



Unlocking Value from Data and AI

The India Opportunity

NASSCOM[®]

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Foreword

The importance of data and digital transformation has accelerated manifold in the last few months. Covid-19 has brought to the fore the importance of digital technologies including data and artificial intelligence in addressing the healthcare crisis, restarting supply chains, enabling online education and almost every aspect of the economy.

Digital India has enabled the country to become a rapid consumer of data and digital adoption in India is accelerating. However, India also needs to build on this and become a data innovator. This could play a key role in driving recovery, economic stimulation and socially relevant reforms.

The report 'Unlock Value from Data and AI: the India Opportunity' showcases that an integrated data utilization strategy can add \$450- \$500 Bn to India's GDP by 2025. In the immediate term, data and AI can play a strong enabling role across sectors. Healthcare is an obvious example, but workforce planning and protection, doubling farmer income, water management, financial health and support for MSMEs – all these and many more can be supported with an effective data utilization strategy. At the same time, we need to incentivize R&D and innovation to solve for India, accelerate India's journey as a global hub for data analytics and AI and catalyse innovate startups.

Learning from best practices of countries, a coordinated program is needed across 5 building blocks - Strategy, Data, Technology stack, Talent and Execution to capture this opportunity. The report also focuses on the key interventions needed to create a vibrant data economy in India that span across identifying datasets of national importance, build a data marketplace and define data standards and governance.

We are confident that a well-structured and executed data strategy can aid India growth and enable India to leverage its data richness for societal and economic benefits to the country.

The recommendations have been reviewed by industry leaders including Mr N. Chandrasekaran, Chairman, Tata Sons, Mr Rishad Premji, Chairman, Wipro and Mr Anant Maheshwari, President, Microsoft India.

Debjani Ghosh

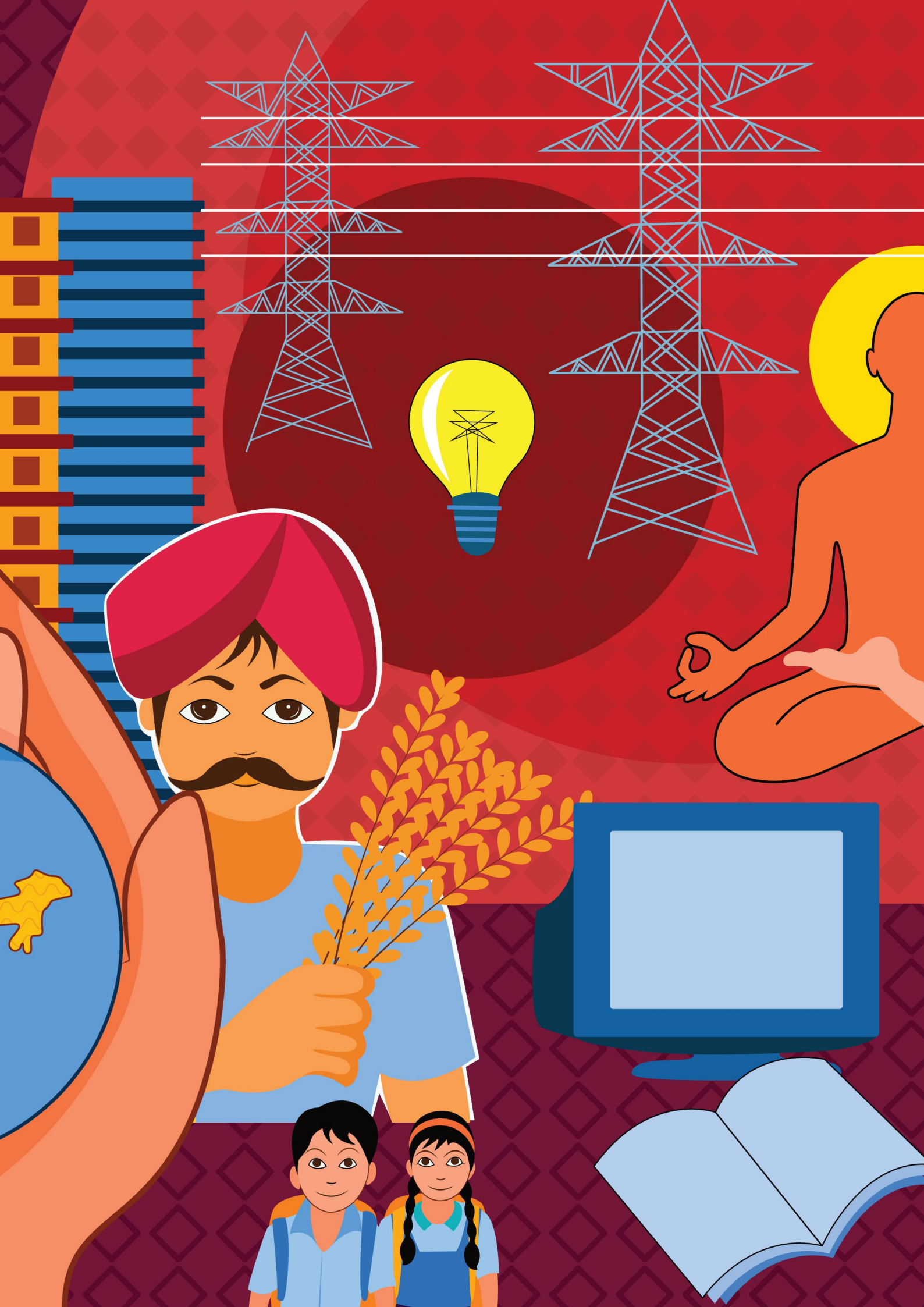
President, NASSCOM

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Executive summary

India responded promptly to contain COVID-19. The scale of response has been unprecedented. On-ground COVID-19 war rooms have highlighted importance of as well as gaps in data assets and integrated systems that are fundamental for pandemic response and reopening the economy. Importance of coordination and avoiding fragmentation have also surfaced.

It has become time critical that rapid action be taken to further enhance data and AI capabilities at scale across all sectors, especially health, as the country moves towards recovery, economic stimulation and socially-relevant reforms.

Data and AI could address dual goals of economic and social value creation and recovery:

- Data and Artificial Intelligence (AI) could support government and businesses during the pandemic for virus containment (e.g., contact tracing), workforce planning and protection (including the marginalized workers), resource optimization and for restarting the economic engine in a systematic and secure manner
- Driving utilization of data and AI could play a crucial role in realizing India's 2025 vision of inclusive development and deliver over \$500 bn in value for the economy. This would be even more impactful as India's economy restarts after the COVID-19 lockdown.

Countries actively promoting data utilization and AI are driving initiatives across 5 building blocks: strategy, data, technology stack, talent and execution. They have acted with speed and started multiple initiatives together in a concerted manner.

If India acts quickly, it can become the first country to launch a holistic data utilization and AI effort, especially as countries emerge from the pandemic. A coordinated program across all 5 building blocks is required to capture the opportunity. Investments in data and AI can be self-sustaining. This is valuable as economic revival can cause fiscal pressures.

While India has strengths to capitalize, delays could result in only partial value realization. There is potential to accelerate India's progress. This paper suggests options that could be considered and actioned within months for visible results.



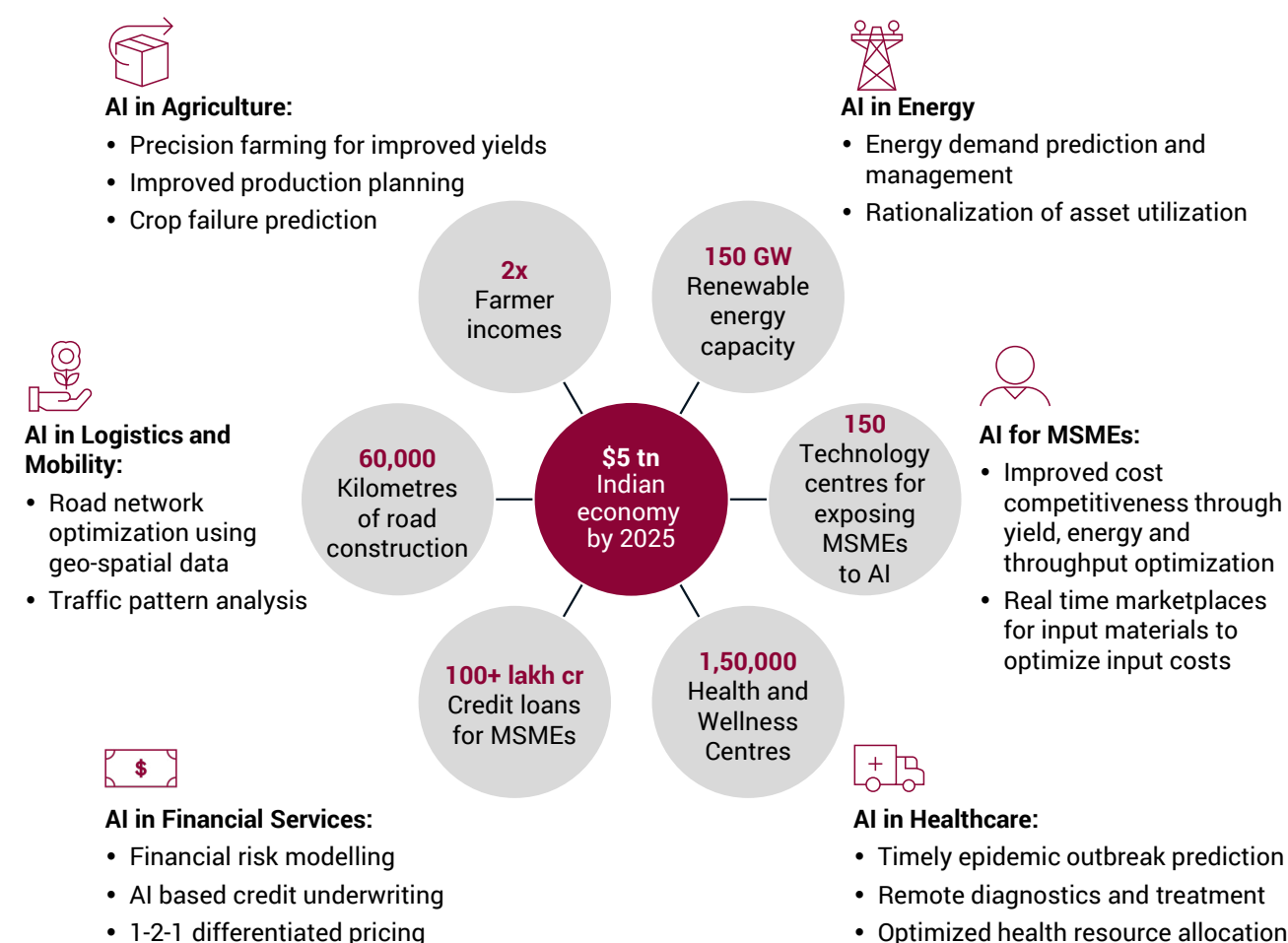
1 Role of data and AI in realizing India's vision for 2025

Prime Minister Modi has announced a bold vision to make India a \$5 trillion economy by 2024-25 while ensuring sustainable and inclusive development, and position the country as a global economic powerhouse moving it from the 7th to 3rd position in terms of current dollar exchange rate. This will call for pulling all the economic growth levers (investment, consumption and exports) across key sectors such as agriculture, tourism, energy, logistics and accounting and financial services, among others.

Data and AI will have a crucial role to play in realizing this vision for India by 2025, and delivering value across the key sectors.

Figure 1.1

Role of Data and AI in realizing the PM's vision for India by 2025



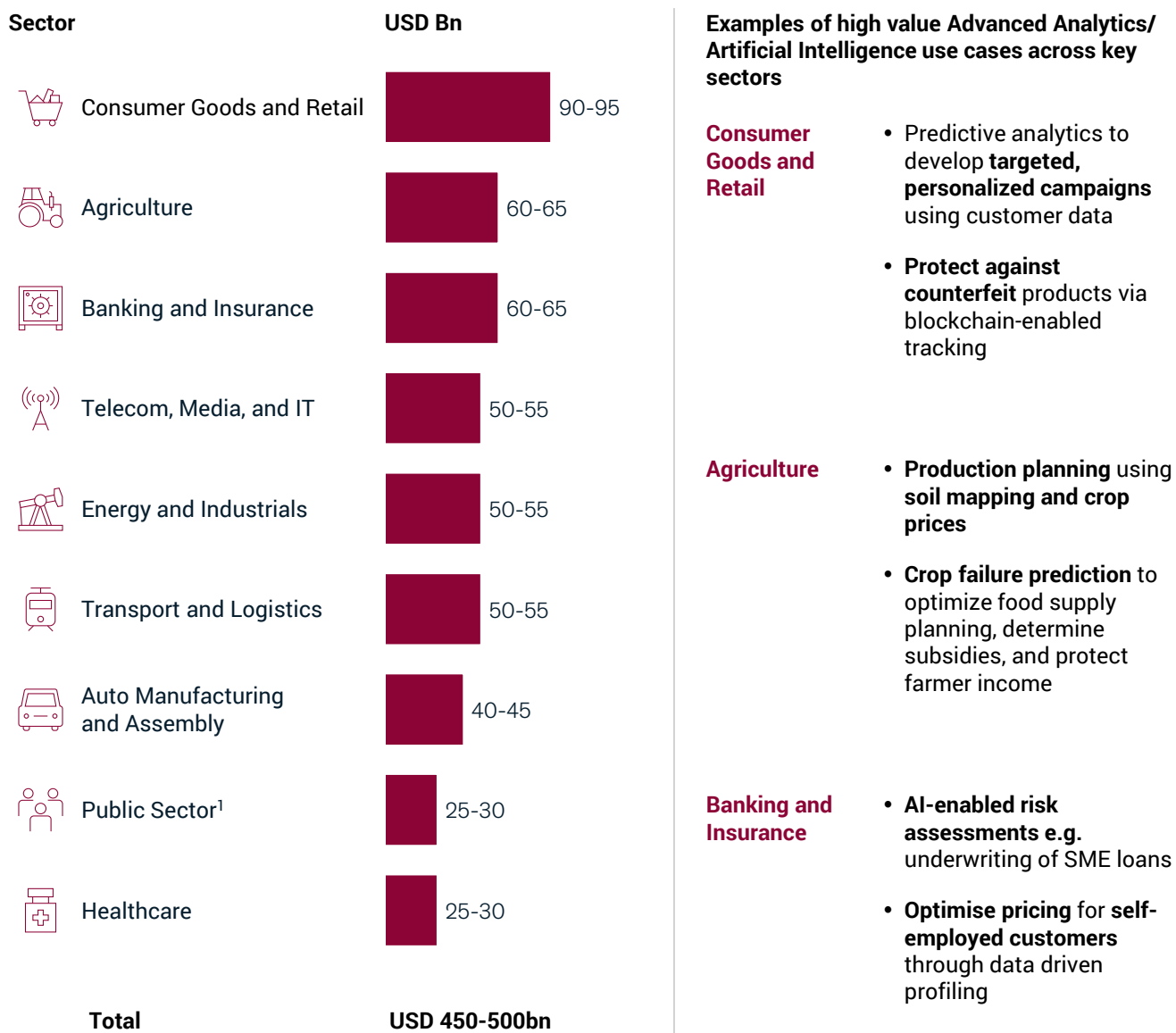
Source: Ruling party Government Manifesto, MGI Playbook on Artificial Intelligence Use Cases, Government of India Press Information Bureau

1.1 Role of data and AI in delivering economic value by 2025

Data and AI could add \$450-500bn to India's GDP by 2025, representing ~10% of the \$5 Tn aspiration pre-COVID-19. Nearly 45% of this value is likely to be delivered by 3 sectors: Consumer goods and Retail, Agriculture and Banking and Insurance.

Figure 1.1.1

Potential contribution of Data and AI to India's GDP by 2025



Public sector includes: Public administration and defense, Water treatment and supply, Sewage and waste management, Human health and social work, Education, Arts and culture

Source: India's Trillion Dollar Digital Opportunity, Feb 2019 (MeitY); Notes from the AI Frontier: Insights from Hundreds of Use Cases, 2018 (MGI)

Enhancing AI usage at a functional level, particularly in operations can unlock almost 50% of this value

Figure 1.1.2

Value unlock by function with enhanced AI usage

USD billion, 2025



AI-enabled use cases could have additional value creation in related industries such as IT services and electronics manufacturing, increasing total value at stake

1. Advanced industries includes: electronics and semiconductors, aerospace and defense, automotive and assembly

2. Public and social sector includes: Public administration and defense, Water treatment and supply, Sewage and waste management, Human health and social work, Education, Arts and culture




Source: India's Trillion Dollar Digital Opportunity, Feb 2019 (MeitY); Notes from the AI Frontier: Insights from Hundreds of Use Cases, 2018 (MGI)

1.2 Realizing India's vision of inclusive development through data and AI

Driving utilization of data and AI could play a crucial role in realizing India's vision of inclusive development especially in 3 areas:



1. Contributing to effective COVID-19 response and economic recovery

In the near term, data and AI could support governments and businesses with effective COVID-19 response and catalyzing economic recovery across key focus areas, including

	Virus containment support	<p>AI models and digital platforms for health systems to plan supply and demand for testing, infrastructure (isolation to intensive-care), health workers (nurses, intensivists and others), medical devices (e.g., ventilators), medicines and PPE</p> <p>Supporting governments with hackathons to create digital products for local needs, e.g., localized awareness building, coordination of health facilities across public and private sectors, online triage and support for people</p> <p>Enabling support to marginalized e.g., highlighting areas of low pandemic risk and high need for labor, and connecting Public distribution systems (PDS) across states</p>
	Workforce planning and protection	<p>Supporting businesses to predict employee sickness due to COVID-19, or monitor social distancing using computer vision</p>
	Supply chain stabilization	<p>Predictive logistics planning processes to improve supply chain resilience and reduce cost impact of shortages</p> <p>Leverage AI for conducting scenario testing to determine the optimal supply chain set-up (from suppliers to customers)</p>
	Financial reporting, cash flow and liquidity	<p>Modelling of complex, multi-dimensional scenarios using real time cash flow data and reporting to support companies to remain liquid during the crisis</p> <p>Predicting delays in payments or defaults to improve financial planning</p>
	Sales continuity and customer engagement	<p>Creating digital sales interface, with automated features (e.g., alerts to signal possible delays) for effective remote operations</p> <p>Conducting customer segmentation and channel testing to reduce churn and improve gross margins</p>

2. Supporting social initiatives and equitable growth

Data and AI could support social initiatives and equitable growth and help realize India's 2025 vision of inclusive development across key focus areas, including

	Water Management	<p>Support the Jal Shakti Abhiyan (National Water Mission) through use cases such as dynamic pricing, demand forecasting, and storage network planning</p> <p>Early Warning System (EWS) for managing flood and coastal erosion risk, facilitating disaster relief, and improving agricultural land usage</p> <p>Integrated Water Management Systems to track targeted interventions to monitor water levels and quality in groundwater and basins</p>
	Pollution and Air Quality control	<p>Pollution source and peak period characterization to enable dynamic and location-based policies for pollution control (e.g., minimize emissions from crop burning by identifying target areas for clean equipment subsidies)</p>



Reduced road fatalities and traffic management

Reduce road fatalities and traffic congestion by identification of accident prone zones, by enabling speed control, and traffic and road quality management

Optimize Government of India budget for Gram Swaraj – *Sadak se Samriddhi* and Rural Road Upgradation Program by prioritizing construction based on usage and road efficiency



Doubling farmer income

Increase farmer lending using credit risk assessment models based on farm characteristics and output data, to improve farmer income and lower cost of financing

Food supply planning, MSPs and subsidy determination using crop failure predictions to optimize public expenditure and protect farmer income

Enabling real-time price discovery and volume management through universal e-marketplaces to enhance farmer income



Financial sustainability and health of MSMEs

Improve access of SME/MSMEs to credit with business loans and cash credit facilities

Creating a nation-wide platform for SME manufacturers to list and sell their products, allowing for better price discovery and higher margins, digitization of procurement process and expanding market access for suppliers

Help drive efficiency through digitization of operations

3. Enhancing talent and capabilities to position India as the global hub for data & AI services

There is a need for increased adoption of data and AI services in India, in partnership with the industry, to accelerate investments in building capabilities that could be exported globally



India enjoys a leading position in the global IT services industry – it is the 2nd largest exporter of ICT services, with 4.4 million people employed by the industry, including over 500,000 in AI/ML¹. Data and analytics are the fastest-growing areas for IT services providers and have been identified as a key priority for the 'GICs of the future'.



The demand for setting up big data and AI CoEs in India is rising - Many leading global organizations have already established BD-AI CoEs in India to access talent and its start-up ecosystem. The demand is growing because of COVID-19 led distancing and digitization



This presents India an opportunity to develop itself as a leading global hub for Data and AI services -

Data and AI could create over 20 million jobs² in technical roles alone and have the potential to create more jobs in peripheral roles

There are 5 key building blocks to promote increased data utilization and adoption of AI. Countries that are actively promoting data utilization and AI are driving initiatives across the 5 building blocks. Below is an overview of the building blocks and possible initiatives for national AI programs.

¹ NASSCOM Publication- Technology Sector In India 2020 - TECHADE- The New Decade Strategic Review

² India's Trillion Dollar Digital Opportunity, Feb 2019 (MeitY); Jobs lost, jobs gained: Workforce transitions in a time of automation, 2017 (MGI)



2 Essential building blocks to promote data utilization and AI

There are 5 key building blocks to promote increased data utilization and adoption of AI. Countries that are actively promoting data utilization and AI are driving initiatives across the 5 building blocks. Below is an overview of the building blocks and possible initiatives for national AI programs.



Strategy

Develop a data and AI vision for the country

Identify priority use cases based on their impact potential and feasibility

Create an integrated action plan—including clearly defined targets and timelines—to implement the prioritized use cases

Prepare a long-term implementation plan and funding mechanism, for the program and commit funding to fuel implementation for the next three years



Data

Identify data sets required to unlock priority use cases.

Assess quality and align on gaps to be filled

Develop programs, in partnership with the ecosystem, to generate and provision data and derived services at-scale

Institute data governance policies—set standards for data classification, meta-data, data security, etc.



Technology Stack

Create platform(s) to securely host data, AI services, models, open-source libraries, applications and testbeds

Formulate policies to ensure the security, reliability, interoperability and economic viability of the stack

Design programs, in partnership with the ecosystem, for components (e.g., NLP for Indian languages) and creating an enabling infrastructure (e.g., 4G and 5G connectivity, or sensors)



Talent

Define AI roles, such as data scientists, data engineers, and translators and establish standards for their training and certification

Estimate demand-supply gaps in AI workforce and develop a talent strategy, to bridge the gap

Develop programs, in partnership with ecosystem, to address gaps by attracting, developing and upskilling talent at-scale



Execution

Design a national program for AI and an empowered central apex body to spearhead it

Define structures, roles and processes to enable various government bodies to effectively collaborate among themselves as well as with the industry and academia

Formulate programs to empower the ecosystem for innovation and adoption through change management

Instate an independent body to define and enforce AI policies (including those related to data privacy and ethical use of AI)

2.1 Learnings from global case studies

Countries proactively leveraging data and AI have taken actions across the five building blocks. Given India's scale and complexity, the global learnings will need to be tailored to an India specific context.

Figure 2.1.1

Assessment of actions taken by countries for national AI programs

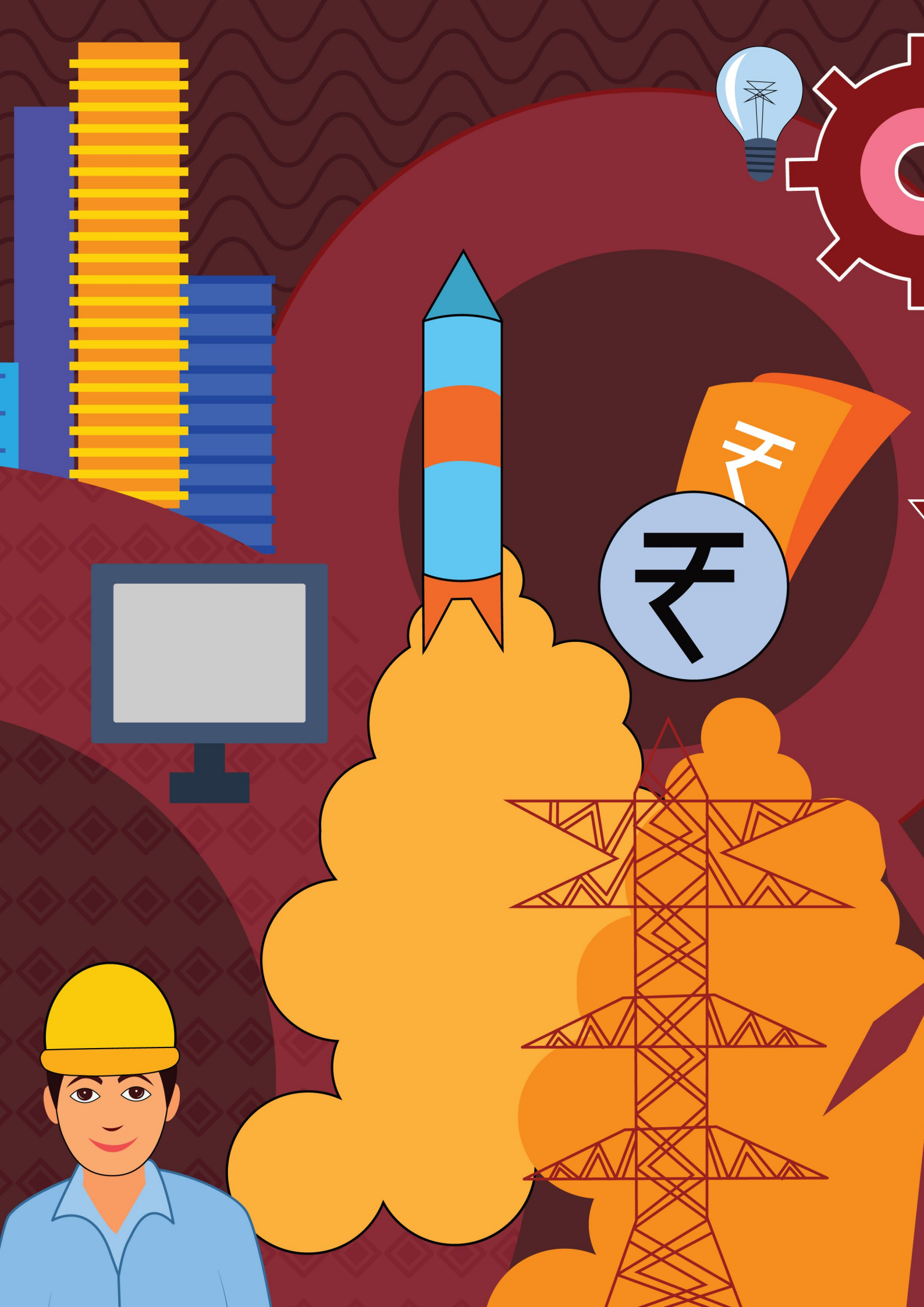
✓ Initiatives underway + Proposed, action yet to be taken

Updated in February 2020

Building blocks	Strategy				Data			Technology Stack			Talent			Execution			
	AI Vision	Priority use cases	Action plan	Business plan	Identify data sets	Data provision	Data governance	AI platform	Tech governance	Tech development	Talent standards	Talent strategy	Talent programs	AI program and owner	Collaboration mechanism	Enable ecosystem	Independent regulator
UK	✓		✓	✓	✓	✓	✓		+	+	✓	✓	✓	✓	✓	✓	✓
Singapore	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UAE	✓		✓			✓		✓				✓	✓	✓	✓	✓	
Estonia	✓		✓	✓		✓	✓	+	+	✓		✓	✓	+	+	+	

Sources: National Strategy On Artificial Intelligence by NITI Aayog, Artificial Intelligence Committees Reports by MeitY, UK AI Sector Deal; UAE National Program for AI, AI Singapore, National Strategy for AI – Denmark, Open Data Act, Report of Estonia's AI Taskforce

Designing a coordinated action plan across these 5 blocks could accelerate India's journey towards its vision for 2025. India has already announced plans in some of these areas. The plan for the journey ahead could build on these initiatives.



3 Potential actions needed to improve data utilization and AI in India

Six coordinated actions over the next 18 months could be considered to catalyze data utilization and adoption of AI in India

1. Launch the National Program for AI³ and create a central, apex body to steer its execution, in collaboration with various ministries, industry groups and other stakeholders. Establish a National Data Office to drive the utilization of public data with the support of CDOs in ministries and various state- and district-level bodies. Leverage the Public Digital Platforms that are already being developed and engage and incentivize the broader ecosystem (e.g., states) to share their data.
2. Consider finalizing India's Data and AI Action Plan in the next 3 months by conducting workshops with ministries and various stakeholders in India's AI ecosystem. With each Ministry, align on the top 3 initiatives (focusing on pandemic response, supporting marginalized groups and economic revival) to be designed and launched at scale in 2020. Agree on short term solution for all blocks. Develop a model to self-sustain financing in the future.
3. Identify datasets of national importance based on selected initiatives. Prioritize datasets that require government attention (which, for instance, are incomplete or have sub-par quality). Launch programs to provision them within 100 days of launching strategy.
4. Kick-off work on 3-5 programs of socio-economic importance across ministries in 2020. E.g., pilots can be initiated on use cases focused on post-COVID recovery. Plan to achieve scale beyond pilots, potentially within 12 months from kick-off. Drive these initiatives in collaboration with the ecosystem (industry, start-ups, academia, and others)
5. Increase data utilization by facilitating access to "data sets of national importance". Create data governance policies and standards. Enable creation of reliable technology platforms as marketplaces for public and private data and AI services. Aim to launch services within 6 months (COVID-19 response related services are very relevant examples of services that could be prioritized)
6. Create schemes to engage the AI ecosystem (industry, startups, civil society, and academia). Set up guardrails to protect public interest, while accelerating program and economic impact. Launch lighthouse projects in public sector, partnerships to create data, tech and services, and grants or incentives to invest in research and innovation.

3 Announced in February 2019 interim budget

3.1 The proposed apex body could play key roles across five areas

Design principles for the Apex Body

1. Create a dedicated and independent body with authority to convene and create accountability with other relevant ministries
2. Appoint a head of the apex body with subject matter expertise and the ability to mobilize government and private stakeholders
3. Create a mechanism for inter-ministry coordination
4. Define clear roles and responsibilities of the apex body

Key Functions of the Apex Body



1. Central program management and coordination
 - Define National AI vision and the desired socio-economic impact to be enabled by AI across sectors
 - Help various ministries prioritize use cases and create an action plan through bootcamps with the private sector, academia and other stakeholders
 - Propose a budget for the National AI action plan, including funds for the development of AI talent, technology, data and other enablers. Ensure self-sustainability in long term.
 - Advise the Ministry of Finance on decisions to allocate budget to other ministries for AI initiatives (based on their progress review). Track progress to self-sufficiency in the future.



2. Data governance and utilization
 - Define sector-agnostic data-governance policies, including standards for data management (e.g., data classification, metadata, data security); set governance rules for each data class and standards for ethical usage of data
 - Act as National Data Office to collaborate with State governments, Departments, and ecosystem to develop and provision datasets of national importance



3. Technology stack design and governance
 - Define the technical architecture and functional requirements of the AI platform
 - Define policies governing the use of technology, to ensure security, reliability, interoperability and economic viability of stack
 - Identify a platform owner for developing and operating the tech stack



4. Talent strategy definition
 - Define a talent strategy that includes clear role definitions and the steps to bridge the demand-supply gaps of AI workforce across ministries, private sector and academia
 - Launch and manage programs, in collaboration with academia and industry to implement the strategy
 - Establish and incentivize global partnerships and links



5. Use case execution, including organization and governance
 - Catalyze the implementation of use cases by launching AI Grand Challenges (a reward and recognition program) and coordinate with ministries and private sector for the implementation of prioritized use cases
 - Define structures, roles and processes to enable various government bodies to effectively collaborate among themselves as well as with the industry and academia
 - Define and enforce AI policies, including those related to data privacy and ethical use of AI

3.2 Build conviction among ministries and develop an action plan for Data and AI with ownership of respective ministries

Data and AI action plan identifies possible priorities, actions and investments for consideration

National strategy could address four themes

- Data and AI vision for the country
- Identified set of priority use cases and their impact sizing, with focus on COVID-19 response, support for marginalized groups and economic revival
- Integrated action plan (including initiatives to develop datasets, tech stack, or talent) to implement prioritized use cases with measurable targets and clear timelines
- Long-term economic plan for the program and near term funding commitments to ensure viability for first 3 years

Government could convene stakeholders, and finalize a plan; adopt agility

- NITI Aayog, MEITY and others have provided useful perspectives on the vision, potential use cases, and the supporting infrastructure required to action a national data and AI strategy.
- Successful implementation would require partnership from ministries and an integrated plan covering data strategy, tech stack, talent and execution mechanisms. The government could convene ministries and other important stakeholders to finalize this plan in a time-bound manner.
- As technology is evolving rapidly, India's strategic efforts on this front would need to embrace an agile "test and learn" approach and mechanisms to review and refine initiatives periodically.

In addition, consider kick-off work on key data and AI initiatives focused on COVID-19 response, support of the marginalized groups and economic revival in the country

3.3 Identify Datasets of National Importance

Figure 3.3.1

Preliminary list of top 10 datasets that may need government's intervention

Proposed datasets	Description
1 360° financial data	Complete financial profile encompassing traditional banking and credit history as well as digital transaction history (Online payments, e-wallet transactions, e-commerce purchases, mobile phone recharges, etc.)
2 Healthcare data	Database encompassing healthcare supply (health workers, infrastructure, equipment), individual patient records, health insurance claims aggregated across providers and agencies, including geographical and demographic information
3 Farm data	Data on actual yields of crop varieties at farm-level and data on soil health
4 Grain value chain	Granular (e.g., real-time) data on variety-wise market prices and inventory at mandis, data for storage (e.g., FCI) and distribution (e.g., PDS)
5 Land records	Digital land registry records with integration across various departments (revenue, survey, etc.), legal validity, and defined usage rights
6 Road traffic data	Real-time data on vehicular movement (including partnerships with private companies)
7 Weather data	Historical and forecasted district-level weather data, updated in real-time
8 Satellite imagery	High-resolution satellite data (or derived features that address security concerns and can be used for commercial purposes)
9 Power and grid data	Data on power generation, pricing, etc. (captured through smart meters and other similar devices)
10 Education data	Central data repository encompassing enrollment, drop outs, graduation, and skill certification linked to geographical and demographic data

3.3.1 India could become a vibrant data economy by developing high-quality datasets, data governance standards and a data marketplace

India's digital push could transform it into a data-rich economy:

India is becoming a digital leader on the foundation of JAM (Jan Dhan-Aadhaar-Mobile). Around 80% of India's adult population holds a bank account⁴, 450mn+⁵ citizens have mobile internet access and 1.25bn⁶ are biometrically registered. All of this translates into an enormous amount of data, considering it is estimated that 1.7 MB of data is being created every second for every human being on earth.⁷ This data holds the potential to transform the delivery of government services, create inclusive policies, and make Indian enterprises globally competitive.

However, various factors are inhibiting the utilization of this data to solve national problems:

There is a high variance in the quality and usability of key datasets in India, because of limited data policies and weak enforcement of the existing ones. Datasets in India exist in silos and are disaggregated across public-sector platforms. This limits their discovery and leads to the creation of duplicate datasets and incompatible data models.

4 Global Findex Database, 2017

5 <https://economictimes.indiatimes.com/tech/internet/india-has-second-highest-number-of-internet-users-after-china-report/articleshow/71311705.cms?from=mdr>

6 https://www.uidai.gov.in/images/Now_125_crore_residents_of_India_have_Aadhaar.pdf

7 Source: DATA TAKES A QUANTUM LEAP, Business First Magazine, 2016

Three interventions could create a vibrant data economy in India.

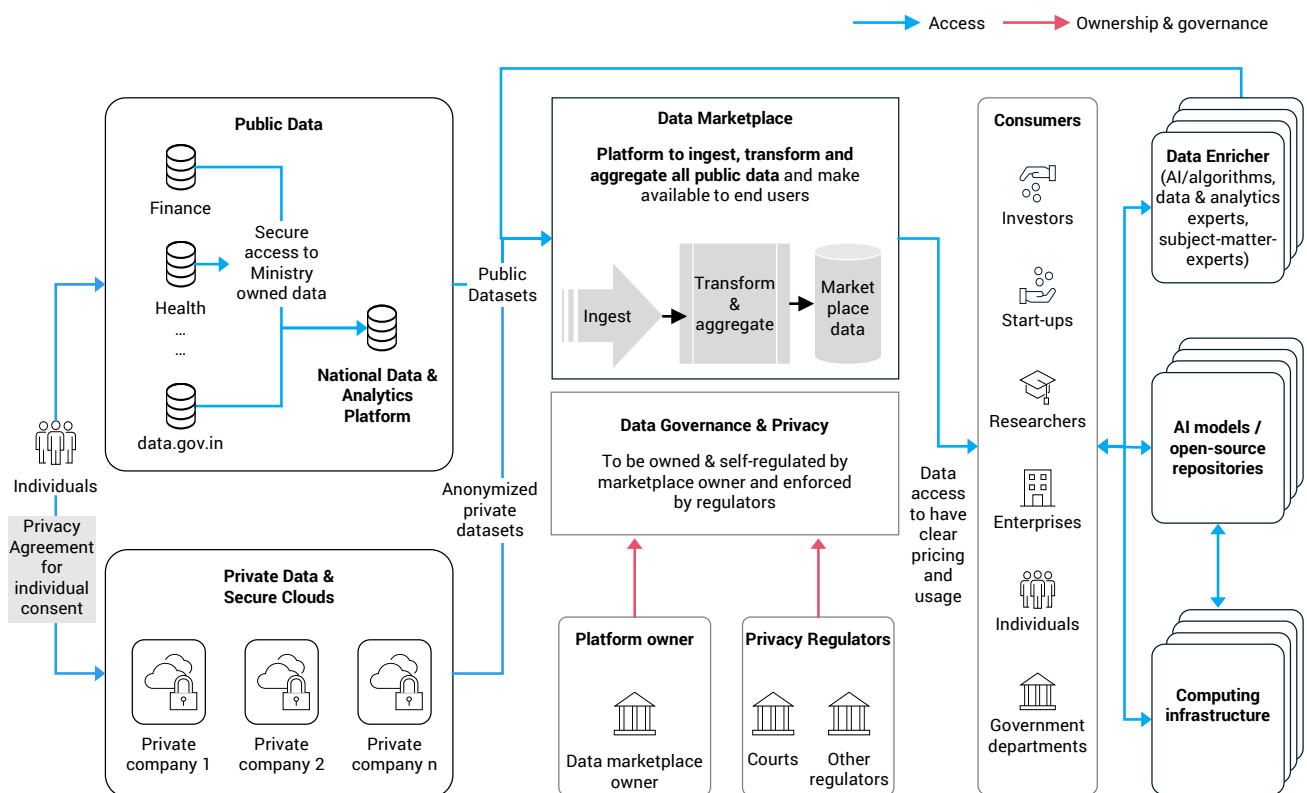
- Launching a 3-month concerted effort to identify “datasets of national importance” in collaboration with various ministries as well as a program (such as a Build operate transfer (BOT) program to develop the necessary infrastructure for collecting data on water) to provision them.
- Launch program to create a marketplace of data and derived assets—data catalogues, price discovery mechanisms, pay-for-use, policies to ensure privacy and security, validation, etc.
- Establish a central agency for defining and enforcing data standards (related to periodicity of update, API access, etc.) through technological interventions (implementation ownership to remain with public or private owners).

3.4 Increase accessibility and utilization of data in India using a data marketplace

To enable data utilization, data sets could be made available on a data marketplace that aggregates data from public and private sector, and is equipped with suitable data governance (classification, access rules and quality control) and privacy controls implemented. Data shall only be collected with user consent and should be anonymized before being made available on the data marketplace. Further, accelerating AI uptake requires a robust technology stack that will allow users to enrich the data on the marketplace, host open source solutions and AI models, and run AI models or big-data analysis using computing infrastructure.

Figure 3.4.1

Increase accessibility and utilization of data in India using a data marketplace



3.5 Build an ecosystem of innovation

Although India has 1600 deep-tech startups, with the deep tech startup pool growing at 40% CAGR from 2014, the pace of AI innovation lags leading economies.⁸ An ecosystem of innovation involving industry bodies, startups and academia could be crucial to accelerate data and AI efforts

Each stakeholder in the ecosystem can play a pivotal role in AI growth.

- Adoption in private sector is suggested for consideration for firms to remain globally competitive and to drive growth in the economy
- Industry and startups could provide the scale and pace required to develop data sets and tech stack, and (technical) implementation of use cases in public and private sector
- While many applications of data and AI have been proven, there are important problems that require innovation. Industry (especially start-ups) and academia could play an important role in finding solutions
- Academic and research institutes are important for innovation in technology components (e.g., low cost sensors) and contributing to defining standards or policies governing data, tech and talent

However, various factors curtail their participation.

- Unclear regulations on data and AI, or IP guidelines can limit private sector participation
- Limited efforts by ministries and public enterprises to drive the adoption of data and AI solutions, with a clear and viable business case for all stakeholders
- No programs to create datasets or tech stacks at the right scale
- Limited investments in R&D on data and AI-related themes
- Unclear business case for smaller firms (MSME) to adopt data and AI driven solutions

India could consider four steps to create an ecosystem for Data and AI.

- Create an empowered and independent regulator to catalyze AI adoption, while balancing concerns related to ethics, privacy and security
- Drive AI adoption through lighthouse projects (such as a data-enabled National Water Mission), thereby driving the demand for services from the ecosystem
- Use Public private partnership models to develop the data and AI infrastructure (data sets, tech stacks, etc.)
- Create incentives and structural enablers for global connectivity. Data and AI is evolving rapidly. It is important to remain current with these developments.
- Identify priority themes for research and innovation aligned with a national AI strategy, and launch AI-related grants for academia and awards for AI entrepreneurship

□ □ □

To emerge strong from the challenges posed by the COVID-19 crisis, India must marshal all the resources in its arsenal—including data. Enabling data utilization and AI services could accelerate inclusive economic development across India, but doing this would likely require a coordinated action plan, informed by global learnings and co-owned by ministries and other key stakeholders. This action plan could play an integral role in the journey to realizing India's 2025 vision.

⁸ India has filed 121 AI patents between 2015-18, while US has filed over 10,000 and other leading economies (such as UK, Japan and China) have filed between 800 to 3000

APPENDIX

UK – Initiatives underway

✓ Initiatives underway + Proposed, action yet to be taken

Building
blocks



Strategy



Data



Technology
Stack



Talent



Execution

Initiatives	AI Vision	Priority use cases	Action plan	Business plan	Identify data sets	Data provision	Data governance	AI platform	Tech governance	Infrastructure	Training and certification	Gap assessment	Talent programs	AI program and owner	Collaboration mechanism	Ecosystem for AI	Advisory authority
Progress status	✓		✓	✓	✓	✓	✓		+	+	✓	✓	✓	✓	✓	✓	✓
Initiatives underway	<p>Potential of AI to contribute 10% to the GDP</p> <p>Developed the UK AI Sector Deal, to advance the AI and Data Grand Challenge</p> <p>£400m committed across research and innovation (including startup funds)</p>				<p>Private institutes (e.g., ODI, UK Data Service) identifying priority data sets</p> <p>Open Data Portal has 50k+ datasets, on which 400 apps have been built</p> <p>Piloted sharing private data through Data Trusts</p> <p>Data publishing guidelines issued</p>			<p>Community of AI developers to create technical standards for interoperability between AI systems</p> <p>Investing over £1bn to develop 5G mobile networks and extend full fibre broadband</p>			<p>Creation of Ada, the National College of Digital Skills</p> <p>Government consultation with AI academics on demand-supply gap</p> <p>Created AI fellowship program; aim to have 2k AI PhDs by 2025</p>			<p>AI Council, an expert committee with members from the industry, academia and govt.; Office of AI for overseeing implementation; reports to the AI Council</p> <p>Creation of innovation hubs, AI startup funds</p> <p>CDEI an independent advisory body</p>			

Source: UK AI Sector Deal Review, 2018
(https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/702810/180425_BEIS_AI_Sector_Deal__4_.pdf)

Singapore – Initiatives underway

✓ Initiatives underway + Proposed, action yet to be taken

Building blocks



Strategy



Data



Technology Stack



Talent








Execution

Initiatives	AI Vision	Priority use cases	Action plan	Business plan	Identify data sets	Data provision	Data governance	AI platform	Tech governance	Infrastructure	Training and certification	Gap assessment	Talent programs	AI program and owner	Collaboration mechanism	Ecosystem for AI	Advisory authority
Progress status	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Initiatives underway	By 2030, to be a leader in developing and deploying scalable, impactful AI solutions AI to generate economic gains and improve lives Identified 5 priority use cases Developed action plan Commitment of SGD\$150mn for 5 years in AI Singapore				Portal (data.gov.sg) for publicly-available datasets , supported with data visualizations and data narratives Developed two sets of APIs to provide access to static and real-time data Data governance managed by PDPC			AI Singapore hosts platform Standards for 40 “nascent” technologies 100 Experiments (100E) to solve problems by AI AI Makerspace provides a suite of AI tools, APIs and pre-built solutions for specific use cases which SMEs and Start-ups can download and use			TechSkills Accelerator (TeSA) and AI Apprenticeship Programme (AIAP) to groom local AI talent AI for Industry – for industry professional to understand and use AI appropriately AI for Everyone – introduce anyone to AI technologies			AI Singapore to pull together Singapore’s AI capabilities; created through a partnership between government, industry and academia Centre for AI & Data Governance (CAIDG), to conduct independent research on policy, regulatory, ethics, etc. on AI and data use			

Source: AI Singapore <https://www.aisingapore.org/>

UAE – Initiatives underway

✓ Initiatives underway + Proposed, action yet to be taken

Building blocks		 Strategy	 Data	 Technology Stack	 Talent	 Execution											
Initiatives	AI Vision	Priority use cases	Action plan	Business plan	Identify data sets	Data provision	Data governance	AI platform	Tech governance	Infrastructure	Training and certification	Gap assessment	Talent programs	AI program and owner	Collaboration mechanism	Ecosystem for AI	Advisory authority
Progress status	✓		✓			✓		✓				✓	✓	✓	✓	✓	✓
Initiatives underway	Support the UAE Centennial 2071 project – goal of making the Emirates the 'best country in the world' Global leader in AI by 2031 ; 35% increase in AI's contribution to UAE's GDP				UAE official Open Data Portal (bayanat.ae) Few ministries have adopted open data policy (e.g., Ministry of Finance)			The UAE National Program for Artificial Intelligence – BRAIN – is a comprehensive and consolidated compilation of resources that highlight the advances in AI and Robotics			Setup world's first AI University² to offer both masters (two years) and PhD programs (four years) Launched AI Camp – a 2 months course for high school students, university students, govt executives UAE AI Internship Program – 500 Emirati students to be trained in AI			Minister for AI to develop legislation and frameworks 10-member council to oversee AI integration in government departments and the education sector UAE India Partnership RegLab for new tech; AI Ethics Self-Assessment Toolkit in Smart Dubai			

Source: National Program for Artificial Intelligence, UAE Artificial Intelligence Strategy

Estonia – Initiatives underway

✓ Initiatives underway + Proposed, action yet to be taken

Building blocks



Strategy



Data



Technology Stack



Talent



Execution

Initiatives	AI Vision	Priority use cases	Action plan	Business plan	Identify data sets	Data provision	Data governance	AI platform	Tech governance	Tech development	Talent standards	Talent strategy	Talent programs	AI program and owner	Collaboration mechanism	Enable ecosystem	Independent body to set policies
Progress status	✓		✓	✓		✓	✓	+	+	✓		✓	✓	+	+	+	
Initiatives underway	Accelerate use of AI leveraging the digital e-state foundation ; focus on responsible usage and eliminating bias Piloting kratt¹ projects to boost adoption of AI EUR 10 million from 2019-2021 to implement AI strategy				Green Paper on Open Data sets out guiding principles, architecture and activity plan “ Data stewards ” to be appointed as product owners for a ministry or agency’s data			Bürokratt : User interface, behind which various AI applications work together, seamlessly transferring user session and data Developed X-road¹ which connects different information systems, write to them, transmit large data sets and perform searches simultaneously; scalable architecture			IT Academy program by HITSA² ensuring digital skills are imparted at all levels; HITSA created 3-year education strategy for 2018-2020 Curricula for master’s studies of data science specialists and organize its studies to train 50 students in four years			AI Task Force created Cooperation network of data science and kratts in the public sector Technological sandboxes for testing and developing AI based applications			

1. Practical applications based on AI technologies
2. Information Technology Foundation for Education

Source: Report of Estonia’s AI Taskforce, May 2019

About NASSCOM

NASSCOM is the industry association for the IT-BPM sector in India. A not-for-profit organization funded by the industry, its objective is to build a growth led and sustainable technology and business services sector in the country with over 2,800 members. NASSCOM Research is the in-house research and analytics arm of NASSCOM generating insights and driving thought leadership for today's business leaders and entrepreneurs to strengthen India's position as a hub for digital technologies and innovation.

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