VIL/PB/RCA/2022/016

November 04, 2022

Advisor (Quality of Service)
Telecom Regulatory Authority of India,
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg (Old Minto Road),
New Delhi – 110002

Kind Attn: Shri Anand Kumar Singh

Subject: Comments on the TRAI's Consultation Paper on "Leveraging Artificial Intelligence and Big Data in Telecommunication Sector" dated August 05, 2022

Dear Sir,

Kindly find enclosed herewith comments from Vodafone Idea Limited to the TRAI's Consultation Paper on "Leveraging Artificial Intelligence and Big Data in Telecommunication Sector" dated August 05, 2022.

We hope our comments will merit your kind consideration please.

Thanking you,

Yours sincerely,

For **Vodafone Idea Limited**

P. Balaji
Chief Regulatory & Corporate Affairs Officer

Enclosed: As stated above

VIL Comments to the TRAI Consultation Paper on "Leveraging Artificial Intelligence and Big Data in Telecommunications Sector"

At the outset, we are thankful to the Authority for giving us this opportunity to provide our comments to the TRAI Consultation Paper on "Leveraging Artificial Intelligence and Big Data in Telecommunications Sector" dated 05.08.2022.

In this regard, we would like to submit as follows:

1. In the past few years, both Indian private and public sector companies and the Central and State governments have invested in multiple Artificial Intelligence (AI) use cases across diverse application areas. In fact, AI has started transforming the operational, functional, and strategic landscapes within various industry sectors. The scope and role of AI is also expanding. Organizations are infusing more of their enterprise applications and processes across functions with AI.

2. AI and Big Data (BD) is also playing a role in telecom and over the years is expected to expand into various areas like enhancement of customer experience, personalization of services, AI led digital acceleration, smart business, sales operations, effective predictive maintenance, network optimization, network Security, Fraud Mitigation, Robotics Process Automation (RPA), power/spectrum optimization for cell-sites, supply-chain management apart from autonomous vehicles, smart drones, building smart cities to remote medical procedures, online game streaming etc. These will be some of the prime reasons driving AI market growth in telecom industry in the evolving digital ecosystem.

3. However, it is vital to realize that AI is not a telecom service or a connectivity solution, rather a wider ICT technology which is emerging as an IT capability with applicability cut across sectors, and can be customized over a period of time to solve a lot of problems being experienced in today's scenario.

4. Also, the growth of AI has been relatively recent and its adoption in India is at a nascent stage. This will be very much driven by how the wider IT and computing capabilities of organizations develop. Any sort of regulation right now will stifle the adoption and hamper the innovation and practices being carried out in all sectors on the technology.

5. The development, deployment and adoption of AI and BD in the telecom sector should be left to the market players for now as each player will have a different set of techno-commercial considerations and solutions to examine and implement based on their own networks and service needs.

In addition to above, we would like to submit our question-wise comments also as follows, for Authority's kind consideration:

Question-wise Comments

Q.1. What may be the most appropriate definition of Artificial Intelligence (AI)? What are the broad requirements to develop and deploy AI models in a telecom sector? Whether any major challenges are faced by the telecom service providers in adopting AI? Please justify your response with rationale and global practices, if any.

VIL Comments to Q. No. 1

1. As mentioned by TRAI in the Consultation Paper, till date, there is no globally accepted definition of AI and Governments, regulatory agencies, international agencies, and other forums have adopted varying definitions depending on the context before them.

2. We believe that NITI Aayog's definition on AI as "a constellation of technologies that enables machines to act with higher levels of intelligence and emulate the human capabilities of sense, comprehend and act" is in sync with today's scenario.

3. In our view, AI can be defined as "the augmentation of human decision making capability with near real time or real-time decision making using structured or unstructured streaming big data by the means of scalable computing machines and complex Machine Learning or Deep Learning Algorithms for pattern identification and inferencing". These provide us actionable insights to run accelerated campaigns & Go to Market initiatives.

4. However, we believe that since the technology is still in the evolving stage, its definition will vary across entities based on the context the technology is being used for.

5. Broad requirements to develop and deploy AI models in telecom sector mainly are focused on Digital & Business Transformation which in turn is specifically focused on the following:

    a) New Revenue streams
    b) Customer Experience
    c) extreme personalization
    d) Pricing, Customer Value Management
    e) Churn Reduction

f) Customer Network Experience Management
g) Network Optimization
h) Ticket Routing & Resolution
i) Perform IoT Analytics
j) Digital Adoption Acceleration & Personalization

6. Major Challenges which are being faced by the telecom service providers in adopting AI are as follows:

a) Data Volumetric running into Petabytes, speed, scale, variety of data, data quality, retention period, regulatory norms for data storage & data monetization opportunities, multiple data sources, Comprehensive Cloudification - integrating / storing / Processing Big Data over cloud and inability to generate real-time or Near Real-time insights.

b) Data Privacy & Security norms act as major road blocks in efficient rollout of use cases & hence, require review. More statutory flexibility & focus is needed in such technological transformation with TSP being backbone of Global Digital Transformation & Business outreach.

c) Data monetization is one of the critical revenue streams for telecom operators. However, TSPs, even after having a veritable pool of customer behavior data, are still unable to reap the benefits of ways to monetize data and are bound by regulations which turns out be the biggest challenge. The telecom industry understands that the non-licensees are better placed to monetize data. Hence, creation of a level playing field is the need of the hour to fasten up AI adoption in the sector.

Q.2. Whether the big data in the telecom sector may be utilised for developing AI models? For efficient and effective handling of big data, whether there is a need for adoption of special programming models or software frameworks? Please justify your response with suitable examples and global practices, if any.

VIL Comments to Q. No. 2

1. The big data in the telecom sector may be utilized for developing AI models as qualitative big data is the key to developing customer & business impacting AI models & eventually perform big data analytics. However, we all know that the growth in the number of connected devices imply that a large portion of data created would presumably consist

of personal details relating to individuals, e.g. purchases, places visited, demography, health statistics, financial transactions, education, work profile etc. and entities operating in the digital ecosystem will be subjected to privacy rules of the country in which services are being offered.

2. Keeping in mind upcoming business requirements & technologies like 5G, IoT, Edge Computing, Quantum Computing, Complex AI algorithms for speech analytics, text analytics, visual intelligence and exponentially growing social media data, it is essential to focus on scalability and speed of AI model execution.

3. Hence, for efficient and effective handling of big data, selection and usage of special programming models or software frameworks shall be left at the discretion of the entities intending to deploy (in this case, telecom sector entities) as it will be dependent on various factors.

4. If we take the example of big data pertaining to telecom sector and use it to feed into non-Telecom AI systems, then, this is a proprietary and a competitive data which can incur cost to obtain, capture, store, process and analyze, and could even involve IPRs. Therefore, any applicability of such Big Data with any party/agency/entity should only be governed under a mutual commercial framework, and no regulatory mandate should be prescribed for the same.

5. Further, it also depends on the end objective/outcome being targeted or the business goal being envisioned to be achieved. It can't be rounded up into boundaries.

Q.3. Whether deployment of 5G and beyond technologies will help to accelerate adoption of AI in all the sectors and vice versa? Please justify your response with suitable illustrations including global practices, if any.

VIL Comments to Q. No. 3

1. 5G technology is indeed a breakthrough. Globally, 5G has capability to provide up to 10 gbps speed with 1 millisecond latency with 100 times support to connected devices per unit area as compared to 4G LTE. In our view, AI use cases around IoT Analytics and building smart cities, banks, hospitals, factories, automotive, logistic management, agricultural productivity, V2X / Autonomous vehicle based use-cases, traffic management, public health & safety on real-time basis, will become a reality. 5G will

support & enable real-time AI intelligence rendering on the edge at connected device level e.g. autonomous car, spectrum management, automated network optimization, etc.

2. However, it has been experienced that any new technology has varied usage scenarios which are difficult to predict in initial stages. It would be therefore good to understand the way the organizations and individual users use 5G and how enterprises look out for new 5G use cases in their systems.

3. Thus, we would like to reiterate that the growth of AI has been relatively recent and its adoption in India is at a nascent stage. It is very early to comment on what extent 5G and beyond technologies will help to accelerate adoption of AI.

Q.4. Do you think that a number of terminologies such as Trustworthy AI, Responsible AI, Explainable AI etc. have evolved to describe various aspects of AI but they overlap and do not have any standardised meanings? If yes, whether there is a need to define or harmonise these terms? Please justify your response with rationale and global practices, if any.

VIL Comments to Q. No. 4

1. The given terminologies are contextually relevant in different scenarios across industries looking at the sensitivity of developed AI use cases across industries and verticals.

2. Explainable AI allows human users to comprehend and trust the results and output created by machine learning algorithms by looking at its impact, potential biases, characterizes model accuracy, fairness, transparency, risks so on and so as terminologies like ethical AI, trustworthy AI etc. For example, any AI model output and accuracy has to be trusted and treated distinctly in case of Product Recommendation against a driverless car applying brakes or accelerating in different scenarios. While for the sake of clear definition of terminologies globally, a standard glossary / definition is recommended.

3. In our view, principles and standards can play a universal harmonizing role for the development of AI-related legal norms across the globe. However, the way we translate and embrace these articulated values, principles and actions to guide Nation and States around the world to formulate their regulatory systems, policies or other legal instruments regarding AI is in progress.

4. Our regulatory systems need to attempt and keep abreast of new technologies by recalibrating and adapting our approach to provide for new opportunities and risks, to

confer rights and duties, safety and liability frameworks, and to ensure legal certainty for businesses.

5. At the same time, there has to be a clear objective/outcome for any standardization. As of now, we would like to submit that there is no requirement of standardizing these terms. In fact, it has been experienced that IT capabilities and technologies work best in the absence of any such regulatory interventions to define terminologies, especially when they are at such a nascent stage of their development. Also, any review of this requirement can be conducted at a later stage when the market is developed enough. Till then, the same should be left to market forces.

Q.5. Which are the applications of AI and BD already being used by the TSPs in their networks to improve Quality of Service, Traffic Management, Spectrum Management and for Security purposes? Please list out all such applications along with the level of maturity of such applications. Please specify whether they are at trial stage or pilot stage or have reached the deployment stage? Details should include type of AI models, methods to access data, and procedures to ensure quality of data.

VIL Comments to Q. No. 5

1. AI & Data Science applicability within the telecom industry is being worked upon to enhance customer experience, personalization of services, AI led digital acceleration, smart business & sales operations, effective predictive maintenance, network optimization, network Security, Fraud Mitigation, Robotics Process Automation (RPA), power/spectrum optimization for cell-sites, supply chain management apart from autonomous vehicles, smart drones, building smart cities to remote medical procedures, online game streaming etc.

2. These will be some of the prime reasons driving AI market growth in telecom industry in the evolving digital ecosystem, however, as mentioned earlier, the deployment of AI/BD is still at a very nascent stage. Hence, it is too early to provide comments on type of AI models, methods to access data, and procedures to ensure quality of data.

Q.6. What are the major challenges faced by the telecom industry, including policy and regulatory, in developing, deploying, and scaling applications of AI listed in the response to

Q.5? How can such challenges be overcome? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 6

1. Given AI's reliance on massive amounts of data, and telecom industry being a big repository of the same, there are various challenges policy and regulatory, in developing, deploying, and scaling applications of AI. The major and fundamental one being the absence of Data Protection Bill with respect to determining the framework of rights and obligations over data residing within the industry. TRAI, also, in its recommendations on "Privacy, Security and Ownership of the Data in the Telecom Sector" dated July 16, 2018 stated that a technologically neutral approach be taken for anonymization/de-identification and on that basis, certain standards for anonymization/de-identification of data need to be put in place.

2. Data monetization is one of the critical revenue streams for telecom operators and there is a need to create a level playing field v/s non-licensed entities, to fasten up AI adoption in the sector.

3. It is expected that new Data Protection Bill and a Digital India Bill will be issued by the Government of India in near future and the same may provide the required legal framework and clarity for compliance and adoption of AI in India.

4. However, AI's prospects will get restricted if developers may only use data for pre-defined purposes. Therefore, there should only be light tough regulation which should not stifle innovation at this evolving stage of AI across various sectors.

Q.7. In which areas of other sectors including broadcasting, existing and future capabilities of the telecom networks can be used to leverage AI and BD? Please justify your response with rationale and suitable examples if any.

VIL Comments to Q. No. 7

1. The broadcasting sector is increasingly a substantial market for AI and ML technologies, majorly due to the popularity of virtual assets such as high-definition graphics and real-time virtual worlds. AI offers considerable benefits here, simplifying content management workflows and high volume content analysis. It is becoming particularly central to broadcaster business models, delivering increased discoverability of older archive content

with the help of improved AI metadata, and powerful localization with the help of speech recognition.

2. AI & BD aids in personalization, packaging and transmission of audio/video content in the real-time via own digital assets of the telco or third-party broadcasters. Today, AI is being used globally for audio/video content Meta Data Tagging which helps user to classify and tag objects, scenes or locations in the streaming video on the runtime at large data scale. Generating multilingual sub-titles on the runtime using machine translation capability of AI.

3. Having said that, AI/BD are having benefits cut across the sectors and its equipment and need will continue to vary.

Q.8. Whether risks and concerns such as privacy, security, bias, unethical use of AI etc. are restricting or likely to restrict the adoption of AI? List out all such risks and concerns associated with the adoption of AI. Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 8

1. AI will have profound impact on privacy in the next decade. Privacy and secrecy of AI users must be carefully considered when designing services and products. However, the risk and concerns are unlikely to restrict the adoption of AI with appropriate safeguards and policies being put in place. In order to ensure that human rights are protected, new governance frameworks, standards, and regulatory bodies, which oversee the use of AI, will be required to be formulated in future, once the ecosystem evolves.

2. The consultation paper currently addresses following risk: Low Quality Data, Data Biases, Data Security, Data Privacy (Identification and Tracking, Profiling). However, it does not deliberate on highlight the external risk of privacy breaches through AI-driven methods. Further, the ability to re-identify or anonymize personal data may be compromised or even nullified in light of new algorithms that have successfully re-identified such data. For eg: Autobots and Robots can cause privacy concerns for humans, partly because these bots can gather data and move around in the real world.

3. In addition to this, we would like to submit that the risks are not specific to AI; risks are specific to the data usage patterns by the digital enterprises and such area is already under governance.

Q.9. What measures are suggested to be taken to address the risks and concerns listed in response to Q.8? Which are the areas where regulatory interventions may help to address these risks and concerns? Please justify your response with rationale and suitable examples, if any.

And

Q.10. What measures do you suggest to instil trust and confidence regarding a robust and safe AI system among customers, TSPs and other related entities/stakeholders? Whether adopting general principles such as Responsible AI and ethical principles at the time of designing and operationalising the AI models will help in developing ethical solutions and instilling trust and confidence in the users? What may be such principles and who should formulate these and how compliance can be ensured? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 9 and 10

1. Telecom sector is fairly organized and the TSPs are governed by a number of guidelines relating to protection of user data. In fact, TSPs have an exceptional track record in terms of trust and keeping customer data secure right through the history of the ICT industry. There are a number of applicable legislation and policies that contain provisions with a bearing on the right to privacy and data security in the telecom sector in India which include:
   a) IT Act, 2000
   b) IT Rules
   c) Indian Telegraph Act, 1885
   d) Indian Telegraph Rule 419A
   e) Unified License conditions
   f) Guidelines, circulars, direction, notifications and regulations, etc. issued by DoT and TRAI

2. In addition to these, in February, 2010, TRAI issued a directive to all TSPs requiring them to ensure compliance of the terms and conditions of the license regarding confidentiality of information of subscribers and privacy of communications. The Authority had directed the service providers to put in place appropriate mechanisms to prevent the breach of confidentiality of information of subscribers and furnish the details of the steps taken in this regard.

3. All these licenses, terms and conditions, etc. have been so stringent at times that TSPs have struggled to innovate and compete with various non-regulated entities. Hence, it is more about awareness rather than instilling trust among customers through any regulatory measures.

4. However, AI being a multi-sector collaboration, there may be a need for the development of viable and applicable legislation and policies that will face the multifaceted challenges associated with AI, including potential breaches of fundamental ethical principles.

5. The consultation paper has discussed measures at National and Individual level, from the purview of telecom sector in India, NITI Aayog published principles of responsible AI in "Approach Document for India Part 1 – Principles for Responsible AI", "Part 2 – Operationalizing principles for responsible AI" and "Risk Based Approach for adoption of AI" have been recommended.

6. NITI Aayog has offered a roadmap for AI adoption in published documents, although the proposal does not address the need for: AI Law in India, sector-specific AI adoption guidelines, Guidelines for Ethical Data Democratization, requirement for telecommunication sector specific data hubs, consultation body and resolution of Organizational AI Complaints.

7. Further, to instill trust and confidence regarding a robust and safe AI system among customers, TSPs and other related entities/stakeholders, measures from a technological perspective, include the availability of state-of-the-art infrastructure, as well as ease of use and adaptation. The development of robust and safe AI systems will be based on ethics by design principles, data ownership control by users and reduced algorithmic bias.

8. By adopting the general principles such as Responsible AI and ethical principles at the time of designing and operationalizing the AI models will definitely help in developing ethical solutions and instilling trust and confidence in the users.

9. Lastly, we would like to highlight again that the technology is not mature at the moment and hence, any sort of regulation right now will hamper the innovation and practices being carried out in all sectors on the technology. Also, existing regulatory oversight is sufficient for TSPs to ensure data privacy and data security of customer data in order to instill trust and confidence regarding robust and safe AI systems.

Q.11. Whether there is a need of telecom/ICT sector specific or a common authority or a body or an institution to check and ensure compliance of national level and sector specific requirements for AI? If yes, what should be the composition, roles and responsibilities of such authority or body or institution? Please justify your response with rationale and suitable examples or best practices, if any.

And

Q.12. In response to Q.11, if yes, under which present legal framework or law such authority or body or institution can be constituted and what kind of amendments will be required in the said law? Or whether a new law to handle AI and related technologies is a better option? Please justify your response with rationale and suitable examples or best practices, if any.

VIL Comments to Q. No. 11 and 12

1. We should not look at AI/BD from a prism of a sector as specific deployments. Considering its nascent stage, there is a need to not go into compliances etc. at this stage and look for enablers supporting deployments. AI is still evolving and is an IT-driven capability that is more capable of helping optimize and bring efficiencies within a telecom network or service than any standalone parameter that enables a telecom service.

2. Various organizations are involved in the research and development of AI systems and the risks of the technology depends on the specific context for which it is used and the environment it is deployed. It is therefore infeasible to identify prescriptive one-size-fits-all guidelines to ensure adherence to the Principles. Instead, the focus must therefore be on instituting governance mechanisms that would enable the creation of reliable, predictable and trustworthy applications.

3. We believe that at present there is no such requirement of sector-specific body or regulatory/legal intervention to ensure compliance of national level and sector specific requirements for AI as the technology is still evolving.

4. At a later stage, however, there can be a cross-sector Regulatory Authority in place whose primary responsibility shall be to formulate cross-sector guidelines, monitor compliance, provide consultation, publish expert advice on AI issues and oversee technology developments.

Q.13. Whether telecom/ICT industry is facing constraints such as access to data, lack of computing infrastructure, lack of standards, and R&D in the adoption of AI and BD technologies? Please list out all such constraints with adequate details.

VIL Comments to Q. No. 13

1. India telecom industry drives massive volume of data & processes it for decision support and run customer & marketing campaigns. This digital transformation at Telco's are in the middle of costly transition from legacy storage data bases, processing CPU's to Cloud, Multi-Cloud or Hybrid cloud environments. Although looking at number of data sources, volumetric, retention period & need for AI innovation, the public cloud still seems to be costly. Telco are well aware augmenting scalability & speedy decision support from Big Data platforms with plug and play AI-based platform.

2. Real-time or Near Real-time AI use case with respect to emerging ecosystem of IoT Sensors and other connected devices still seems far looking at data colocation issue & processing power. Identification of mutually beneficial AI use case and joint sponsorship for the same will ensure rapid R&D. With the mass-scale deployment of 5G planned beginning 2022, telecom operators will need to re-engineer their networks to make them smarter and more efficient.

3. To turn this around, the companies innovate their offerings, optimize their performance, and transform their network operations hence data storage & processing capabilities have to be augmented exponentially.

Q.14. What measures are required to make data and computing infrastructure available and accessible to developers and also to make data/AI models interoperable and compatible? Please respond along with examples, best practices and explanatory notes.

VIL Comments to Q. No. 14

1. The surge of Public cloud, Hybrid & Multi cloud is enabling predictive AI use case especially in consumer, marketing, enterprise, network management & digital acceleration apart from other functions within Telco.

2. In order to optimize the cost and optimum return on investment, it is critical to make data / AI models should be made interoperable and compatible especially building AI models private cloud and deploying the on Public cloud with least latency and eventually running

them through remote accesses for inferencing & running business campaigns via integrated CRM tools. Telco has multiple data sources running into 100's from data acquisition, building & scoring AI models to running campaigns through multiple customer touchpoints, therefore compatibility via multiple connectors provided by these cloud environments provides seamless execution of go to market strategies with speed at scale.

Q.15. Whether there is a gap between requirement and availability of skilled AI workforce? If so, what measures are required to be taken to ensure availability of adequate skilled workforce in AI domain? Please respond along with suggestions with supporting details and best practices.

VIL Comments to Q. No. 15

1. Yes, there is a shortage of AI skilled workforce including Data Scientist, MLOps, Cloud AI and Data Engineers. Gartner survey in 2019 found that 54% of Chief Information Officers believe AI skillset gap as the biggest challenge facing their organisation. Key skillset gap consists of programming skills in Python, R, Hadoop components, Spark, Scala, Hive, associated Libraries and frameworks, Machine Learning and Deep Learning, Speech Recognition, Natural Language processing and Computer Vision along with domain expertise.

2. Some of the measures to shorten this skill gap include:
   a) Open source portals to upgrade existing resource like Coursera, Udemy, Datacamp etc.
   b) Internship with partitioning industries.
   c) Tie up with academic institutions or universities for these specific skillsets.
   d) Run on job trainings programs to upskill existing resources.
   e) Recommending existing resources for global certifications in AI technologies.

3. Some of the existing short & exhaustive courses are indicated as below:

   a) Advanced Certification in Data Science and AI, IIT Madras
   b) Simplilearn's Dual Master's program in Data Science and Artificial Intelligence
   c) Professional Certificate Programme in Applied Data Science, IIT, Palakkad
   d) Data Science, Machine Learning and Artificial Intelligence programme, IIM Kozikode
   e) Executive M.Tech in Artificial Intelligence programme, IIT Patna
   f) Professional Certificate Program in Machine Learning & Artificial Intelligence, MIT

g) Advanced Certificate Program In Data Science & AI by E&ICT Academy, IIT Roorkee
h) Executive Post Graduate Programme in Machine Learning & AI, IIT Bombay
i) Python for Data Science and Machine Learning Bootcamp, Udemy
j) Intro to Big Data, Data Science and Artificial Intelligence, Udemy
k) Deep Learning Specialization, Coursera
l) Advanced Computer Vision with TensorFlow, Coursera
m) Natural Language Processing Specialization, Coursera
n) Applied Machine Learning - Beginner to Professional, Analytics Vidhya
o) Certified Business Analytics Program, Analytics Vidhya

4. Hence, with more and more AI/ML and BD courses being offered at undergraduate and postgraduate level by various universities, this demand is likely to be met.

5. However, it can also be seen if there can be a multidisciplinary institution for research, enabling private sector, legal, social and policy thinking on empowering effective interfacing with relevant Ministries and the States to ensure availability of adequate skilled workforce in AI domain.

Q.16. What initiatives do you suggest to democratise data required to develop AI models in the telecom sector? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 16

1. Data democratisation for building AI models is critical keeping in mind the real-time and batch processing of data for business use cases for AI modelling and scoring. The key objective for this democratisation is to fasten AI modelling, scalability, single source of data for all AI models, reduce entry barriers, cutting down cost & processing time, creating accurate models for acquisition & retention, facilitating sentiment analysis, visual intelligence use cases etc. Creating consolidated harmonised KPI bank or function specific GNOME is the most appropriate methodology for object creation and consumption by various AI models. These created objects can be structured as tables with rows and columns or be semi-structured or unstructured like images, videos, audio, and text.

2. The key elements for Data democratization for AI models include Data itself (eg. UCI datasets), Storage & Computing (AWS, Azure or Google Cloud), Machine Learning and deep learning algorithms (eg. Tensorflow, Pytorch, github), model development and

deployment frameworks (eg. Sagemaker, Spark, Flask, Django) and Marketplace (eg. Kaggle, KD Nuggets etc.).

Q.17. Whether the authority or body or institution as suggested in response to Q.11 may also be entrusted with the task to manage and oversee collection, cataloguing and storage of data? Whether such authority or body or institution need to be entrusted to generate and make available synthetic data? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 17

1. As suggested in response to Q.11, we believe that at present there is no such requirement of sector-specific body to ensure compliance of national level and sector specific requirements for AI as the technology is still evolving.

2. At a later stage, as part of the responsibility of the department, synthesized data will be generated and made available, along with frameworks and guidelines for democratization, as well as handling issues such as data storage, availability, sanitization, privacy, security, etc.

Q.18. Whether the legal framework as envisaged in para 3.5.3 and Q.12 should also enable and provide for digitalisation, sharing and monetisation for effective use of the data in AI without affecting privacy and security of the data? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 18

1. We understand that the telecom sector is fairly organized and the TSPs are governed by a number of guidelines relating to protection of user data. There are a number of applicable legislation and policies enforced by the Government that contain provisions with a bearing on the right to privacy and data security in the telecom sector in India.

2. In addition to this, it is expected that new Data Protection Bill and a Digital India Bill will be issued by the Government of India in near future will cater the need of effective use of the data in AI without affecting privacy and security of the data. Also, the same may

provide the required legal framework and clarity for compliance and adoption of AI in India.

3. Overall, we believe that the issues related to this question pertain to a much wider aspect of Data Protection and Privacy, which the proposed Bill will try to address, and no overlapping institutions/mechanisms should be created lest they add any avoidable cost and complexities.

Q.19. (a) Which are the currently used privacy enhancing and privacy preserving technologies facilitating adoption of AI and BD? Are there any challenges in using these technologies? How these challenges can be addressed?

(b) Which are the potential technologies likely to be available in near future to further strengthen privacy?

Please justify your response with rationale and suitable examples, if any.

And

Q.20. Whether the list of technologies provided in response to Q.19 are adequate to handle all the perceived risks and concerns in the AI domain? Or is there a need to develop new privacy preserving architecture? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 19 and 20

Due to the fact that these technologies are still relatively nascent, the privacy challenges associated with them are still evolving. As these technologies continue to evolve, so will the challenges and risks associated with them. However, it is imperative to keep an eye on evolving risks and implement mitigation controls as they arise.

Q.21. Whether the next generation telecom network architectures such as AI at edge, federated learning, TinyML or their combination can offer solutions to meet both privacy as well as intelligence requirements? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 21

1. Federated learning along with TinyML augmenting Machine Learning with TensorFlow Lite on Arduino and Ultra-Low-Power Microcontrollers will be key to distributed data acquisition, storage, AI model training and inferencing especially for real-time predictive decision support at the device edge be it mobile or IoT.

2. Federated learning or collaborative learning is a machine learning technique that trains an algorithm across multiple decentralized edge devices or servers holding local data samples, without exchanging them. This approach stands in contrast to traditional centralized machine learning techniques where all the local datasets are uploaded to one server, as well as to more classical decentralized approaches which often assume that local data samples are identically distributed.

3. Hence, federated learning enables multiple nodes to build a common, robust machine learning model without sharing data, thus allowing to address critical issues such as data privacy, data security, data access rights and access to heterogeneous data.

4. However, as AI is in nascent stage, it is too early to say that next generation telecom network architectures can offer solutions to meet both privacy as well as intelligence requirements.

Q.22. What type of technological advancements are happening for running the AI models on the end user devices to overcome constraints in respect of processor, memory, battery etc.? Whether special tools, programming languages, and skills are required to be developed to build such AI models? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 22

1. Edge artificial intelligence is transforming the way computers interact with the real world, allowing internet of things (IoT) devices to make decisions using the 99% of sensor data that was previously discarded due to cost, bandwidth, or power limitations. With techniques like embedded machine learning, developers can capture human intuition and deploy it to any target, from ultra-low power microcontrollers to flexible embedded Linux devices, for applications that reduce latency, protect privacy, and work without a network connection, greatly expanding the capabilities of the IoT.

2. Edge AI is certainly the need of the future where the deployment of AI applications happens within the devices throughout the physical world. Since the AI computation is done near the user at the edge of the network, close to where the data is located instead of processing centrally in a cloud computing facility or private data centre thus it help data privacy, security and especially from implementing real-time use cases perspective.

3. Tools & languages from multi-cloud On demand Cloud service providers are enabling and accelerating this Edge AI by provisioning capabilities to:

   a) Connect, manage, and scale device fleets easily and reliably without provisioning or managing servers.
   b) Provides preferred communication protocol, including MQTT, HTTPS, MQTT over WSS, and LoRaWAN to support lowest possible latency in triggering response and provide high throughput.
   c) Provisions secured device connections and data with mutual authentication and end-to-end encryption
   d) Allows flexibility to filter, transform and act upon device data on the fly, based on any defined business rules.

4. Skill enhancement with respect to components of cloud storage, AI model building and deployment, edge device connectors, integration etc. apart from upgrades happening in Python, R, Spark, Kafka, C++, Linux is critical in the future.

5. However, it is again submitted that the aspects mentioned in the questions above, pertain to futuristic developments which are not certain, and in such cases, IT, computing developments or capabilities of the future would only be able to indicate what the future can hold, and not to any certainty.

Q.23. Considering availability of new privacy preserving architectures as suggested in response to Q.19 and Q.20, what is the likelihood of emergence of new business and operational models? Whether such models will raise issues related to ownership and responsibilities? What do you suggest to address these issues? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 23

1. Cognitive technologies will allow businesses to automate and optimize routine processes, saving time and money, improving operational efficiency, and making better business decisions.

2. As a result of the framework outlined above, businesses can adopt practical measures to manage risk, integrate human decision making into AI, and minimize bias in data sets.

3. Any organization can ensure proper governance by creating an internal governance committee, which would be diverse and knowledgeable about AI-infused systems and their possible consequences.

4. However, it is again submitted that the aspects mentioned in the questions above, pertain to futuristic developments which are not certain, and in such cases, IT, computing developments or capabilities of the future would only be able to indicate what the future can hold, and not to any certainty. The same will progress gradually with the deployment of technology.

Q.24. Whether the concept of "Operator Platform" would help in providing AI based solutions in a unified and more equitable manner? Apart from popular federated use cases of edge cloud federation, Cloud XR, Cloud Gaming, whether this concept may also be applied for public service delivery and in making public policies that are data-driven? Whether there is a need to take initiatives for developing and demonstrating advantages of concept of "Operator Platform"? If so, what steps and measures are suggested to launch such initiatives? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 24

1. The concept of "Operator Platform" for AI application and solutions is revolutionary development/deployment especially looking at upcoming 5G technology which would exponentially enhance seamless & uninterrupted smart connected services and experience.

2. Since the Operator Platform defines a common platform exposing operator services/capabilities to customers/developers in the 5G-era in a connect once, connect to many AI models supporting multiple use cases concurrently like self-healing networks, optimized spectrum management, network congestion optimization, trigger predictive or prescriptive events at IoT edge etc. by cloudification of MEC servers thereby moving servers to the edge of the network closer to the user for AI inferencing. Therefore State-

of-the-art platform for Intelligent Process Automation as All-in-one AI platform would bring speed scale and value for telecom consumer for sure.

3. The concept of federated use cases of edge cloud federation, Cloud XR, Cloud Gaming, ESporting can certainly be applied in public services and policies that are data and AI driven where intelligence built on the monetized non personal data. For instance, data driven AI use cases such as intelligent traffic management / identify stolen vehicle location, planning security personnel basis traffic or human density, identifying water logging or flood with feed from visual sensors / cameras all deployed and operated by a unified Operator Platform.

4. At a later stage, there need to take initiatives for developing and demonstrating advantages of concept of "Operator Platform" in form of resilient & robust demo or pilots before scaling the use-cases to national or international levels. These multiple use cases must be taken to Cloud with massive storage, multicore processing with GPUs etc. augmented by 5G for seamless and impeccable connected services.

5. However, the development and deployment of "Operator Platform" has to align with the market demand, use-cases and commercial deliberations; it should not be driven through any compliance obligations.

Q.25. Whether there is a need to create AI-specific infrastructure for the purpose of startups and enterprises in the telecom sector to develop and run AI models in an optimised manner? Whether such an infrastructure should cover various real-world scenarios such as cloud AI, edge AI and on-device AI? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 25

1. Yes, there is a need for AI-specific infrastructure for start-ups and enterprise to innovate and deploy smart AI applications and services be it for smart real-time or batch processing for decisioning, triggering and action fulfilment at the edge device.

2. The said infrastructure must cover provisioning Cloud AI, Edge AI or on device AI. Private cloud service providers such as AWS, MS Azure, GCP are already providing & augmenting excellent AI compatible infrastructure including devices today as well as upgrading it as per real-time use cases and scenarios.

Q.26. Whether the emerging trends of development of foundational AI models such as GPT-3, Gopher etc. are leading to democratisation of AI space by offering fine-tuned or derived AI models? Whether such a trend will also help in reducing costs for the AI developers? Whether similar approach will help in development of large-scale AI model for the telecom sector? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 26

1. GPT3 (trained on 175 bn parameters) or Gopher (trained on 280 bn parameters) as transformer language models have made immense progress in the past with significant funding and resourcing from OpenAI and Deepminds respectively trained on hundreds of billion parameters. Although the development of these AI models for natural language processing has reached fair amount of accuracy but lack robustness and reliability in many application fields and industries. It will be fair to say in many applications from GPT3 / Gopher have displayed value but will take few years to mature and stabilize to support applications and use cases. Some of the useful applications include application icon generation using textual inputs, language translation, real-time code development for react application components with textual inputs, generating synthetic data with desired patterns, question and answer based human like chat capability as used in Alexa, Siri, translate conventional language into formal computer code, write essays based on themes etc.

2. However, these large scale AI transformer language models hold potential to transform future in terms of generating intelligent language based range of output formats, help democratize AI models, bring speed, scale and reduce AI resource cost as well.

3. When these approaches become more democratized, robust & reliable, then only it may help development of large-scale AI model for telecom sector, however, it may take few years to reach any such stage, and it will need further detailed deliberations at that stage.

Q.27. Whether there is a need to establish experimental campuses where startups, innovators, and researchers can develop or demonstrate technological capabilities, innovative business and operational models? Whether participation of users at the time of design and development is also required for enhancing the chances of success of products or solutions? Whether such a setup will reduce the burden on developers and enable them

to focus on their core competence areas? Please justify your response with rationale and suitable examples, if any.

And

Q.28. Whether experiments are required to be backed by regulatory provisions such as regulatory sandbox to protect experimenters from any violation of existing regulations? Whether participation of government entities or authorities during experimentation will help them to learn and identify changes required in the existing regulations or introducing new regulations? Please justify your response with rationale and suitable examples, if any.

And

Q.29. In response to Q.27 and Q.28, whether establishing such a campus under government patronage will enable easy accessibility of public resources such as spectrum, numbering and other resources to the researchers? Whether it would be in mutual interest of established private players as well as startups, innovators and enterprises to participate in such experiments? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 27, 28 and 29

1. AI innovation, research and development market has immense potential to not only boost economic growth but improve the livelihoods of millions in India and the world around.

2. In order to propel innovation, research and development in the AI ecosystems, it is essential to establish & sponsor collaborative facilities & infrastructure. Creating dedicated courses would certainly accelerate the understanding of global AI use cases across industries and develop AI product and solutions of global standards. Also, it would be in mutual interest of established private players as well as start-ups, innovators and enterprises to participate in such experiments as private organization have deeper insight into market centric AI use cases and therefore there directions are critical in guiding the dynamic skillset trajectory and ensure fulfilment.

3. Hence, additional AI Centre of excellence or specialized campus is recommended with Government patronage to incorporate, sponsor and approve new experiments and innovations to boost rapid AI industry growth.

4. Also, Regulatory Sandbox will play a positive role in nurturing the entire ecosystem by providing necessary environment to test and demonstrate the AI solutions for the

industry and protect developers during experimentation stage, from any probable violation of existing regulations. It would facilitate policy makers to review existing regulations and address such concerns using alternative ways. Adoption of a regulatory sandbox may help to achieve the goal of AI through experimentation. However, any such activity should take place in consultation with the relevant stakeholders to assess the outcomes that certain intervention would like to meet.

Q.30. Whether active participation in the international challenge programs such as ITU AI/ML 5G challenge will help India's telecom industry in adopting AI? Whether similar programs are also required to be launched at the national level? Whether such programs will help to curate problem statements or help in enabling, creating, training and deploying AI/ML models for Indian telecom networks? What steps or measures do you suggest to encourage active participation at international level and setting up of such programs at national level? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 30

1. There are many international and national AI based hackathons, competitions & conferences conducted by global organisations such as World Artificial Intelligence Cannes Festival, Open Data Science Conference, World Summit AI, AI & Big Data Expo, Machine Learning Prague, Conference on Computer Vision and Pattern Recognition, Big Data & Analytics Summit Canada, IntelliSys, International Conference on Pattern Recognition, European Conference on Computer Vision, Robotics Summit & Expo Boston will help India in adopting AI, however, not limiting to only telecom industry. Participation in these excelling hackathons events such as HackerEarth, Machinehack, Helmholtz GPU Hackathon, Smart India Hackathon, Machacks, etc. also can be looked forward to.

2. These events indeed help in building competitive pool of AI skilled resources defining accelerated AI adoption, build AI for society, AI today & tomorrow, AI strategy, AI technology, and AI application & solutions.

3. These programs are already happening on the national level although predominantly organized by private sector which is coupled with rewards & recognitions both in monetary as well as visibility. The need is to make it more pervasive across universities & institutions especially focused on AI & Data innovation, research and development along with necessary vision and required efficient sponsorships. However, it should not be looked at from the prism of telecom sector only, as utility of AI is across various sectors.

Q.31. Whether AI/ML developers should launch bounty programs to establish trust in the public about robustness of measures taken by them to protect privacy in their products or solutions? Whether conduction of such programs will help companies or firms to improve their products or solutions? Whether such programs should be conducted under the supervision of the government or an institution established/assigned for this purpose? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 31

Certainly, bounty programs would build public trust and ensure that privacy and security issues are discussed and addressed in AI/ML solutions. In order to ensure that such programs are conducted ethically and to improve privacy and security in AI/ML products and solutions, the concerned Ministry should oversee them.

Q.32. Whether the telecom industry is required to adopt a Machine Learning Operations (MLOps) environment to develop, train, validate and store ML models? Whether there is also a need to establish a DataOps feature store to help MLOps for training purposes? What standardisation is required in terms of interoperability and compatibility for MLOps to function in a federated manner? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 32

1. MLOps would work better over efficient DataOps and managed by operators' platform over cloud for federated capability accessible across the Telecom circles or clusters as on date.

2. DataOps will be the basic foundation for any pipeline setup for MLOps. Creating exhaustive & consolidated KPI bank build on top of multiple AI use cases will be the key to perform & optimize data preparation, feature extractions, AI model building, deployment in containerized method, flexibility of refinement over cloud for real-time or batch processing of the models is the way to go.

3. Above automation from data to AI modelling to scoring for federated ease of operation and consumption at edge locations would help trigger model training and scoring in form of API's as desired enabling flexibility via web or app interface or consoles.

4. However, same should not be pushed as compliance obligations, but, should be encouraged and telecom industry should have freedom to adopt the best environment in their networks.

Q.33. Whether active participation in the international bootcamp programs such as MIT Bootcamps, Design Thinking Bootcamp by Stanford University etc. will help India's telecom industry workforce to find international developers community, navigate challenges and learn from experiences of others? Whether similar programs are also required to be launched at the national level? What steps or measures do you suggest to encourage active participation at the international level and setting up of such programs at the national level? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 33

1. It is highly critical to build AI applications and solutions having global standards as all industries are moving towards digital in future. Hence, it is imperative to have active participations in international bootcamps, design thinking, conferences & summits conducted by AI specialized universities (Stanford, University of Waikato, open source platforms (coursera, towardsdatascience, datacamp) and global telecom industries to align to new innovations as well as optimize the existing ones as per global standards.

2. In addition to this, it is highly recommended to have such programs on national level as well inviting domestic and global bodies to present their AI experimentations and research work.

3. In order to encourage participations at international levels for developments and progress in the field of AI, collaboration and attaining membership to some of the key leading international AI experts from civil society, academia, industry and governments, including ministerial-level delegates should be done. To name a few global communities, International group of Artificial Intelligence (IGOAI), The Global Partnership on Artificial Intelligence (GPAI), UNESCO's International conference on Artificial Intelligence and Education, International Telecom Union (ITU) etc. which provides neutral platform for government, industry and academia to build a common understanding of capabilities of emerging AI technologies and consequence needs for technical standards and policy guidance and governance.

4. We understand that recently, the Government of the People's Republic of China and UNESCO had co-organized an International conference on Artificial Intelligence (AI) and Education to study emerging AI technologies and innovative practices of the use of AI in

education. This conference had more than 500 participants, including high-level representatives from each Member State, representatives of UN agencies and international organizations, leaders of the AI industry, academic experts, policy makers and practitioners.

Q.34. Whether the courses or programs related to AI/ML currently being offered by various institutions and universities in India are adequate to meet the capacity and competence required to develop and deploy AI solutions or products in the telecom networks? If not, what additional steps or measures are suggested to fill the gap? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 34

1. In our view, there is a knowledge gap between the AI/ML courses offered by the Universities and the institutions as on date which needs to be filled. This gap exists in practical value / Industry driven AI applications and products vis a vis theoretical coverage of concepts like machine learning, deep learning, natural language processing, computer vision, speech analytics and robotic process automation etc.

2. Some of the key initiatives to narrow this gap requires bridging the gap in skills through Indian Higher Education & accelerating AI start up growth. The key steps must be focused around:

    a) Joint AI innovation, research and development institutions between University & various industries.
    b) Making or sponsoring AI ecosystem more accessible to students especially youth for experimentations.
    c) Creating room to learn from experienced SMEs and professionals from various industries.
    d) Facilitating training, reskilling and upskilling existing manpower within various industries.
    e) Enhancing digital know-how to be future ready.
    f) Creating more refined, engaging and updated curriculum suited to various industries.
    g) Delivering AI education via demos, capstone & value impacting projects in various industries.
    h) Myths surrounding open source AI must be dispelled.
    i) Empower & invest in AI start-ups with financial risk covers.

Q.35. Whether establishing a system for accreditation of AI products and solutions will help buyers to purchase such solutions or products? If yes, what should be the process of accreditation and who should be authorised or assigned with the task of accrediting such products or solutions? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 35

We would like to submit that the technology is still evolving and establishment of any kind of system for accreditation of AI products and solutions will just lead to stifling the innovation at this stage. Therefore, at this stage, no system for accreditation of AI products and solutions should be prescribed.

Q.36. Whether creating a framework to prepare a list of prequalified suppliers of AI products or solutions will help industry including government agencies to procure AI products or solutions? Whether there is a need to formulate a standard Code of Conduct or guidelines for AI related procurements? What should be the typical elements of such a Code of Conduct or guidelines including guidelines on trusted source and who should be tasked to formulate such a Code of Conduct or guidelines? Please justify your response with rationale and suitable examples, if any.

VIL Comments to Q. No. 36

1. Even though the technology is at a nascent stage in the country, there is no issue of availability of qualified suppliers. Further, the use cases and deployments will vary on case to case basis and across sectors and will hugely depend on the business objective/target intended to be achieved through the same.

2. Therefore, we do not foresee the need to prepare a list of prequalified suppliers of AI products or solutions or any need to formulate a standard Code of Conduct or guidelines for AI related procurements.

Q.37. Whether there is a need to prepare and publish a compendium of guidance, toolkits and use cases related to AI and BD, to foster adoption in the telecom sector? If yes, what should be the process to prepare such a compendium and who should be assigned this task? Please justify your response with rationale and global best practices, if any.

VIL Comments to Q. No. 37

1. Compendium or manual of guidance, toolkits and use cases offered by AI & Big Data Analytics products & solutions will help the consumer to understand its features, configurations, perceived risks & threats etc. better and adopt with full awareness and trust. However, the same shall not be restricted to telecom sector since various organizations are involved in the research and development of AI systems and the adoption of the technology be fostered across all the applicable sectors.

2. Though, at the later stage, whenever such a compendium is prepared, the manuals and guidelines for AI Applications and product may include the following:

   a) Comments from human agency, oversight & reviews
   b) Technical robustness and safety specifications
   c) Privacy and data governance covered
   d) Transparency without any hidden clauses
   e) Diversity, non-discrimination and fairness policies followed
   f) Societal and environmental well-being feature
   g) Accountability & after sales support
   h) Assessment list that operationalizes the key requirements and offers guidance on how to implement them in practice.

Q.38. Whether there is a need to establish telecom industry-academia linkages specifically for AI and BD to accelerate the development and deployment of AI products and solutions? Whether there is a need to establish Centres of Excellence (CoEs) for this purpose or it can be achieved by enhancing the role of existing TCoE? Please justify your response with rationale and global best practices, if any.

VIL Comments to Q. No. 38

1. There is a need to look at AI/BD from a sector agnostic approach. Its use cases and deployments cut across sectors. Also, the academia should not focus on AI/BD from the limited prism of telecom sector.

2. To train students to be AI ready professionals, some of the measures which are already being carried out by various entities are listed as below:

a) Centre of Excellence for Data Science & Artificial Intelligence by NASSCOM is planning to accelerate leading AI and BD products and services providing states within India thereby positioning as a premier global destination for Artificial intelligence.

b) Nokia announced a collaboration with the Indian Institute of Science (IISc) in Bengaluru to establish a Centre of Excellence (CoE) to facilitate research in the areas of networked robotics. The research lab will promote inter-disciplinary research involving robotics and advanced communication technologies in 5G and Artificial Intelligence (AI).

Q.39. Whether there is a need to establish telecom industry-academia linkages specifically for AI and BD for AI related skill development? Please give the suggestions for strengthening the industry-academia linkages for identification of the skill development courses. Please justify your response with rationale and global best practices, if any.

VIL Comments to Q. No. 39

1. As submitted in our comments to Q. no. 38, there is a need to look at AI/BD from a sector agnostic approach. Its use cases and deployments cut across sectors. Also, the academia should not focus on AI/BD from the limited prism of telecom sector.

2. The collaboration between private sector and academia has already started to find its way as many companies are found joining hands with universities & institutions for AI/ML innovation, research and development such as:

   a) Teerthanker Mahaveer University (TMU) in Moradabad inked a memorandum of understanding with NVIDIA Corporation to deliver artificial intelligence (AI) and deep learning (DL) to a new generation of students and developers.

   b) I-Hub Foundation for Cobotics (IHFC), the Technology Innovation Hub (TIH) of the Indian Institute of Technology Delhi (IIT Delhi) recently inked an agreement to establish India's first Medical Cobotics Center (MCC) at IIIT-Delhi.

   c) IIT-Roorkee and the Mehta Family Foundation (MFF) in the United States of America collaborated to establish the Mehta Family School of Data Science and Artificial Intelligence.

Q.40. Any other issue which is relevant to this subject? Please suggest with justification.

VIL Comments to Q. No. 40

1. AI is reliant on massive amounts of data, and telecom industry being a big repository of the same, various challenges related to policy and regulatory, in developing, deploying, and scaling applications of AI will be resolved by the Data Protection Bill with respect to determining the framework of rights and obligations over data residing within the industry.

2. Hence, it is expected that new Data Protection Bill and a Digital India Bill will be issued by the Government of India in near future and the same may provide the required legal framework and clarity for compliance and adoption of technologies like AI in India.

x---------- End of Document ----------x