TECHNOLOGY GOVERNANCE

FORGING A NEW ERA OF PUBLIC POLICY

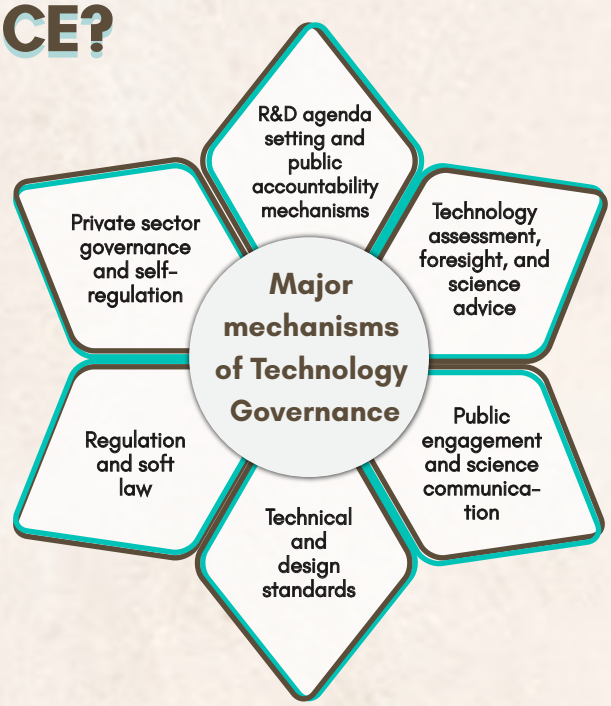
INTRODUCTION

The rapid diffusion of technology in the past decades has immensely changed everyday life—in business, in government, at home, and at work. It has deeply impacted all spheres of our lives, including the way we interact, socialize, understand, and even administer or govern. Although the growth of digital and physical technologies is full of promise, it also presents risks. Technology raises concerns for individuals and societies, as witnessed in previous waves of technological change in the industry and in current debates around artificial intelligence, nuclear power, gene editing and social media.

Evidently, the **policies and governance mechanisms supervising** these new technological breakthroughs now assume great importance, for developed and developing countries alike. Given these circumstances, **the concept of 'technology governance' is gaining prominence across the globe.** In this document, we will discuss the meaning of technological governance, and why is it critical to have an efficient technology governance framework. What are the major governance frameworks for regulating technologies? What are the existing and emerging technology governance gaps? And What can be the potential blueprint for technological governance?

WHAT IS TECHNOLOGY GOVERNANCE?

- Technology governance can be defined as the process of **exercising political, economic, and administrative authority in the development, diffusion, and operation of technology in societies.**
- It not only pertains to formal government activities but also to the **activities of firms, civil society organizations, and communities of practice.**
- It consists of a multitude of **norms** (e.g., regulations, standards, and customs), and **institutional and normative mechanisms** and can also be operationalized through **physical and virtual architectures** to steer technology development and manage risks and benefits.
  - ➤ It includes various elements such as **risk management, security, privacy, compliance, and transparency.**



- Technology governance typically involves **multiple stakeholders, including government agencies, regulators, industry associations, and individual organizations.**

As the adoption of technology is continuously increasing swiftly, it is important to have **discussions about the need for balanced and effective technological governance in the future.**

WHY IS IT CRITICAL TO HAVE AN EFFICIENT TECHNOLOGY GOVERNANCE FRAMEWORK?

At present, the world is reaching the end of the deployment phase of the "**Age of Information and communications technology (ICT)**" and starting the installation phase of a new paradigm, **involving frontier technologies (blockchain, artificial intelligence, Internet of Things, etc).** In this scenario, the role of technological governance becomes critical due to the reasons stated below-

- **Mitigating future risks:** Technology is essential for addressing some of **society's most pressing challenges,** but it can also have negative **consequences for individuals and societies.** Technology governance frameworks help organizations mitigate risks and manage the potential negative impacts arising from the use of emerging technologies.
  - ➤ Some examples of risks associated with emerging technologies, requiring changes in present governance mechanisms have been stated below-

Blockchain technology promises a revolution in business models and transaction transparency, but also calls into question decades of global regulation of financial markets.

Autonomous vehicles carry enormous potential, but early experiments also highlight the dangers of their use in real-world environments

Digital platforms like Uber or Airbnb have begun to revolutionise entire service sectors, but have also raised concerns about new inequalities, and have occasionally been met with fierce resistance

New developments in bioengineering, including gene editing and do-it-yourself biology kits, have recently triggered a series of global discussions about the future, including a potential ban on CRISPR-Cas9 and other gene-editing technologies

- **Fostering innovation:** Effective technology governance can help foster innovation by providing a framework for experimentation and risk-taking while still ensuring the responsible use of technology.

Balancing Governance and Innovation

Technological advancements are creating a sea of change in today's regulatory environment, posing significant challenges for regulators who strive to maintain a **balance between fostering innovation, protecting citizens, and addressing the potential unintended consequences of disruption.**

However, **uncertainty of public policies and excessive interventions** from governments, **going into the micro-details of innovation processes,** can prove to be a hindrance to a productive innovative environment. This can cause humanity to lose out on the many potential socio-economic benefits offered by technological advancements.

Hence, in the wake of technological developments, regulatory officials are faced with key challenges **like how to best protect citizens, ensure fair markets, and enforce regulations, while allowing these new technologies and businesses to flourish.**

Among other things, there is a strong case for governments to efficiently **train human capital working in governance institutions** in line with ongoing technological developments and uphold an **efficient, effective, and appropriately constrained intellectual property regime.** This will ensure presence of adequate regulation without obstructing the flow of innovative processes.

- **Promoting ethical use of technology:** We need dedicated governance frameworks to ensure that technology is used and operated in a **responsible and ethical manner,** promoting positive outcomes for society.
- **Ensuring National security:** There is a need for governments across the world to adapt to the new security environment and enhance their capacity to meet evolving challenges to the long-term security of our nation.

Ethical dilemmas in emerging technologies

New ethical problems regarding the use of science and technology are always arising. From **biases in AI, rising inequalities in digital sphere, threats to consumer privacy to growing misinformation,** emerging technologies have the potential to adversely impact the ethical fabric of our society.

Technologies even have the potential to **threaten human rights.** For example, while genetic engineering possesses great potential for human health and the recovery from damaging genetic mutations, there are considerable ethical considerations that surround the editing of the human genome.

Hence, ethical considerations around privacy, disparate impact and discrimination should be prioritized in governance mechanisms.

- Particularly, **threats in the digital domain need governance mechanisms** to keep up with information technology and its complexities.

- **Shaping Public policy:** Technology is now deeply intertwined with a policy with complex socio-technical systems being built at all levels of our society. Surviving the future depends on **bringing technologists and policymakers together**, which also reaps benefits in the form of **transforming public services** through new technologies.

- For example, decision-makers may use **data mining techniques** to analyze large data sets in order to identify trends or patterns that could inform policy choices.

E-governance in India: How is emerging technology transforming Governance in India?

With the launch of the **'Digital India' program**, almost every citizen today is positively touched by the impact of the Government of India's steady adoption of information and communication technology to bolster transparency and governance in the country. Some prominent examples include-

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  In healthcare: Research on the use of AI to develop a "precision public health" approach enables our limited resources to have a more targeted approach. For example, National Digital Health Mission to create a national digital health ecosystem.

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  In policing: Many state governments, including Delhi, Punjab, Uttar Pradesh, and Maharashtra, have begun **to use face recognition technologies, AI, and Machine learning to control crime, monitor traffic,** etc.

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  In the Financial domain: India stack is the largest open Application Programming Interface (API) in the world. It allows governments, businesses, startups, and developers to utilize the digital infrastructure to solve India's problems towards presence-less, paperless, and cashless service delivery.

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  In Education: Diksha is a national-level educational platform that helps students and teachers to participate, contribute and leverage a common platform to achieve learning goals.

- **Other areas:**

  - **SVAMITVA** uses drone technology for mapping land parcels, providing a 'Record of Rights' to village household owners with the issuance of legal ownership cards to the property owners.
  - **Disaster relief agencies**, including the National Disaster Management Authority (NDMA) and National Disaster Relief Force, have used drones as part of their operations.
  - **National Agriculture Market (e-NAM)** was launched with the objective of creating an online transparent competitive bidding system to facilitate farmers in getting remunerative prices for their produce.

WHAT ARE THE MAJOR GOVERNANCE FRAMEWORKS FOR REGULATING TECHNOLOGIES?

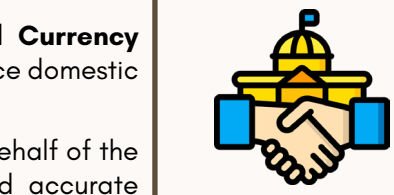
To address existing and upcoming challenges, innovative governance and regulatory frameworks are emerging to regulate new technologies. Some common frameworks have been discussed below-

Ethical Governance

- Many countries have developed **ethical governance frameworks** that provide guidelines on how to develop emerging technologies responsibly.
- **Example- Government of New Zealand's Privacy, Human Rights and Ethics (PHRaE) framework** incorporates privacy, human rights, and ethics into the design process of government algorithms.

Public-private coordination

- The public and private sectors **collaborate using mechanisms such as multistake-holder engagement**, co-created regulation, and, where appropriate, self-regulation.
  - ➢Governments protect the public from harm and provide stewardship for new technol-ogies, while companies take responsibility for their social obligations.
- **Example**- Japan's financial regulator, has afforded the **Japan Virtual Currency Exchange Association (JVCEA)** the official status to self-regulate and police domestic exchanges ahead of other countries.
  - ➢The public-private body is authorized to establish binding guidelines on behalf of the cryptocurrency industry, including rules for local trading platforms and accurate reporting of transactions.



Agile, responsive regulation

- Regulation acts like an agile process, checking its effectiveness against user feedback.
- **Example- USA's National Highway Traffic Safety Administration (NHTSA)** has been revising its guidelines for autonomous vehicles (AVs) based on feedback from industry participants.

Experimental: sandboxes & accelerators

- Regulatory sandbox (RS) usually refers to live testing of new technology in a **controlled/test regulatory environment** for which regulators may permit certain **regulatory relaxations** for the limited purpose of the testing.
  - ➢The RS allows the regulator, the innovators, and the users to conduct field tests to **collect evidence on the benefits and risks of new innovations**, while carefully monitoring and containing their risks.
- Government can also act as an **accelerator** i.e., an organization that helps startups to grow at scale.
- **Example- Reserve Bank of India (RBI) in India**, released an Enabling Framework for Regulatory Sandbox to facilitate responsible fintech innovation in the country

Data sharing/ interoperability

- It focuses on accelerating **improved data sharing** within ethical guardrails.
- **Example- Data-sharing framework for the IoT created by the Alliance for Telecommunications Industry Solutions (ATIS),** a standard-setting body, aims to promote data sharing, data exchange marketplaces, and public-private partnerships among smart cities.

Regulatory collaboration

- It includes **collaboration among agencies** within a country (escaping regulatory siloes to gain a whole-of-relevant-government approach) as well as cross-border collaboration.
- **Example- The United Nations Economic Commission for Europe (UNECE) facilitat-ed a forum** in which China, the EU, Japan and the US came together to develop a framework **for harmonizing autonomous vehicle regulations.**

Steps taken by the Indian government to build a framework for technological governance

- **Legislative frameworks**
  - **Draft Digital Personal Data Protection Bill** aims to regulate the collection, use, and processing of personal data by businesses and organizations. It proposes a framework for data protection that includes data localization, consent requirements, and penalties for violations.
  - **Drone Rules, 2021,** regulates usage and operations of drones in Indian airspace.
  - **The Information Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules 2011 (Privacy Rules)** regulate collecting, receiving, possessing, storing, dealing, handling, retaining, using, transferring, and disclosing sensitive personal data or information (SPDI).
  - **The Information Technology Act, of 2000,** is the primary legislation governing the use of technology in India.
  - **The Aadhaar Act, of 2016,** uses biometric and demographic data to create a **digital identity** that can be used for various services.
- **Policy Framework**
  - **National Cyber Security Policy** aims at facilitating the creation of secure computing environment and enabling adequate trust and confidence in electronic transactions and also guiding stakeholder's actions for the protection of cyber space.
  - **Code of Practice for Securing Consumer Internet of Things (IoT)** aims at securing consumer IoT devices & ecosystems as well as managing vulnerabilities.
- **Strategy papers for new technologies: NITI Aayog has released strategy documents** for governing emerging technologies like Artificial Intelligence and blockchain.
- **Regulatory sandboxes:** Apart from RBI, regulatory bodies like the Insurance Regulatory and Development Authority of India (IRDAI) and the Telecom Regulatory Authority of India (TRAI), have also launched regulatory sandboxes for their respective sectors.
- **Other efforts-**
  - **INDIAai (The National AI Portal of India)** is a joint initiative by the Ministry of Electronics and IT (MeitY), National e-Governance Division (NeGD) and NASSCOM, has been set up to prepare the nation for an AI future.
  - **Open Government Data Platform** (OGD) India is a single point of access to Datasets/Apps in open format published by Ministries/Departments.

WHAT ARE THE EXISTING AND EMERGING TECHNOLOGY GOVERNANCE GAPS?

Despite the existence of various technology governance policies and frameworks, there are still significant gaps that need to be addressed. Major gaps have been discussed below-

- **Limited or lack of regulation:** Many regulatory bodies are **unprepared for the legal consequences** that could arise due to the use of transformative technologies.
  - **For example**, there is a **lack of regulation** for social media in India. While there are guidelines in place for social media companies, there is no legal framework for regulating them. This has led to several instances of **misinformation, hate speech, and cyberbullying.**
- **Adverse effect of technology through misuse:** Technology can be used **differently from how it was intended by its developer** in ways that can be detrimental to society.
  - **E.g.,** AI trained using videos can create **"deep fakes", in which politicians, celebrities, or news anchors** can be made to appear as if they have said things they did not.
- **Liability and accountability of technology:** It can be difficult to assign accountability for outcomes of decisions made by **autonomous systems.**
  - **For example,** who is to be held responsible if a **drone crash damages a building** or a **medical software misdiagnoses a disease?**
- **Privacy and Data Sharing:** Data has created many opportunities for development and personalized services, but at present there is little in the way of **shared technical standards or governance frameworks** to regulate how such information can be dispensed.
  - **E.g.,** inaccurate use or misuse of data-based technologies to fuel partisan and biased agendas can heighten social inequalities and affect the **human rights of marginalized groups.**
- **Limited technological capabilities of government institutions:** Regulatory and enforcement agencies generally lack trained human resources to effectively frame and enforce technological frameworks.
  - Further, due to financial constraints, especially in developing countries, public agencies fail to invest in the requisite infrastructure and research activities needed for creating and operating effective, long-term technology governance frameworks.
- **Dominance of Private sector:** Private sector entities, particularly Big data companies like Amazon, may have significant influence over the development and governance of technology, potentially undermining the interests of other stakeholders.
- **Uncertainty and unpredictability:** The rapid pace of technological change and the complexity of emerging technologies make it difficult for governance policies and frameworks to keep up with new developments.

- In such conditions of uncertainty, traditional regulatory instruments – e.g., risk assessment, product-based standard-setting, export controls and liability – tend to **narrowly focus on management of immediate or readily quantifiable consequences** or enter only after key decisions about technology design have been made.

- **Cross-border inconsistencies:** Emerging technologies such as AI and blockchain **transcend national boundaries,** further complicating the regulation process.
  - **E.g.,** data and privacy laws change from nation to nation, ranging from no-touch regulation to restrictive systems, which increases both **the difficulty and the risk that existing technologies will be non-compliant.**

- **Other issues:**
  - **Excessively prescriptive regulation** can rapidly become obsolete as new ideas, products, and business models emerge.
  - **Lack of rules in the cases of misuse of technologies by government agencies.**
  - Vulnerabilities and exposure of fast-expanding digital networks to **cyberattacks**.

Examples of technology Specific Governance gaps

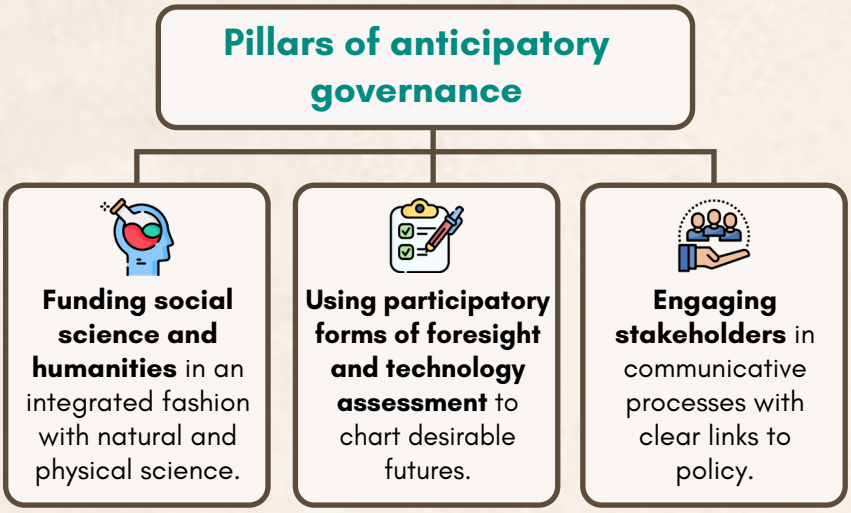
Technology	Governance Gaps
 Artificial Intelligence	• **Low AI literacy** among policy-makers. • Issues with **bias, fairness, transparency, and explainability** in the working of AI algorithms. • Use of AI for **disinformation and digital manipulation.** • **Data privacy and data rights** issues. • Use of **adversarial AI systems to conduct cyberattacks** and disrupt other AI-powered systems. • AI-powered systems being **used in surveillance** and the need for **facial recognition safeguards.**
 Blockchain	• **Cybersecurity threats** in a blockchain world. • **Regulatory fragmentation** in terms of digital identities, assets and cryptocurrencies. • **Cross-border regulatory inconsistencies.** • The preservation and **challenge of anonymity** in an immutable blockchain world. • **High energy consumption** due to use of high-powered computers in mining processes.
 Internet of things	• **Regulating smart contracts, instant payments and other IoT-enabled transactions** may demand new approaches to keep up with the speed of such transactions. • **Market failure of device security and quality** often leaves the public with unsupported and insecure IoT devices

WHAT CAN BE THE POTENTIAL BLUEPRINT FOR TECHNOLOGICAL GOVERNANCE?

A balanced approach to technology governance is highly desirable to fully harness the benefits of the ongoing technological revolution while regulating any potential risks. Some approaches that can be adopted to achieve this outcome are-

- **Anticipatory governance approach:** Regulators that are able to anticipate innovation and disruption will be better positioned to **capture the opportunities of technological innovation while minimizing the risks.**

- Government should invest in **regulatory planning** to help understand what the future looks like and prepare accordingly.



- **Focus regulations on outcomes: Soft law mechanisms**, such as regulatory guidance, codes of practice, and voluntary standards, may be used to complement goal-based regulation and **reduce regulatory uncertainty and provide flexibility for innovation.**
- **Create space to experiment:** Regulators should engage with **technological development so that they are able to shape their evolution** and learn about how their own regulatory approach needs to adapt.
  - Example- **RBI's "sandboxes"** enable innovators to get advice on the regulatory implications of their ideas and/or trial them under regulatory supervision.
- **Build a Culture of Responsibility:** Building ethical codes and raising awareness among the public about their rights can help create a culture where the private sector believes they are responsible for the safe and ethical usage of technology.
- **Develop a pool of technocratic bureaucrats:** Civil Services need to be restructured for better inclusion of technocrats through steps such as establishing dedicated civil service for technology and allocating suitable resources to attract and retain young brains into the system.

Mission Karmayogi: Reimagining civil services in a fast-changing world

In today's rapidly advancing world, **an evolving skill set** has become a requirement for civil servants. They need multitude of skill which also include nuanced and practical understanding of disruptive innovations, digital arenas, big data management, and emerging technologies.

This understanding is critical for civil services to **predict future outcomes of technological innovations** on the society and transforming public services, government policies and regulatory frameworks to adapt to said outcomes.

In this regards, **Mission Karmayogi** launched by the Government of India, endeavours to prepare Indian civil servants for the future by making them more creative, constructive, imaginative, innovative, enabling, transparent, and **technology enabled**. It will also provide a lifelong and continuous learning environment for all civil servants.

- Further, **a dedicated civil service for technology** would encourage better innovation and implementation of technology-driven solutions in the country at large.

- **Use data to target interventions: Regulators have access to more ways to gather and analyze data than ever before,** including through drones, smart sensing, wearables, the Internet of Things (IoT), and artificial intelligence.
- These developments open up a world in which regulatory interventions may be **finely targeted, outcomes may be monitored in real-time, and rules may be evaluated and updated at pace.**

- **Leverage the role of business:** The information asymmetry between businesses and regulators means that the industry is often better placed **to manage the risks from technological innovation most efficiently and effectively.**
  - Industry-led governance can complement the use of **goal-based regulatory approaches by providing guidance to businesses on how outcomes can be achieved.**
- **Work across institutional boundaries:** Coordination is needed to avoid unnecessary **divergence in regulatory approaches across localities** that would make it harder to trade or achieve shared regulatory goals.
  - This need not mean that **regulations should be the same**, but they should be interoperable.
- **Collaborate internationally:** Collaboration can create the conditions for regulators to develop more **interoperable and effective rules, share best practices and knowledge,** promote cross-border collaboration on R&D, and work towards **international standards and norms** for technology governance.
  - E.g., the United States and India elevated their strategic partnership with the **Initiative on Critical and Emerging Technology (iCET)** for codeveloping and governing emerging technologies.
  - Also, multilateral organizations can act as a facilitator in this regard.
- **Emphasis on digital commons:** Digital commons can help in actively designing **shared democratic values across the market structures and governance models** that drive today's technology development. It could point the way forward for an inclusive and sustainable ecosystem with shared social benefits.

Technology Governance and the Role of Multilateralism

Multilateralism organisations work on the basis of certain principles that have been agreed upon by the international community. So, they can immensely help in **shaping the regulatory environment of technologies transcending international borders**. Some ways they can help are-

- Establishing governing principles for **an open, free, secure, and inclusive digital future for all.**
- **Engaging with the multistakeholder technological communities** beyond the established channel.
- Providing **leadership and the vision and pathways.**
- **Participation of civil societies, academia, and business,** among others to form a balanced regulation.
- Developing **shared principles and shared understandings** of threats from emerging technologies.

Multilateralism when properly directed, serves as an effective tool for democratic governments within a geopolitical environment to deal with emerging challenge. Some examples of prominent multilateral efforts for technological governance include-

- **Internet Governance Forum (IGF):** It brings together people and groups to spread information to **influence policy and best practices for the internet and technology.**
- **Global Technology Governance Summit 2021:** First hosted by the **World Economic Forum in collaboration** with the Centre for **the Fourth Industrial Revolution Network (C4IR)**, it has a goal of becoming the leading authority on technology governance of emerging technologies by **ensuring public-private collaboration.**

IN CONVERSATION: WHAT IS DIGITAL COMMONS?

Vinay: *Hey Vini! Have you ever heard of this thing called "digital commons"?*
Vini: *No. What is it?*
Vinay: *Well, it's the idea of shared digital resources that are accessible to everyone.*
Vini: *Okay. So, it's like a collective digital space that anyone can use and contribute to?*
Vinay: *Yes Exactly! And the best part is that it's not owned by any one person or organization. It's a community-driven space that fosters collaboration and innovation. For example, Wikipedia can be edited by everyone.*

Vini: *Is there anything like that going on in India?*
Vinay: *Absolutely. India has launched an Open Government Data platform, which basically makes all kinds of government data accessible to the public.*
Vini: *That's interesting. So, people can use that data to figure out what's going on in the country?*
Vinay: *Yes. You could use it to know things like how much money the government is spending on education, or where certain diseases are most common.*
Vini: *That sounds great!*

CONCLUSION

Maximizing the benefits of the current lively environment of innovation requires a new generation of governance mechanisms across public, private, and non-profit sectors. These mechanisms – if designed well – can enable "responsible innovation": a kind of innovation that is more productive, responsive, and socially robust. Engaging governance within the innovation process has the potential to embed public good considerations into technologies.

TOPIC AT A GLANCE

Technology governance

The process of **exercising political, economic, and administrative authority in the development, diffusion, and operation of technology in societies.**

Consists of **norms** (e.g., regulations, standards, and customs), **institutional and normative mechanisms and physical and virtual architectures**	Includes various elements such as **risk management, security, privacy, compliance, and transparency.**	Typically involves **multiple stakeholders, including government agencies, regulators, industry associations, and individual organizations**

Need for Efficient Technology Governance Frameworks

- **Fostering innovation** by providing a framework for experimentation and risk-taking while ensuring the responsible use.
- **Mitigate risks and potential negative impacts** arising from the use of emerging technologies.
- **Promoting ethical use of technology**
- **Ensuring National security.**
- **Shaping Public policy** by bringing technologists and policymakers together.

Major governance frameworks for regulating technologies

- **Ethical governance frameworks**
- **Public and private sectors collaboration** using mechanisms such as multistakeholder engagement, co-created regulation, self-regulation etc.
- **Agile and responsive regulation** according to changing technology.
- **Experimental mechanisms** like **regulatory sandboxes and accelerators.**
- **Data sharing/interoperability frameworks** focused on accelerating improved data sharing within ethical guardrails.
- **Regulatory collaboration** among agencies within a country as well as cross-border collaboration

Existing and emerging technology governance gaps

- **Lack of/limited regulation** with regulatory bodies being **unprepared for the legal consequences.**
- **Adverse effects of technology through misuse.**
- Lack of **liability and accountability of technology.**
- **Privacy and Data Sharing issues.**
- **Limited technological capabilities** of government agencies.
- **Dominance of Private sector.**
- **Uncertainty and unpredictability** due to rapid pace of technological change and the complexity of emerging technologies.
- **Cross-border inconsistencies.**

Potential blueprint for technology governance

- **Anticipatory governance approach** to predict innovation and disruption outcomes.
- **Focus regulations on outcomes** through soft law mechanisms.
- **Create space to experiment.**
- **Build ethical codes and raising awareness** among the public.
- **Develop a pool of technocratic bureaucrats.**
- **Use data to target interventions by gathering and analysing data.**
- **Leverage the role of business.**
- **Work across institutional boundaries.**
- **Collaborate internationally,** e.g., through multilateral institutions.
- **Digital commons** for designing **shared democratic values across the market structures and governance models.**