

# *Ethics of* **Emerging Technology**

*Magna Potentia, Magna Responsabilis*



## **Introduction** —

**“It has become appallingly obvious that our technology has exceeded our humanity”**

**- Albert Einstein**



Advancing technology has always evoked a range of emotions among us due to its impact on us, our communities, and our world. Some view it as a tool for advancement of life by bringing people together and solving the greatest challenges of humanity. Others view it as a threat to humanity, leading to various ethical questions on the right and wrong or good and bad of technology.

Emerging Technologies are the latest of such high potential technologies in human life with evolving considerations on their ethical usage. Any failure to consider the ethical implications of these technologies can push humankind on the path of destruction.

In this context, we will delve upon questions like - what do we mean by emerging technologies and what is their significance in our life in terms of their features and applications. Next, we will cover the ethical implications of these technologies or what moral conflicts/challenges we face in these areas. Based on it, we will try to identify the existing legal and ethical measures undertaken and what more can be done in terms of guiding principles, values, and other initiatives to ensure ethical technological development.

## What are Emerging Technologies and what is their significance?

Emerging technology commonly refers to **existing or new and innovative technologies under development with unrealized practical applications**. It can have slightly different meaning when used in different areas, such as media, business, science, or education.

They employ **new concepts, methods, and techniques and are expected to be available within the next 5-10 years**. They promise to find better solutions to the world's challenges and are expected to generate significant economic and social value.

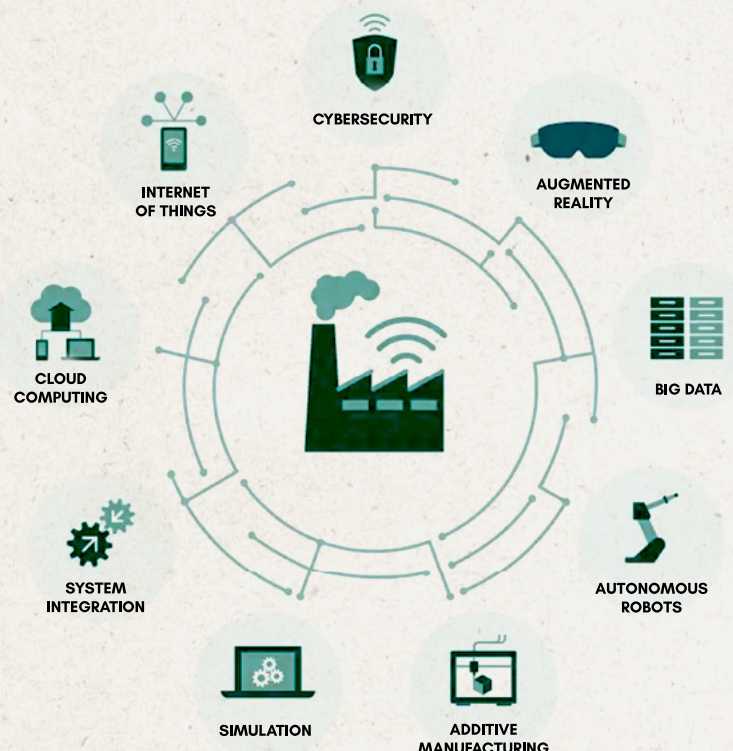
For example, technologies such as **fuel-cell vehicles, artificial intelligence, genome-editing** etc. have been around for years but have found market presence only in recent times. Similarly, new technologies such as **blockchain, 5G, Internet of Things, etc.** are developing with promise of limitless opportunities in education, healthcare, transportation, retail industry etc. These opportunities along with the rising acceptance of emerging technologies showcase their significance towards-

- **Creating New Economic Opportunities via Industry 4.0:** The **Fourth Industrial Revolution** is based on convergence of emerging Cyber-physical systems such as machine-learning and artificial intelligence, robotics, cloud computing and the Internet of Things etc. Collectively these technologies would create new production processes, business models, and service delivery mechanisms among others.

- ▶ For instance, development of metawork (a part of metaverse) would create new opportunities like need for virtual world developers.

- **Developing Digital Ecosystems:** Emerging technologies help in development of digital ecosystems through processing of large unstructured data, automation of tasks, providing connectivity via technological frameworks like Web 3.0 etc.

- ▶ For instance, **Amazon** has created a strong digital ecosystem of in-house products and platforms, helping it in becoming more agile, reduce cost and launch products of future.





- **Bringing Sectoral Transformation:** Emerging Technologies hold potential to transform any environment that can be made "smart" (i.e., faster, efficient, and more useful). This has led to their integration in **building smart cities, smart education, smart healthcare** etc. E.g.
  - ▶ **Healthcare:** Use of Internet of Things (IoT), Big data, Cloud Computing etc. to connect doctors and patients, hospitals, and research institutions, making healthcare more personalized, efficient, and convenient.
  - ▶ **Education:** The Education sector is changing rapidly with Virtual and Augmented Reality tools which transforms the modalities of teaching or learning. Alongside, the growing internet connectivity has also improved the access to these tools.
- **Provide Immersive Communication and Engagement:** Technologies like Internet of Things, 5G, Augmented Reality (AR) and Virtual Reality (VR) provides an immersive experience through virtual shared spaces. This holds potential to change how we engage in formal as well as informal settings.
  - ▶ For instance, holding meetings in 3D environment, making educational videos to train employees, and providing simulations, additional data/information on the real world etc.
- **Accelerating towards Sustainable Development Goals:** Achievement of multiple SDGs is directly or indirectly linked to use of emerging technologies such as **SDG 4 on Quality Education, SDG 9 on Industry, Innovation and Infrastructure; SDG 11 on Sustainable Cities and Communities** etc.
  - ▶ For instance, using **biometrics** for identity in order to disburse the subsidies. **The Aadhaar ecosystem** helps in achieving SDGs goal of **No Poverty (SDG 1), Zero Hunger (SDG 2)** etc and supports **ease of living, promotion of equity and inclusion.**

◦ **Fueling innovation and further technological growth:**

New and Emerging technologies such as robotics, AI, Blockchain technology etc. often merge to design new approaches and techniques to fuel innovation and technological growth.

▶ For instance, use of more **powerful computation** capabilities of Quantum computing to improve **navigation and timing systems.**

▶ Similarly, use of genome editing to **investigate, prevent and treat genetic diseases.**

◦ **Enhancing overall security of systems:** Emerging technologies can potentially add

newer dimensions to the security systems making it safer.





- ▶ For instance, use of emerging technologies in personal devices such as laptops, smartphones etc. makes the personal data more secure as the biological/physical markers used in them are **difficult to steal or impersonate**. For instance, use of **voice recognition, Fingerprints, Facial Recognition** etc. in devices.

But these new opportunities also bring with them a gamut of new challenges. Most of the challenges that emerge in the context of emerging technologies have their roots in the philosophy of their usage i.e., the ethical debates/issues on how such technologies should be used?

## What are the primary ethical issues/questions concerning Emerging Technologies?

- **Human vs. Machines:** One of the most-discussed issue is automation wherein machines (autonomous technologies) potentially replace humans as labour, soldiers etc.

E.g., at what point can we rely on the technology enough to fight a war for us, drive a car or deliver packages?

- **Invasion of privacy:** Due to political and economic interests, invasion of citizens/consumer privacy is major ethical issue, which directly or indirectly reduces **Individual's Freedom of Choice**.

E.g., Is it okay to nudge people's choices as policy action?

- **Misuse of Personal Information:** Growing use of social media, e-commerce, health apps etc. lead to sharing personal details, reducing **control over your own data**.

E.g., should Big Tech companies sell user's personal data?

- **Environmental Consequences:** Whether it is the field of computing or genomes, the increasing power (**energy use** or **ability to change genes**) alters and challenges **Ecological Balance**.

E.g., should we attempt to edit germline cells as it will be passed down through generations?

- **Discrimination:** Whether it is cost of emerging technologies or algorithms used by some of them, the risk of discrimination exists at **Individuals, companies, and communities level**, leading to **Monopolies in Business** and **Unequal Access to Technologies, Healthcare** etc.

E.g., will gene therapies, if too expensive, would have limited access and worsen existing health inequalities between the rich and poor?

- **Distortion of Reality:** The growing monetisation of media, use of people and groups for spreading disinformation, misinformation, deepfakes etc., taken to a whole new level by social media, leading to:

- ▶ **Weaponizing data for information warfare and personal benefits**, sowing seeds of chaos, mass hysteria etc. which **weakens the legal system** and **social fabric** with negative impact on **mental well-being of people**.

- **Other Ethical Issues:** Apart from other issues, the ethical issues of increasing digital divide; rising cyberattacks; illegal distribution of copyrighted works; blurring lines of work and home due to 'Always-On' Culture etc.

**"Always-on" culture** refers to the expectation that employees are always available and responsive to work demands, even outside traditional 9-5 work hours.



## In Conversation!

### Is Artificial Intelligence (AI) biased?

**Vinay:** Hey Vini! Did you hear that Amazon is employing AI in its recruitment process?

**Vini:** Yes, I heard. But how exactly?

**Vinay:** The AI algorithm has been fed with resumes of selected candidates for the past 10 years. Learning from that, it selects the potential candidates.

**Vini:** Okay. That is very efficient. But at the same time, I think it is a little risky.

**Vinay:** How is it risky?

**Vini:** Have you heard about algorithmic bias?

**Vinay:** No. What is it?

**Vini:** AI learns from humans. In this case, it is learning from the human judgement on suitability of the candidate. But what if there are flaws in human judgement?

**Vinay:** The algorithm will learn those flaws as well.

**Vini:** Correct. So, if the past recruiters were biased against women, the algorithm would also be biased. That is algorithmic bias.

**Vinay:** Okay. Now I understand the risk you were referring to. But what is the solution to this problem?

**Vini:** Firstly, complete reliance on AI based systems could be avoided. And second, regular re-evaluation of AI systems in relation to ethics.

**Vinay:** Got it. This means a hybrid AI-Human system which improves continuously is the best way forward.



So, it isn't just that the **decade old threats of robots replacing humans** have enhanced but several other ethical issues from technology have emerged with devastating impacts.

## Impact of Challenges Posed by Emerging Technologies

- **Legal Complexities: Lack of oversight and laws** to ensure responsibility due to complex technologies and need of global approach. E.g., who should protect data if third party technology is involved?
- **Political Concerns:** Emerging Technologies are used by **Government** as part of policy tool for behavioral interventions (nudge), good governance etc. But it is also used by **political representatives** to gain support base even at **risk of misinformation**.
- **Economic Potential:** It can produce positive as well as negative outcomes. High Potential for Businesses to increase efficiency, create new markets as well as issues like monetization of people's data, lack of transparency in operations, increased economic concentration etc.
- **Regulatory Dilemma: Safety issues** in Bioresearch Regulation. E.g., Regulating Genetically Modified Organisms (GMOs), Germline Gene Therapy etc. with great significance as well as risks.
- **Social Impact:** Emerging Technologies have mixed impact in terms of their vital role in equality and equity as well as **risk of increasing wealth inequality, discrimination, change people behavior etc.**

To overcome these challenges and associated impacts, India has adopted several legal and ethical practices.





# What are the current Legal and Ethical Practices adopted to make technology use ethical?

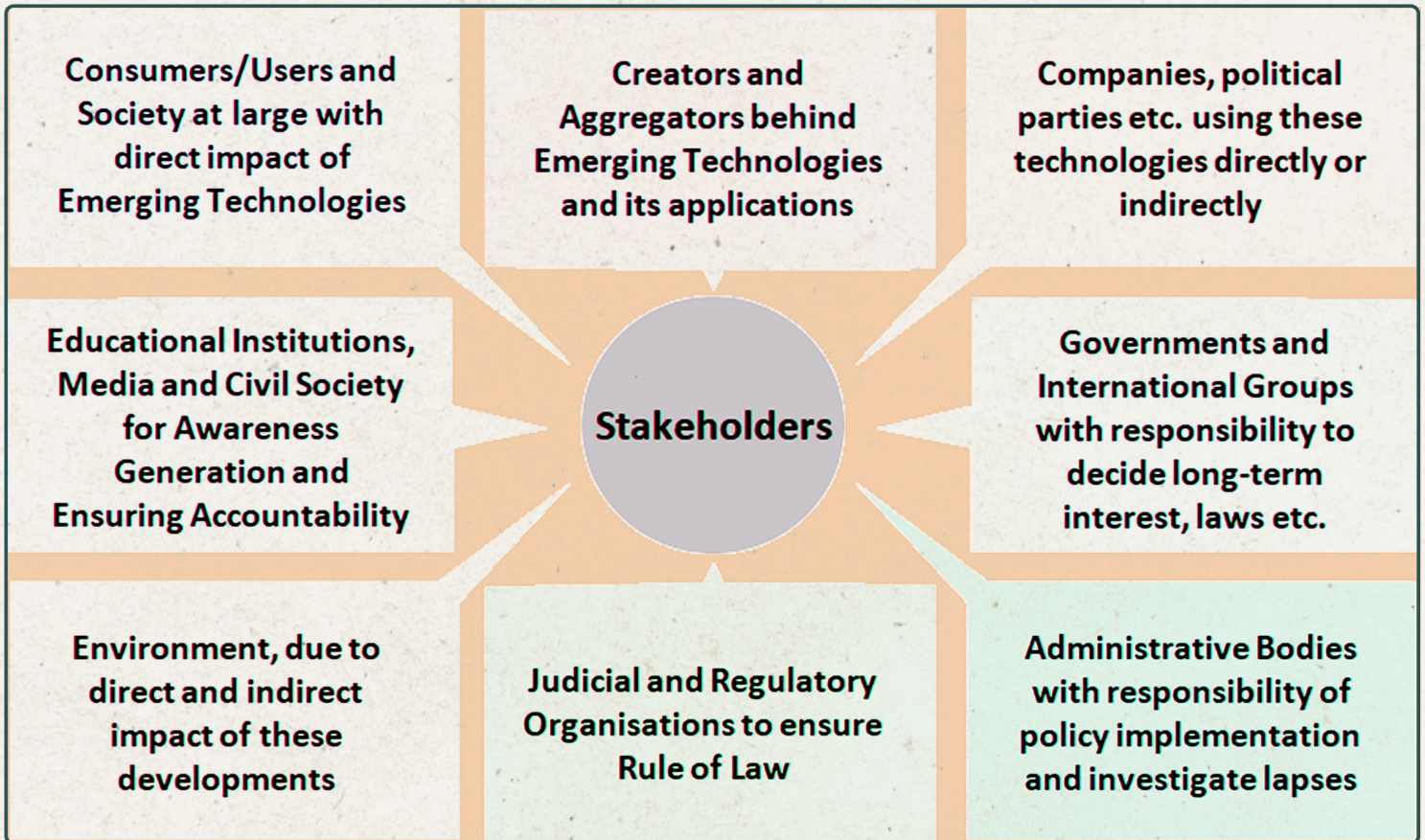
## ◉ State Measures to address Ethical Issues:

- ▶ **Information Technology Act, 2000** provides for safeguards to be adopted for security and prevent unauthorized use of data.
- ▶ **Right to Privacy** is declared a Fundamental Right and an intrinsic part of the **right to life and personal liberty** by Supreme Court (**Justice Puttaswamy case**) in 2017.
- ▶ **Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021** to regulate intermediaries and fix accountability with responsiveness through due diligence, grievance redressal etc.
- ▶ **Policy actions** to promote its beneficial use for economy and society; and create necessary workforce and infrastructure to thwart illegal actions. E.g.
  - **Promotion of technologies** for sustainable development like drones for sustainable agriculture, Adaptive Agriculture Project for climate-smart farming practices.
- ▶ **Moral Suasion** to persuade companies to act in an ethical manner and respect for the rights of people, environment, and communities.
- ▶ **Setting up of New and Emerging Strategic Technologies (NEST) Division** by the **Ministry of External Affairs** to engage in technology diplomacy.
  - It will work to safeguard national interest, deal with threats from dual use of emerging technologies and frame legal norms.

## ◉ Corporate Measures to address Ethical issues:

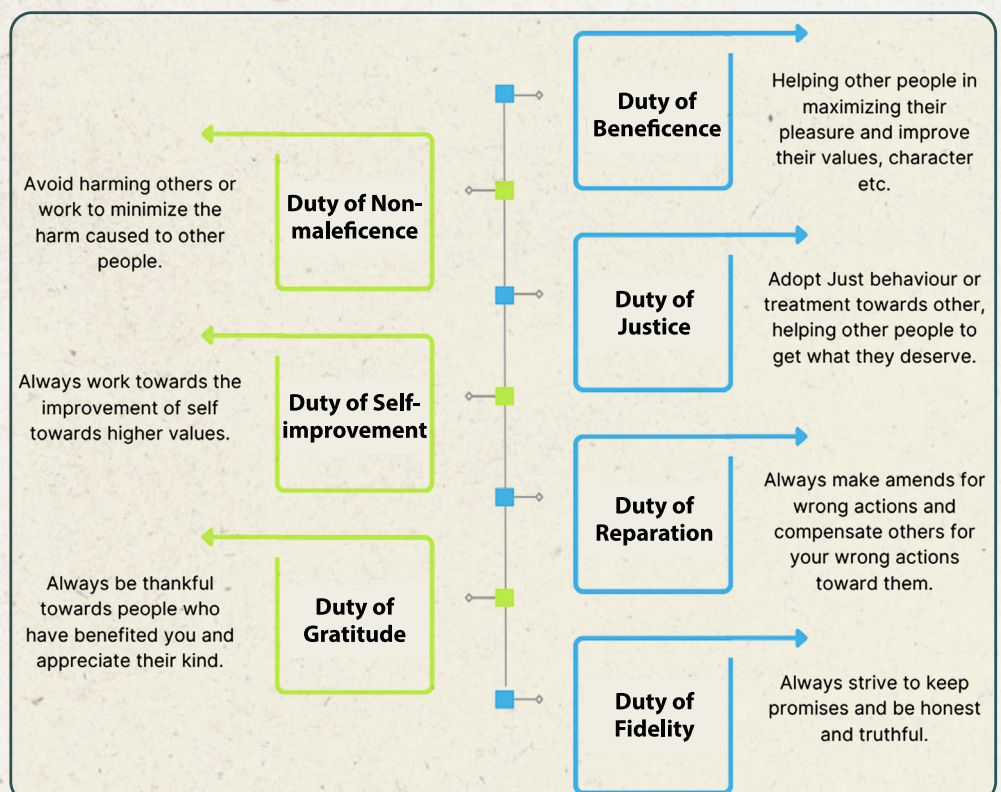
- ▶ **Discourse on adoption of Stakeholder Capitalism**, i.e., a system in which corporations are oriented to serve the interests of all their stakeholders, for long-term value creation.
  - This includes work for the welfare or avoiding harm to customers, suppliers, employees, shareholders, and local communities.
- ▶ **Use of Code of Conduct to create a Culture of Responsibility** and ensure high standards of integrity, privacy, freedom of expression, accountability etc.
- ▶ **Creating Digital Trust** through use of the same emerging technologies towards **security, privacy, data integrity** and **combat the misuse of technology**.
- ▶ **Disallowing of projects** which have a high potential of misuse. E.g., Google stopped training AI system which can be used for generating deepfakes, Facebook banned **posting AI-driven deepfakes** on its platform etc.

Although, these efforts have had significant positive impact. But in the long run, they would not be enough. Therefore, it requires all stakeholders (see image) to work together and assess the negative outcomes. It will help to mitigate risks and pre-plan for the ethical issues involved with technologies that are not yet fully developed for well informed decisions.



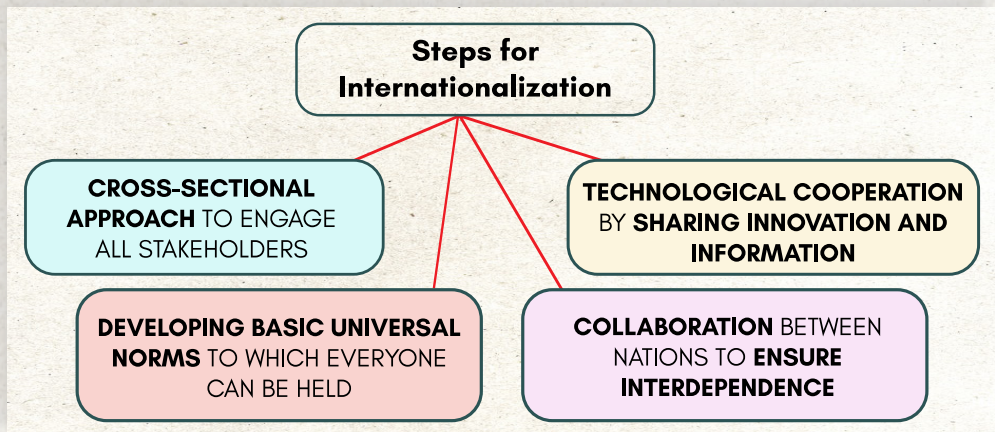
## What are the Principles and Values which can help in creating a multi-stakeholder Ethical Framework?

- Promoting General Good or prima facie duties** (see image): Any technological development or application must go through the test of these duties. This would ensure that the technology is at its best ethical self.
- Framing Pending Domestic Laws and Regulations** to make these technologies safe and protect citizen rights while promoting ethical innovations, helping in:
  - Security of data and Public Order** by controlling unlawful information.
  - Protecting sovereignty, unity, and integrity** of nation.
  - Impose penalties** on misuse or non-consensual use of data or any breach.



◦ **Striving for internationalization of Ethics of Emerging Technology.** This is needed to-

- ▶ **Avoid weaponization of emerging technologies** as cyber-warfare, advanced form of arms race, biological or hybrid warfare etc.
- ▶ Ensure that **emerging technologies do not further increase the gulf between developed and developing countries.**



- **Visualization of the Future** to help individuals understand not just fundamental technology concepts but ethical implications as well. It will ensure responsible use of technology as leaders, entrepreneurs, employees, and users.
- ▶ **Making Technology Companies Transparent and predictable** to uphold the **Right to Know**, i.e., how they use personal data and provide necessary details on benefits. E.g., General Data Protection Regulation from the European Union to ensure that websites disclose when they have cookies to collect visitor information.
- ▶ **Responsible Adoption of Disruptive Technology** by integrating ethics across the business cycle or processes to ensure due diligence, protecting user's privacy as well as freedom of speech and expression.
- **Appointing Ethical Officers** to guide businesses in overcoming ethical dilemmas, bias, and unintended consequences by:
  - ▶ **Providing ethical insights, developing ethical resources** (e.g., Code of Conduct) and **training programs** to promote ethics and responsibility through ethical work culture.
  - ▶ **Feedback for management introspection** by engaging impacted people, civil society, and media to create faith.

**"It's not a faith in technology. It's faith in people"**

**- Steve Jobs**

## Ethics in Practice

**Who can be held liable for damages caused by autonomous systems?**

An 'autonomous' robot was moving through a factory. Another robot surprisingly crosses its way and the first robot draws aside to prevent collision. However, by this manoeuvre the robot injures a person. Who can be held liable for damages caused by autonomous systems? The factory owner using the robots, or the robot manufacturers or one of the companies that programmed the software of the robots?

**As a regulatory authority of autonomous systems, how would you decide?**





## Who can be held liable?

Who has the primary responsibility?

The owner of the robot similar to how it happens with vehicles.

How can the owner be held accountable?

Making the owner pay for damages or punishment similar to Motor Vehicles Act.

Is the owner solely responsible?

Yes



No



Who else is responsible?

### Manufacturer

Responsibility of creating a safe beneficial & efficient product.

How can the manufacturer be held accountable?

Creating regulatory standards for manufacturing of robots.

### Software Developers

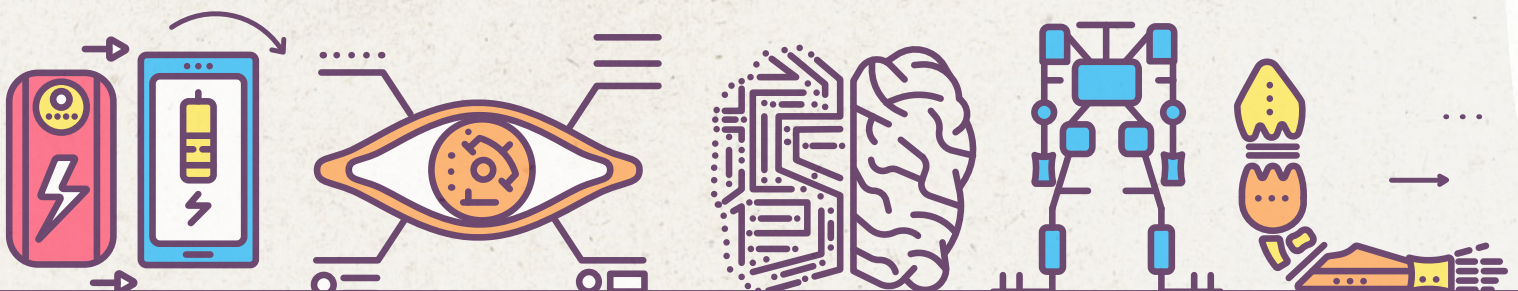
Responsibility for creating an unbiased, transparent and supportive system.

How can the software developers be held accountable?

Creating safeguards to ensure that universal software development principles are adopted.

## Conclusion

Incorporating ethics in powerful emerging technologies could create challenges to existing business models or maintaining both revenue streams and strong ethical practices. But this trade-off is necessary to create trust in these technologies and have a more ethical approach on- how to make them more equitable, use information, engage with stakeholders, manage resources, and approach sustainability. It will ensure faith in technology among stakeholders. After all, technology is what people make of it.





## Topic at a Glance

### Ethics of Emerging Technology

- Emerging technology commonly refers to **existing or new and innovative technologies under development with unrealized practical applications.**
- They employ **new concepts, methods, and techniques** and promise to find better solutions to the world's challenges.
- At the same time, any failure to consider the ethical implications of these technologies can push humankind on the path of destruction.

#### Significance of Emerging Technology

- To create **New Economic Opportunities** with **Industry 4.0.**
- To develop **Digital Ecosystems** and **Bring Sectoral Transformation** by making them smart.
- Provide **Immersive Communication and Engagement.**
- Accelerating** towards **Sustainable Development Goals.**
- Fuel Innovation and Technological Growth.**
- Secure Personal Data** as well as **Enhance overall Security of Systems.**

#### Challenges Posed by Emerging Technologies

- Legal Complexities** due to lack of oversight and laws.
- Political Concerns** as it is useful in serving government interests as well as political interests.
- Economic Potential** of creating good as well as bad outcomes.
- Regulatory Dilemma** due to conflict between its potential benefits and the issues of Ethics and Safety.
- Social Impact** will be mixed as it can help in equality and equity as well as increase wealth inequality, change people behavior etc.

#### Major Ethical Issues

- Human vs Machines**, i.e. Autonomous machines replacing humans.
- Invasion of citizens privacy** and reducing freedom of choice.
- Misuse of Personal Information** by taking individual control over own data.
- Environmental Consequences** as it can threaten ecological balance.
- Discrimination** risk at individual, companies and communities level.
- Distortion of Reality** through deep fakes, misinformation etc.
- Other issues** such as **increasing digital divide, Always-On Culture, Use of intrusive technologies** etc.

#### Roadmap for an ethical technology ecosystem

- Promoting General Good** to protect rights, avoid harm etc.
- Developing Certain Universal Principles** for global governance and accountability.
- Framing Pending Domestic Laws and Regulations** to secure data, protecting unity and integrity etc.
- Striving for internationalization of Ethics of Emerging Technology.**
- Visualization of Future** to help individuals understand technology as well as ethical implications.
- Appointing Ethical Officers** to create ethical work culture and engage stakeholders to help in introspection and creating faith in technological development.