and consumers, being the less informed party, are facing challenges in comprehending and navigating these AI-driven transactions.

In a lifecycle journey to buy any product, the consumer goes through a set of experiences which are characterized based on the threats it poses due to AI -

These threats are detailed further based below -

**1. Targeted advertisements** - The use of self-learning algorithms in big data analytics gives private companies an opportunity to gain profound insights into individuals' personal circumstances, behavior patterns, and even their personalities, drawing from a wide array of data sources including purchase history, websites visited, social media likes, and health data. AI is actively employed in online tracking and the profiling of individuals, often facilitated through the use of "cookies" and digital fingerprinting. These insights are then amalgamated with data obtained from search engine queries or interactions with virtual assistants. This extensive data collection enables companies not only to tailor their advertising but also to customize pricing and contract terms based on each customer's profile. Leveraging the principles of behavioral economics, companies can exploit consumers' biases or willingness to pay, potentially leading to unfair practices. This phenomenon poses grave concerns for the right to privacy and freedom of expression. The profiling also limits consumer choices for specific products and restricts their freedom of choice. The automated nature of internet tracking and profiling processes often renders users unable to provide meaningful consent. For instance, social media algorithms wield substantial influence over a users' newsfeed, affecting which content they see and share. Similarly, search engine algorithms determine content indexing and the order of appearance in search results, raising concerns about the diversity of viewpoints and information access<sup>2</sup>.

**2. Price Discrimination** - AI supports digital businesses in presenting consumers with individualised prices, and offering to each consumer an approximation of the highest price point that the consumer may be able or willing to pay. Certain markets, such as credit or insurance, operate on cost structures based on risk profiles correlated with features distinctive to individual consumers, suggesting that it may be reasonable to offer different prices (e.g., interest rates) to different consumers.

**3. Privacy Concerns and data protection** - AI systems rely heavily on extensive training datasets, necessitating the continuous collection of consumer data through online and offline behavior tracking. This data is then stored, amalgamated with other data sources, and processed to create detailed consumer profiles. However, the rapid growth of the data industry and the extent to which personal information has become a commodity transferred among various entities remain largely unknown to the public. Many individuals are unaware of the quantity of information collected by third parties and how both private companies and government entities employ this data. Vast databases are formed by recording individuals' online activities, these include transaction data, emails, videos, images, clickstream data, logs, search queries, health records, and social media interactions. Additionally, personal information can be assembled from diverse offline sources, including public records, retailer sales records, credit agencies, hospitals, and more.

Furthermore, the proliferation of smart devices, such as cell phones, security cameras, global positioning satellites, and AI-driven devices like Alexa and Google Assistant, contributes to the accumulation of substantial amounts of data. Once this information is collected, there is an elevated concern regarding the potential for inappropriate access or disclosure to third parties.

**4. Discrimination and Bias** - The use of AI in commerce and various economic activities introduces the risk of discrimination and bias. While AI systems are designed to make objective and statistically-driven decisions, they heavily rely on the data used to train them. Bad data can contain implicit biases related to race, gender, or ideology, which can perpetuate discrimination when used in AI systems. Discrimination has already been observed in AI-driven advertising, where certain demographics are shown ads based on their past behavior, potentially excluding new consumers. Moreover, in industries like financial services, AI-driven decision-making processes may inadvertently lead to biased outcomes, even if unintentional. The transparency traditionally associated with creditworthiness assessments may become challenging with AI and big data, potentially discriminating against protected groups. This issue becomes particularly concerning in diverse populations where historical discrimination could be ingrained in training data, perpetuating bias through technology-driven services.

**5. Market Collusion and Concentration** - AI-driven markets are vulnerable to collusion, which can lead to reduced consumer choice and higher prices. Self-learning algorithms can coordinate prices without developers or users being aware of it, and increased use of pricing algorithms combined with market transparency can result in tacit collusion. Economies of scale and vertical integration in AI development can also lead to market concentration, benefiting large enterprises and early adopters while limiting competition. Additionally, the combination of hardware, software, and closed ecosystems can lock consumers into specific products or services, reducing choice and potentially increasing prices. Difficulty in assigning liability in case of defaults/lapse – AI systems involved in market operations often make complex decisions on large datasets and intricate algorithms, depending highly on data quality. If AI technologies are employed for consumer redressal, and in case of any defaults, it is difficult to determine the liability for the outcomes produced by AI. Similarly, In the case of targeted advertisements, if the AI targets a certain demographic more than others, it could lead to discrimination or ethical concerns. Determining who is responsible for such biases can be challenging, whether its AI developers, market players or the operators.

## Opportunities with AI for consumer protection

In addition to addressing various threats of AI for consumer protection, AI also offers various opportunities for businesses and governments to engage with consumers that ensures protection and fairer market services. AI can contribute to primary objectives of Consumer Protection Act and deliver more efficient solutions to consumer complaints and enhance consumer trust with transparency. Department of Consumer Affairs may adopt these mechanisms to foster growth to the innovative solutions, quicker grievance redressal and enhancing consumer engagement.

### Complaints Redressal

Quicker examination of consumer complaints based on content and resolution

### Consumer Awareness

Consumer education programs that focus on digital landscape and navigating challenges such as frauds

### Fraud Detection and Prevention

AI- powered algorithms can quickly detect frauds or deepfake advertisements

### Product Recommendations

AI-powered solutions to suggest products based on consumer needs

### Price Monitoring

AI-powered solutions to monitor prices for essential commodities

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## Promoting responsible innovations

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While AI-driven innovations offer remarkable advantages, they also raise significant concerns regarding consumer privacy and protection. Striking the right balance between safeguarding interest of consumers and using AI for economic growth has become a top priority for the ministry, raising calls for guidelines for ethical practices in advertising industry<sup>3</sup>. Department of Consumer affairs in their recent draft guidelines of Prevention and Regulation of Dark Patters<sup>4</sup> has listed some dark patterns adopted by companies that go against the consumers. These guidelines define dark patterns as any practices or deceptive design patterns using UI/UX (user interface/user experience) interactions on any platform. Similarly, the ministry has come up with similar guidelines for use of AI in advertising that targets consumers and makes sure companies clearly define all the practices that come under targeting and profiling of consumers. These guidelines compliment the Digital Personal Data Protection (DPDP) Act, 2023 that limits the use of personal data for unlawful purposes and requires consent to process the data for a very specific purpose. In addition to keep a check on use of AI in economic growth, safety measures such as Productive data management, critical evaluation, secure interaction, and auditing of algorithms are required for ethical use of AI in economic markets.

**Action required from regulators**– In order to strengthen innovations of AI in responsible manner, Central Consumer Protection Authority (CCPA) under section 10 of Consumer Protection Act 2019 has the power to regulate matters relating to violation of rights of consumers, unfair trade practices and false or misleading advertisements as specified in Section 18 (1)(a) read with Section 18(1)(b) to promote, protect and enforce the rights of consumers. Further, to promote and enforce the rights of consumers, CCPA must issue guidelines to establish code of ethics by industry members ensuring responsible use of AI adopting principles of –

1. **Accountability** – Companies ensure that AI systems are designed to help consumers identify AI-generated content and posts. AI-generated advertisements and marketing materials must contain watermarks that differentiate content from human generated content.
2. **Transparency** - AI systems are designed to inform the public when it is interacting with an AI system and that the system's capabilities and limitations are communicated clearly, including via model- and application-level documentation. Especially with interaction with AI chatbots that facilitate seamless disposal of queries and complaints.
3. **Safety** – Implement safety practices for advertising, that can allow testing of algorithms prior to release or publishing of advertisements in market. Such testing of AI algorithms would check for any unfair practices of discrimination, engagement in social scoring or infringement with consumer rights. Transparency in algorithmic decision-making is paramount for consumer rights protection.

4. **Privacy** – Implement DPDP Act 2023 mandating companies to take consent before using personal information to deliver targeted advertisements. Also ensure companies are clearly informed for the purpose of processing their personal data.
5. **Fairness** – Companies continuously review and update the algorithms that poses risk of infringement of consumer rights specially sectors of housing, employment and credit agencies.

**Opportunities of Collaboration**– Department of Consumer affairs (DoCA) must take this opportunity to engage discussion with industry involved in business of developing AI models and products to further compliment departments efforts in consumer welfare activities planned under Consumer Welfare Fund (CWF). Actively engaging in dialogues with industry will help align department's priorities with industry and identify areas where AI can enhance consumer welfare activities. Following are few suggestions for collaboration with industry on key priorities of Consumer Protection Act-

- Participate in establishing Centre of Excellence (CoE) with industry to deeply study and research the use cases of AI adoption in addressing consumer concerns such as unfair trade practices, price discrimination, etc. Develop AI algorithms that monitor pricing trends and identify instances of price discrimination and unfair trade practices. This platform can further be used to analyze market data and provide insights on fair pricing to customers.
- Collaborate on developing awareness campaign/ educational content that helps consumers identify cases of consumer exploitations using AI, especially cases of price discrimination and unfair trade practices. Identification of such instances by industry will embolden government's effort in 'Jaago Grahak Jaago' campaign. This consumer awareness campaign will prove to be revolutionary when integrated with AI to provide personalized education and provide insights on consumer rights.

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<sup>2</sup><https://digitalregulation.org/3004297-2/#post-3004297-footnote-1>

<sup>3</sup><https://www.financialexpress.com/opinion/advertising-and-ai-with-the-first-anniversary-of-chatgpt-it-is-important-to-look-at-how-ai-can-coexist-with-stakeholders-in-current-landscape/3268863/>

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# Catalyzing India's Future: A Strategy for AI Skilling – Roadmap for Ministry of Skill Development And Entrepreneurship

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## Introduction:

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Digitalization and technological innovation – such as Artificial Intelligence (AI) – and the way we manage and choose to use them will have a significant impact on labour markets, influencing how people work, the type of jobs they perform and the skills they need to carry out new tasks effectively.

As per a 2016 study conducted by McKinsey & Co., the strongest growth in demand will be for technological skills, the smallest category today, which will rise by 55% and by 2030 will represent 17% of hours worked.<sup>1</sup> According to a recent study conducted by Nasscom, India has the second largest global AI talent pool and has ranked first in terms of both AI skill penetration and AI talent concentration.<sup>2</sup> However, considering the current talent base of approximately 420,000 professionals, India still has a 51% gap between the demand and supply of AI/Machine learning Big Data analytics tech talent in India.<sup>3</sup>

In light of India's vision to emerge as a global leader in AI, it is strategically positioning itself to become a skilling capital. Recognizing the transformative potential of emerging technologies, especially in the realm of AI, India is intensifying efforts to bridge the significant talent gap. The Ministry of Skill Development and Entrepreneurship (MoSDE) plays a pivotal role in this vision, aiming to equip the Indian workforce with cutting-edge AI skills that are increasingly in demand globally. As a service-oriented economy, India acknowledges the imperative to align its skilling initiatives with the evolving landscape of work, ensuring that its workforce remains competitive and adaptable in the face of digitalization and technological innovation. By integrating AI skills into the fabric of its educational and professional development programs, India not only addresses its immediate talent deficit but also aligns with the broader goals of the MoSDE, fostering a workforce capable of driving the nation's digital transformation and sustaining its status as a service-oriented economic powerhouse.

Therefore, developing an AI skilling roadmap becomes crucial to address the widening gap between demand and supply of AI talent. By equipping the workforce with essential AI skills, it ensures individuals are prepared for future job roles, fostering economic growth and technological progress in the country. Moreover, the implementation of a robust AI skilling roadmap is not merely a response to immediate talent shortages but also a proactive measure to future-proof the workforce. As technology continues to evolve at an unprecedented pace, the roadmap ensures that individuals are equipped with the agility and adaptability needed to navigate the dynamic landscape of emerging technologies. By fostering a culture of continuous learning and innovation, the roadmap contributes to the creation of a resilient workforce that can readily embrace new advancements, reinforcing India's vision of being a global leader in AI and a skill capital of the world.

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## Current AI-Skilling initiatives:

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In the realm of AI and emerging technologies, India has witnessed a convergence of efforts from the government, industry, and academia to bridge the existing talent gap. The government's initiatives, such as the National Programme on Artificial Intelligence (NPAi) Skilling Framework and AI for India 2.0, underscore a commitment to equipping the workforce with essential AI skills. These programs, part of the broader Digital India Programme including the Pradhan Mantri Kaushal Vikas Yojana 4.0 (PMKVY), that emphasize the integration of AI into skill development, reflecting an awareness of the transformative potential of technology in the evolving job market.

On the industry front, initiatives like FutureSkills PRIME by NASSCOM and AI for India by Data Tech Labs are proactive approaches to addressing the skills shortage. Collaborations between the Directorate General of Training (DGT) and AWS, as well as the signing of MoUs between tech giants like IBM and Wadhvani AI and the Government, exemplify strategic efforts to deploy AI-based skilling solutions and leverage industry expertise.

On the academic front, several initiatives including LeadingIndia.AI demonstrate a forward-thinking stance that focuses on AI deep learning skilling and research, fostering collaboration between academia and industry stakeholders. Additionally, academic institutions, such as the Indian Institute of Science (IISc) and IIT Roorkee, have previously entered into partnerships with entities like Kotak Mahindra Bank and Course5 Intelligence to establish centers and schools dedicated to AI research and data science.

Efforts to prepare workforces for the future of work extend beyond national borders. Former US President Donald Trump's announcement of the American AI Initiative reflects a commitment to retraining workers at risk of job displacement due to AI. Similarly, Singapore's SkillsFuture Initiative, championed by the Ministry of Education, stands as a model supporting workforce transition by funding skill-related courses across 23 industries, enabling individuals to acquire new skills for enhanced employability.

On a broader scale, the World Economic Forum's Artificial Intelligence and Machine Learning (AI/ML) Project takes a proactive stance, aiming to shape governance policies and frameworks that mitigate the risks associated with AI and ML. These initiatives represent crucial steps toward addressing the challenges posed by advancing technologies.

The focus on initiatives in the northern hemisphere reveals a crucial gap, emphasizing the need for comparable efforts tailored to the needs of the Indian workforce. This underscores the importance of the AI skilling roadmap detailed below, one that is designed to prepare the Indian workforce for the challenges and opportunities presented by the future of work in the era of AI.

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## Roadmap for Engagement:

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Creating a roadmap for future AI skilling requires a thorough understanding of the unique challenges and opportunities in the Indian context, with a specific emphasis on addressing various schooling levels. The following is the suggested roadmap that the MoSDE can employ to establish a transformative AI skilling initiative. The roadmap focuses on the following key action items:

### 1. Creation of an Online AI Learning Platform:

National Skill Development Council (NSDC) can build on existing platforms like Skill India Digital platform to create a comprehensive online AI Learning Platform with the portal being efficiently deployed on the Skill India digital platform for easy access. This initiative aims to bridge the skills gap across different educational levels and foster a tripartite collaboration among MoSDE, the Central Board of Secondary Education (CBSE), and the Ministry of Education's (MoE) Innovation Cell. This online AI Learning Platform will cater to a nationwide audience, ensuring inclusivity and accessibility and equip learners with cutting-edge skills essential in today's digital landscape. This platform would cater to learners at different career stages, offering tailored courses for college students, entry-level professionals, and mid-career individuals which will be in line with the government's vision of Fresh Skilling, Upskilling, and Reskilling.

The platform could contain the following features:

- The platform will feature interactive modules comprising multimedia elements such as video lectures and animations, elevating the learning experience.
- Courses such as those launched by the Government including 'AI for India 2.0' can be deployed on the platform among other AI skilling courses offered by various organizations.
- Interactive discussion/knowledge sharing forums similar to the Govt's Digital Infrastructure for Knowledge Sharing (DIKSHA) platform will foster a sense of community and provide real-world insights, enhancing the overall learning experience.
- Recognizing the prevalence of mobile devices, the platform will be optimized for smartphones and tablets, enabling learners to access educational resources anytime, anywhere. This resonates with the broader Digital India campaign, promoting digital literacy and technology-enabled learning.
- Provide industry-recognized certifications for completed courses to enhance the professional credibility of the learners and establish partnerships with industry associations for certification validation.

The online AI Learning Platform can address the specific needs of learners at different stages of their education and career as mentioned below, thus, contributing to a holistic and inclusive skill development ecosystem.

1. School students with the objective of Introducing AI concepts to them and guiding them towards relevant courses in higher education.

### **Engaging Learning Resources for Foundation Building:**

- Develop interactive and gamified content to make AI concepts engaging and accessible for school children.
- Provide simplified modules explaining the basics of AI, machine learning, and their real-world applications.

### **Career Guidance and Exploration:**

- Include a career guidance section specifically designed for school students, highlighting the diverse career paths in AI and related fields.
  - Integrate quizzes and assessments to help students identify their interests within the AI domain.
2. College students with the objective of providing them with AI skills aligned with industry needs and enhanced placement opportunities.

### **Integrated Curriculum:**

- Ensure that the AI courses seamlessly integrate with existing college curricula, providing academic credits for completion. Collaborate with universities to create standardized AI modules that can be adopted across institutions. This is where CBSE and Ministry of Education would come in.

### **Internship Opportunities:**

- Collaborate with industries to offer internships directly related to AI, connecting college students with real-world applications of their learning.
  - Include a module on the platform guiding students on how to apply for and make the most of internships.
  - The platform's interface can incorporate analytics software designed to match individuals with suitable job or internship opportunities. However, it is important to note that the availability of internship or job opportunities will be exclusively on the All India Council for Technical Education's (AICTE) Internship Portal or the National Career Service (NCS) Portal, respectively.
3. Professionals with the objective of facilitating the transition of entry-level/mid-career level/professionals on sabbatical leave into AI-centric roles and offer upskilling opportunities for mid-career individuals.

### **Specialized Modules for Industry Relevance**

- Entry-level professionals can access specialized modules for a practical understanding, facilitating a smooth transition into AI-centric roles, while mid-career individuals can benefit from advanced courses for upskilling. This aligns with the broader objective of the Government's Skill India Mission.
- Collaborate with industry experts for course development and guest lectures.

### **Job Matching and Skill Analytics:**

- Implement advanced analytics to match professionals with suitable job opportunities based on their acquired skills.

- Offer personalized career advancement recommendations based on individual learning paths.
4. Reskilling with the objective of enabling individuals re-entering the workforce to acquire AI skills and receive formal recognition for existing skills.

#### **Recognition of Prior Learning (RPL):**

- For professionals on the sabbatical, the platform can incorporate the Recognition of Prior Learning (RPL) component as given under the PMKVY scheme, allowing individuals with prior learning experience or skills to register and get assessed and certified. This ensures that teachers with existing skills relevant to AI can receive formal recognition, contributing to their professional development.

#### **2. Collaborate with the NSDC Board to establish an AI Skill Sector Council (SSC):**

Establishing an AI Skill Sector Council allows for a focused approach to addressing the intricate demands of the AI industry.

- An AI SSC which aligns with the Govt's Skill India Mission ensures that individuals are equipped with the precise skills demanded by the diverse applications of AI, ranging from machine learning to data science.
- Standardization of education and certification processes within the AI domain provides credibility to training programs and assists employers in evaluating the proficiency of potential candidates. This is in congruence with the NPAi which emphasizes the need for a structured approach to AI education and skilling to meet the demands of the evolving job market. Moreover, an AI SSC's inclusive approach, addressing the needs of underrepresented groups, fosters diversity in the AI workforce.
- By assuring employment opportunities for trained individuals and emphasizing the training of proficient AI educators, an AI SSC promotes innovation, competitiveness, and economic growth, positioning the country as a leader in the field of AI.

#### **3. Development of occupational standards and competency framework by the AI Skill Sector Council:**

- The AI Skill Sector Council can develop a framework that will encapsulate a curriculum consisting of fundamental AI concepts, programming languages, machine learning algorithms, and practical applications. This is in line with the courses mentioned under PMKVY 4.0.
- The aim of this collaborative effort is to create an inclusive AI skilling program, accommodating learners from various skill levels and diverse demographic backgrounds including teachers. This curriculum can then be taught via the online AI learning platform, as suggested above.

#### **4. Organizing a series of physical 'Train the Trainer' workshops for teachers/educators:**

- The AI Sector Skill Council with the help of NSDC can collaborate with educational institutions to upskill/re-skill teachers/educators through a series of 'Train the Trainer' workshops encompassing vital domains like AI fluency, cloud computing, web development, Power BI, and soft skills. The emphasis on upskilling/re-skilling teachers/educators aligns

- The workshops can be designed to provide face-to-face training supplemented by online modules, ensuring a comprehensive and flexible learning experience.
- Participants can undergo pre-assessment to gauge their skill levels, and the workshops can include online courses supported by technical assistance. This model enables continuous learning and accommodates the diverse needs of educators at different skill levels.
- Post-assessment can be implemented to measure the acquired skill set and the overall effectiveness of the training. Certification of participation, along with badges, can be awarded to individuals who successfully complete the program, acknowledging their commitment to advancing their skills in alignment with the evolving technological landscape.

#### **5. Organizing a series of placement camps to enhance student's employability:**

In line with the National Apprenticeship Promotion Scheme (NAPS-2) and the Govt's Atmanirbhar Bharat initiative, the MoSDE and the NSDC, along with the All India Council for Technical Education (AICTE) can partner with industry stakeholders and educational institutions to conduct a series of impactful workshops to enhance students' employability with a special emphasis on AI. These events can serve as exclusive platforms for youth, connecting them directly with corporate India for employment and entrepreneurship opportunities. This initiative aligns with the broader goals of the MoSDE by facilitating direct interaction between youth and corporates, bridging the gap between academic learning and real-world employment opportunities. Here, AICTE will play a pivotal role in providing AI-specific internship opportunities on its platform, extending this feature to the online AI learning platform, as discussed above.

This collaboration ensures access for learners to curated internships, fostering practical experience, and enhancing their readiness for the AI job market focusing on the following aspects:

- Industry Interaction Workshops with expert insights: Networking events, job fairs, and seminars for direct interaction with diverse companies, providing valuable industry insights and trends, allowing students to showcase skills and connect with potential employers.
- Skill Enhancement Sessions: Workshops on soft skills, communication, problem-solving, specific tools, and technologies to boost students' attractiveness to employers.
- Interview Preparation: Mock interview sessions and personalized feedback on resumes and cover letters for effective self-presentation.
- Real-world Projects: Collaborative projects with industry partners, offering practical experience and showcasing problem-solving abilities.
- Mentorship Programs: Connecting students with professionals in their fields for personalized career guidance, aiding informed career decisions.

Through these targeted workshops, students gain a holistic skill set, industry exposure, and individualized mentorship, ensuring their readiness for the job market. Additionally, these workshops significantly improve their prospects for securing coveted internship and apprenticeship opportunities.

# Responsibilities

S. no.	Stakeholder	Responsibilities
1.	MoSDE	<ol style="list-style-type: none"> <li><b>Collaboration and Oversight:</b> MoSDE is responsible for collaborating for overseeing the implementation of the initiative, ensuring alignment with national skill development goals.</li> <li><b>Employability Enhancement:</b> MoSDE, in collaboration with NSDC and AI Skill Sector Council (SSC), conducts industry interaction workshops, skill enhancement sessions, interview preparation, real-world projects, and mentorship programs. These activities focus on enhancing students' employability, bridging the gap between academic learning and professional experience.</li> <li><b>Stakeholder Engagement:</b> Engage with industry stakeholders, educational institutions, and relevant government bodies to foster collaboration and support for the AI skilling programs.</li> <li><b>Awareness and Outreach:</b> Conduct awareness campaigns to promote AI skilling initiatives and encourage participation at various educational and professional levels.</li> </ol>
2.	National Skill Development Corporation (NSDC)	<ol style="list-style-type: none"> <li><b>Establishment of an Online AI Learning Platform:</b> NSDC under the supervision of the MoSDE creates an online AI learning platform, ensuring accessibility and inclusivity for learners across the nation. This platform hosts multimedia-rich content, including video lectures and animations, and hosting internship/ placement opportunities.</li> <li><b>Collaboration with AI Sector Skill Council (SSC):</b> NSDC partners with the AI SSC to develop occupational standards, competency framework and to organize Train the Trainer workshops. This collaboration includes the development of a curriculum covering fundamental AI concepts, programming languages, machine learning algorithms, and practical applications. NSDC ensures that these courses are deployed on the online platform.</li> </ol>
3.	AI Skill Sector Council	<ol style="list-style-type: none"> <li><b>Standardization and Framework Development:</b> The AI SSC takes the lead in developing an occupational framework in collaboration with NSDC, encapsulating industry-specific AI skills. This framework includes a curriculum with detailed modules on AI concepts, programming languages, and practical applications, aligning with the needs of the industry.</li> <li><b>Certification and Skill Standards:</b> The AI SSC sets certification standards and skill benchmarks, ensuring that the training programs offered at the online platform meet industry requirements. Certification processes are standardized, providing credibility to the training programs and assisting employers in evaluating candidates' proficiency.</li> <li><b>Inclusivity and Diversity:</b> The AI SSC ensures an inclusive approach, addressing the needs of underrepresented groups, fostering diversity in the AI workforce. By emphasizing the training of proficient AI educators and providing an inclusive learning environment, the SSC promotes innovation, competitiveness, and economic growth, positioning India as a leader in the field of Artificial Intelligence.</li> </ol>
4.	Industry	<ol style="list-style-type: none"> <li><b>Internship Opportunities:</b> Industries can collaborate by offering internships and real-world projects to students, bridging the gap between academic learning and practical application.</li> <li><b>Mentorship:</b> Industry professionals can provide mentorship to students, offering valuable insights, guidance, and real-world learning.</li> <li><b>Feedback Mechanism:</b> Industries can provide feedback on the curriculum's relevance, ensuring that students are equipped with skills directly applicable to the workplace, fostering a seamless transition from education to employment.</li> <li><b>Workshop Coordination:</b> In addition to preparing content for the workshop, they can organize and conduct workshops, seminars, and mentorship programs, enhancing students' practical skills and industry exposure.</li> </ol>
5.	AICTE & MOSDE	<ol style="list-style-type: none"> <li><b>Partnership Facilitation:</b> MoSDE can actively engage in facilitating partnerships between educational institutions and industry stakeholders. This involves connecting colleges, universities, and training centers with potential industry partners to create opportunities for internships, apprenticeships, and real-world projects.</li> </ol>



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## Conclusion

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In conclusion, the proposed roadmap for the MoSDE presents a comprehensive AI skilling roadmap tailored to address India's growing demand for AI talent.

By creating an inclusive online learning platform, forming an AI Skill Sector Council, conducting 'Train the Trainer' workshops, and enhancing students' employability through industry-focused initiatives, this roadmap not only bridges the skills gap but also nurtures a skilled workforce ready to excel in the rapidly evolving field of AI. This strategic partnership not only prepares individuals for the future workforce but also propels India toward becoming a global leader in technological innovation and economic growth.

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