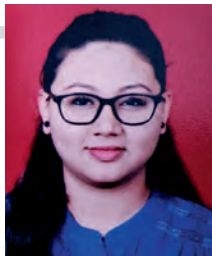


# Emerging Technologies and Viksit Bharat: Unlocking the Potential for Governance Professionals

Emerging technologies are catalyzing innovation across diverse sectors, driving productivity and enhancing global competitiveness. In the financial sector, fintech companies are leveraging AI and blockchain to provide seamless and secure digital financial services, fostering financial inclusion and promoting financial literacy. AI-powered chatbots and robo-advisors are offering personalized financial advice and investment recommendations, democratizing access to financial planning services. Blockchain-based solutions like decentralized finance (DeFi) platforms are enabling transparent and secure cross-border transactions, streamlining trade finance processes, and reducing operational costs.



## CS Hetali Mehta, ACS

Company Secretary & Chief Compliance Officer  
Sattva Holding and Trading Private Limited, Mumbai  
[hm241194@gmail.com](mailto:hm241194@gmail.com)

## INTRODUCTION

As India forges ahead towards its ambitious vision of Viksit Bharat – a developed nation by 2047, emerging technologies are poised to play a transformative role in driving economic growth, enabling efficient governance, and catalyzing sustainable development. In this digital age, technologies such as artificial intelligence



(AI), blockchain, Internet of Things (IoT), cloud computing, big data analytics, and advanced robotics are rapidly revolutionizing various sectors and redefining the way businesses operate and nations govern.

For governance professionals, these emerging technologies present both challenges and opportunities. While they offer unprecedented potential for enhancing transparency, accountability, and streamlining processes, they also necessitate the development of robust regulatory frameworks, ethical guidelines, and capacity-building initiatives. As stewards of good governance, governance professionals are uniquely positioned to navigate these complexities and ensure the responsible adoption of emerging technologies, paving the way for India's journey towards Viksit Bharat.

## EMERGING TECHNOLOGIES: DRIVERS OF VIKSIT BHARAT

### Economic Growth and Innovation:

Emerging technologies are catalyzing innovation across diverse sectors, driving productivity and enhancing global competitiveness. In the financial sector, fintech companies are leveraging AI and blockchain to provide seamless and secure digital financial services, fostering financial inclusion and promoting financial literacy. AI-powered chatbots and robo-advisors are offering personalized financial advice and investment recommendations, democratizing access to financial planning services. Blockchain-based solutions like decentralized finance (DeFi) platforms are enabling transparent and secure cross-border transactions, streamlining trade finance processes, and reducing operational costs.

The manufacturing industry is witnessing a profound transformation through the integration of IoT, cloud computing, big data analytics, and advanced robotics, collectively known as Industry 4.0. Smart factory solutions enabled by IoT sensors, machine learning algorithms, predictive analytics, and collaborative robots (cobots) are optimizing operations, minimizing downtime, and enhancing supply chain management. Predictive maintenance techniques can identify potential equipment



failures before they occur, reducing maintenance costs and improving operational efficiency. Additive manufacturing (3D printing) is revolutionizing product design and production, enabling mass customization and reducing waste.

Agriculture, a crucial sector for India's economic growth and food security, is also benefiting from the adoption of emerging technologies. Precision agriculture techniques, powered by IoT sensors, drones, satellite imagery, and data analytics, are enabling farmers to optimize resource utilization, monitor crop health, and make data-driven decisions. This not only leads to increased crop yields and reduced wastage but also contributes to environmental sustainability by minimizing the excessive use of water, fertilizers, and pesticides. Additionally, blockchain-based solutions are enhancing supply chain traceability and transparency, ensuring food safety and quality.

#### **Governance and Transparency:**

Beyond economic gains, emerging technologies offer immense potential for strengthening governance frameworks and promoting transparency. Blockchain technology, with its decentralized and tamper-proof nature, can revolutionize record-keeping and secure data management across various domains, enhancing trust and accountability in processes such as land registration, identity management, and supply chain traceability. For instance, several state governments in India have pioneered the use of blockchain for land record management, streamlining property transactions and reducing fraud.

AI-driven analytics can aid in fraud detection, risk assessment, and compliance monitoring, enabling proactive identification and mitigation of governance risks. Machine learning algorithms can analyze vast amounts of data, identify patterns and anomalies, and raise red flags for potential fraudulent activities or non-compliance issues. This can significantly enhance the effectiveness of auditing and monitoring processes, ensuring adherence to regulatory norms and ethical standards. In the banking sector, AI-based fraud detection systems are being employed to detect suspicious transactions and prevent financial crimes.

IoT devices, when integrated into infrastructure and public services, can facilitate real-time monitoring, and ensure adherence to regulatory norms. For instance, smart meters and sensors can track energy consumption and emissions, enabling better compliance with environmental regulations and sustainable energy policies. In the healthcare sector, IoT-enabled devices can monitor patient health and treatment adherence, improving service delivery and regulatory oversight. Several smart city initiatives in India are leveraging IoT for efficient waste management, traffic management, and public safety.

#### **Sustainable Development:**

Achieving environmental sustainability is a crucial pillar of Viksit Bharat, and emerging technologies can play a pivotal role in this endeavor. Smart city initiatives, powered by IoT, big data analytics, and AI, can optimize resource utilization, reduce carbon footprints, and improve urban

planning. For example, intelligent traffic management systems can alleviate congestion, reducing emissions and improving air quality. Smart grids and energy management systems can facilitate the integration of renewable energy sources and promote energy efficiency. The India Smart Cities Mission is a prime example of leveraging emerging technologies for sustainable urban development.

Renewable energy technologies, such as advanced solar and wind power solutions, coupled with energy storage systems and smart grid infrastructure, can accelerate the transition towards clean energy sources. AI and data analytics can be leveraged to optimize the placement and performance of renewable energy installations, maximizing their efficiency and long-term sustainability. India's ambitious targets for renewable energy capacity addition and the National Solar Mission are driving the adoption of these cutting-edge technologies.

Precision agriculture techniques, enabled by IoT sensors, drones, satellite imagery, and data analytics, can contribute to sustainable food production while minimizing environmental impact. By precisely monitoring soil conditions, crop health, and weather patterns, farmers can optimize water usage, reduce chemical inputs, and implement sustainable farming practices, promoting biodiversity and soil conservation. The Government of India has launched several initiatives, such as the Pradhan Mantri Krishi Sinchayee Yojana and the Digital Agriculture Mission, to promote the use of emerging technologies in agriculture.

## CHALLENGES AND OPPORTUNITIES FOR GOVERNANCE PROFESSIONALS



### Regulatory and Legal Frameworks:

As emerging technologies gain traction, the need for robust regulatory and legal frameworks becomes paramount. Governance professionals must collaborate with policymakers, industry stakeholders, subject matter experts, and legal professionals to develop comprehensive regulations that address concerns related to data privacy, cybersecurity, intellectual property rights, and ethical implications.

One of the key challenges lies in striking the right balance between fostering innovation and safeguarding public interest. Overly restrictive regulations can stifle technological progress and hinder competitiveness, while a lack of adequate oversight can lead to misuse, exploitation, and unintended consequences. Governance professionals must navigate this delicate balance, advocating for regulatory frameworks that promote responsible innovation while mitigating potential risks and protecting consumer rights.

Governance professionals can play a crucial role in conducting impact assessments, identifying potential risks and vulnerabilities associated with emerging technologies, and proposing appropriate mitigation strategies. This could involve collaborating with technology experts, legal professionals, and civil society organizations to develop holistic and future-proof regulations that adapt to the rapidly evolving technological landscape. For instance, the Digital Personal Data Protection Act, 2023, effective in India from 11<sup>th</sup> August, 2023, aims to establish a comprehensive framework for data protection and privacy, addressing the challenges posed by emerging technologies.

### Skill Development and Capacity Building:

To effectively navigate the complexities of emerging technologies, governance professionals must continuously upskill and develop their technological competencies. Collaborations with educational institutions, professional bodies, technology companies, and government agencies can facilitate the development of specialized training programs, certifications, and knowledge-sharing platforms.

Incorporating emerging technologies into the curriculum of governance-related courses and professional development programs is essential. This could include modules on blockchain fundamentals, AI ethics, data privacy and security, cybersecurity, and the legal implications of emerging technologies. Hands-on training, workshops, and simulations can equip governance professionals with practical skills in leveraging these technologies for compliance, risk management, and governance processes.

Building a future-ready workforce equipped with the necessary technical and governance skills is imperative. Governance professionals must embrace a mindset of continuous learning and actively seek opportunities to enhance their digital literacy and technological proficiency, enabling them to stay ahead of the curve and effectively navigate the challenges and opportunities presented by emerging technologies. Organizations like the Institute of Company Secretaries of India (ICSI) can play a pivotal role in facilitating such capacity-building initiatives.

### Fostering Responsible Innovation:

Governance professionals have a pivotal role in promoting the ethical and responsible use of emerging technologies. Establishing robust governance frameworks, codes of conduct, and best practices can ensure that technological advancements align with societal values and ethical



principles. Engaging in multi-stakeholder dialogues, conducting impact assessments, and promoting transparency and accountability will be crucial in fostering responsible innovation.

One key consideration is the ethical implications of AI and automation. As AI systems become more sophisticated and autonomous, concerns around algorithmic bias, privacy, and accountability arise. Governance professionals can contribute to the development of ethical guidelines and frameworks that ensure AI systems are designed and deployed in a fair, transparent, and accountable manner, mitigating potential risks and upholding ethical principles. The recent initiative by NITI Aayog to establish a framework for Responsible AI is a step in this direction.

Another area of focus is the governance of data and data privacy. With the proliferation of IoT devices, cloud computing, and big data analytics, vast amounts of personal and sensitive data are being generated and processed. Governance professionals must advocate for robust data protection regulations, ensure compliance with privacy laws, and champion data governance practices that safeguard individual privacy while enabling responsible data utilization. This is particularly important in sectors like healthcare, where patient data privacy is of utmost concern.

Furthermore, governance professionals can promote responsible innovation by fostering an organizational culture that embraces ethical considerations and societal impact assessments throughout the technology development lifecycle. This could involve establishing ethics committees, conducting stakeholder consultations, and implementing monitoring and reporting mechanisms to ensure emerging technologies are developed and deployed in alignment with ethical principles and societal values. Leading by example and integrating ethical considerations into organizational decision-making processes will be crucial.

## GLOBAL BEST PRACTICES AND LESSONS FOR INDIA



As India embarks on its journey towards Viksit Bharat, valuable lessons can be drawn from global best practices in leveraging emerging technologies for effective governance.

The manufacturing industry is witnessing a profound transformation through the integration of IoT, cloud computing, big data analytics, and advanced robotics, collectively known as Industry 4.0. Smart factory solutions enabled by IoT sensors, machine learning algorithms, predictive analytics, and collaborative robots (cobots) are optimizing operations, minimizing downtime, and enhancing supply chain management.

Countries like Estonia, renowned for its digital governance initiatives, have successfully implemented blockchain-based solutions for secure data management and e-government services. The Estonian e-Residency program, for instance, allows individuals and businesses to establish a digital identity and conduct various transactions and services online, leveraging the security and transparency of blockchain technology.

Singapore's Smart Nation initiative offers insights into integrating IoT, data analytics, and AI into urban planning and public service delivery. The nation's Mobility-as-a-Service (MaaS) platform uses real-time data and AI algorithms to optimize transportation systems, reducing congestion and improving accessibility. Singapore's Virtual Singapore platform, powered by 3D modeling and IoT sensors, enables urban planners and policymakers to simulate and visualize the impact of development projects on factors such as traffic flow, energy consumption, and environmental impact.

The European Union's General Data Protection Regulation (GDPR) serves as a benchmark for data privacy and protection regulations, providing a robust framework for governing the collection, processing, and storage of personal data. The GDPR principles, such as data minimization, purpose limitation, and individual consent, can inform the development of India's data protection regulations, ensuring the responsible and ethical handling of personal data.

The IEEE's Ethically Aligned Design provides a comprehensive framework for prioritizing ethical considerations in the development of autonomous and intelligent systems. This initiative offers guidance on issues such as accountability, transparency, privacy, and human control, promoting the responsible design and deployment of AI and autonomous technologies.

Other noteworthy examples include the United Kingdom's Centre for Data Ethics and Innovation, which advises the government on the ethical and societal implications of emerging technologies, and Canada's Advisory Council on Artificial Intelligence, which provides guidance on the responsible development and use of AI systems.

India can learn from these examples and adapt them to its unique context, fostering public-private partnerships, encouraging collaborations with international organizations, and leveraging the expertise of global technology leaders. Governance professionals can play a crucial role in facilitating knowledge transfer and tailoring global best practices to India's specific needs and challenges.

Additionally, governance professionals can actively participate in international forums and standard-setting bodies, contributing to the development of global standards and guidelines for emerging technologies. By engaging with their counterparts from other nations, governance professionals can share insights, learn from diverse perspectives, and shape the global discourse on responsible technological development and effective governance frameworks.

## CONCLUSION

As India strives towards its vision of Viksit Bharat, emerging technologies present both immense opportunities and significant challenges for governance professionals. By embracing these technologies and adopting a proactive approach, governance professionals can drive economic growth, enhance transparency and accountability, and contribute to sustainable development.

However, this journey requires a concerted effort to develop robust regulatory frameworks, foster ethical and responsible innovation, and build a future-ready workforce equipped with the necessary technological and governance skills. Governance professionals must collaborate with policymakers, industry stakeholders, and international bodies to ensure the responsible adoption of emerging technologies, while drawing lessons from global best practices and adapting them to India's unique context.

Emerging technologies are transforming the governance landscape, offering unprecedented opportunities for

streamlining processes, enhancing transparency, and enabling data-driven decision-making. By leveraging technologies such as blockchain, AI, IoT, and data analytics, governance professionals can revolutionize record-keeping, fraud detection, compliance monitoring, and risk management, ensuring accountability and ethical conduct across various sectors.

Furthermore, these technologies hold the key to unlocking sustainable development goals, facilitating the transition towards smart cities, clean energy, and precision agriculture, thus contributing to India's overall progress towards becoming a developed nation. However, the responsible adoption of emerging technologies necessitates a proactive approach to regulatory frameworks, capacity building, and fostering a culture of ethical innovation.

Governance professionals must take the lead in navigating these complexities, advocating for robust data protection regulations, promoting algorithmic accountability, and upholding ethical principles in the development and deployment of emerging technologies. They must also prioritize skill development and continuous learning, ensuring that the governance workforce remains equipped to manage the challenges and opportunities presented by technological advancements.

The path towards Viksit Bharat is not merely about technological advancement but also about fostering an ecosystem of effective governance, ethical conduct, and sustainable development. Governance professionals, with their expertise and commitment to upholding the highest standards of governance, are poised to play a pivotal role in shaping India's journey towards becoming a developed nation by 2047. By embracing emerging technologies while prioritizing ethical considerations and societal impact, governance professionals can catalyze India's transformation and contribute to the realization of the Viksit Bharat vision.



## A ROADMAP FOR GOVERNANCE PROFESSIONALS

- **Develop a robust emerging tech governance framework:** Establish a comprehensive set of policies, principles, and processes to ensure the ethical, secure, and responsible adoption and implementation of emerging technologies across the organization.
- **Foster emerging tech literacy:** Facilitate training programs, workshops, and knowledge-sharing initiatives to enhance the understanding of emerging technologies, their applications, and their implications among stakeholders.
- **Conduct emerging tech risk assessments:** Regularly evaluate potential risks associated with the adoption and use of emerging technologies, such as data privacy, cybersecurity, and unintended consequences, to develop appropriate risk mitigation strategies.
- **Ensure regulatory compliance:** Stay updated with relevant regulations, guidelines, and industry standards related to emerging technologies, and ensure the organization's practices comply with applicable laws and norms.
- **Encourage cross-functional collaboration:** Promote collaboration among governance professionals, technology teams, legal counsel, risk management, and other relevant departments for a holistic and well-rounded approach to governing emerging technologies.
- **Facilitate ethical and responsible innovation:** Collaborate with technology teams and subject matter experts to integrate ethical considerations, promote transparency, and ensure alignment with organizational values and societal good throughout the innovation lifecycle.
- **Advocate for stakeholder engagement:** Encourage open communication and collaboration with stakeholders, seeking their input, addressing their concerns, and ensuring their interests are represented in decision-making related to emerging technology initiatives.
- **Promote emerging tech accountability:** Implement mechanisms for transparent reporting, clear accountability, and effective governance of emerging technology systems, their decision-making processes, and their outcomes.
- **Prioritize data privacy and security:** Develop robust data governance practices, safeguarding individual privacy and ensuring the secure handling and management of data generated or processed by emerging technologies.
- **Foster continuous monitoring and improvement:** Regularly monitor and audit the organization's adoption and use of emerging technologies, ensuring

ongoing compliance with ethical principles, regulations, and organizational policies, and implementing processes for continuous improvement and adaptation as technologies evolve.

### REFERENCES:

- i. *NITI Aayog. (2021). Responsible AI for All. Retrieved from [https://www.niti.gov.in/sites/default/files/2022-11/Ai\\_for\\_All\\_2022\\_02112022\\_0.pdf](https://www.niti.gov.in/sites/default/files/2022-11/Ai_for_All_2022_02112022_0.pdf)*
- ii. *Ministry of Electronics and Information Technology, Government of India. (2022). India AI Strategy. Retrieved from <https://www.meity.gov.in/emerging-technologies-division>*
- iii. *NASSCOM. (2021). Ethical AI: Governance, Accountability & Principles. Retrieved from <https://www.nasscom.in/ai/responsibleai/responsible-ai-governance-risk-and-compliance/>*
- iv. *World Economic Forum. (2024). Generative AI Governance: Shaping a Collective Global Future. Retrieved from [https://www3.weforum.org/docs/WEF\\_Generative\\_AI\\_Governance\\_2024.pdf](https://www3.weforum.org/docs/WEF_Generative_AI_Governance_2024.pdf)*
- v. *IEEE. (2019). Ethically Aligned Design: A Vision for Prioritizing Human Wellbeing with Artificial Intelligence and Autonomous Systems. Retrieved from <https://ieeexplore.ieee.org/document/8058187>*
- vi. *European Union. (2018). General Data Protection Regulation (GDPR). Retrieved from <https://gdpr-info.eu/>*
- vii. *Government of Estonia. (n.d.). e-Residency. Retrieved from <https://e-resident.gov.ee/>*
- viii. *Singapore Smart Nation Initiatives and Possible Opportunities. Retrieved from <https://www.scs.org.sg/articles/smart-nation-singapore>*
- ix. *OECD. (2019). Recommendation of the Council on Artificial Intelligence. Retrieved from <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449>*
- x. *United Nations. (2021). Ethics for Artificial Intelligence. Retrieved from <https://www.un.org/en/content/digital-cooperation-roadmap/>*
- xi. *Ministry of Housing and Urban Affairs, Government of India. Smart Cities Mission. Retrieved from <https://smartcities.gov.in/>*
- xii. *Ministry of New and Renewable Energy, Government of India. National Solar Mission. Retrieved from <https://mnre.gov.in/solar-overview/>*
- xiii. *Ministry of Agriculture and Farmers Welfare, Government of India. (n.d.). Digital Agriculture Mission. Retrieved from <https://agriwelfare.gov.in/en/DigiAgriDiv>*