

# Gist of Yojana May 2023: Techade

Yojana Magazine is an important source of material for the UPSC exam. The monthly magazine provides details of major government schemes and programmes in various domains. Moreover, coming from the government, it is an authentic source of information for the UPSC Exam. Here, we provide the Gist of Yojana, exclusively for the IAS Exam.

	<b>TABLE OF CONTENTS</b>
1.	<b>Innovation in Space Technology</b>
2.	<b>Startups-Revolutionising India's growth story</b>
3.	<b>Potential of India's Edtech sector</b>
4.	<b>Leveraging technology for transforming healthcare</b>
5.	<b>Quantum Computing-Transforming Technology</b>
6.	<b>AI Chatbots-Future and Challenges</b>
7.	<b>5G Cyber Security Challenges</b>
8.	<b>Digital Publishing- Expanding the horizon</b>
9.	<b>Use of Technology in Urban Planning</b>

## Chapter 1: Innovation in Space Technology

### Introduction:

- [Indian Space Research Organisation \(ISRO\)](#) has been at the forefront of space technology and exploration since its inception.
- Over the years, leveraging its key resources, the organisation has made several strides in space technologies, making India a major player in the global space arena.
- In ISRO, the evolution of space technology and innovation had taken place in various technological frontiers.

### Space transportation system:

- The 1970s marked the beginning of the space transportation system with the development of solid-propulsion-based Sounding Rockets, which are capable of putting 30 kg of payload in 120 km of altitude.
- It was followed by the subsequent development of first generation launch vehicles, i.e., Satellite Launch Vehicles (SLV) and Augmented SLV (ASLV) with the induction of liquid-propulsion technology.
- The integration of solid and liquid propulsion and the development of various key technologies have resulted in the development of the Polar Satellite Launch Vehicle (PSLV), with the capability of placing a 1700 kg payload into polar orbit.
- The indigenous development of a Cryogenic propulsive engine was the major technology leap in the development of third generation rockets i.e., GSLV launch vehicles, which have the capability of placing a 2000 kg payload in Geo-Synchronous Transfer Orbit (GTO).
- Launching of high-throughput communication satellites necessitated the development of a further advanced launch vehicle, i.e Launch Vehicle MK3 (LVM3).
  - Powered by the world's 3rd largest solid boosters, high-capacity liquid and cryogenic engines, LVM3 has the capability of putting 4000 kg payload in GTO.
- ISRO recently introduced the [Small Satellite Launch Vehicle \(SSLV\)](#).

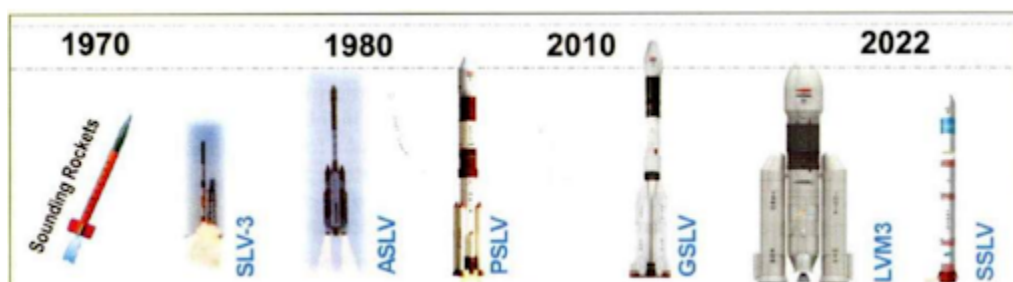


Image Source: Yojana

**Space Infrastructure:**

- In the early years, ISRO focused on developing satellite launch vehicles like SLV-3 and ASLV, which were used to launch small satellites into low earth orbit.
- In the late 1990s, ISRO began work on the GSLV, a more powerful rocket capable of launching heavier payloads into geosynchronous transfer orbit.
  - The first successful launch of the GSLV took place in 2001, and since then, it has been used to launch a number of important satellites.
- In the 2000s, ISRO began focusing on deep space exploration with the launch of [Chandrayaan-1](#), India's first lunar mission, in 2008.
  - This was followed by the [Mars Orbiter Mission](#) in 2013, which made India the first country to successfully launch a spacecraft to Mars on its first attempt.
- In 2016, ISRO launched the Indian Regional Navigation Satellite System (IRNSS), a satellite-based navigation system similar to GPS.
  - This system, now known as [NavIC](#), provides accurate position information to users in India and surrounding regions.
- In recent years, ISRO has been working on developing the infrastructure for human spaceflight.
  - This includes the development of a crew module for carrying astronauts and the testing of a crew escape system. ISRO also plans to launch its first crewed mission, [Gaganyaan](#), in 2024.

**Space Applications:**

- Earth Observation (EO) applications by ISRO are institutionalised across many user Ministries/Departments, towards National security, Agriculture, Agroforestry, Disaster management, Fishery, Land Use Land Cover (LULC), Resource Mapping, Planning, Monitoring & Evaluation and decision support for major flagship programmes of the government.
- In order to meet above requirements for remote sensing/PO applications, a great deal of development had taken place in ground infrastructure and imaging technologies.
- Ground technologies for tracking multiple objects in space, including the establishment of multi-object tracking radar, an integrated multi-mission ground segment for earth observation satellites, Polarimetric Doppler Weather Radar, state-of-the-art advanced ground station for Earth Observation satellites at Bharti station, Antarctica have facilitated the uninterrupted usage of satellite services.

**Ongoing projects:**

- Strides in space technology innovation continue in the thrust areas of Reusable Launch Vehicles, Stage Recovery and Reuse, Vertical Take-off Vertical landing (VTVL), LOX-Methane engine, Air breathing/ Hybrid Propulsion, Space Robotics, Humanoid robots, Advanced Inertial systems, Low Cost Spacecrafts, Quantum Communication, advanced Scientific Payloads, Space Based Surveillance and Atomic Clock.

- In an effort to develop technologies for low-cost access to space and space travel, ISRO is working on a [Reusable Launch Vehicle \(RLV\) programme](#).
- ISRO is also working on Air breathing propulsion with reusable capability for a cost-effective futuristic space transportation system.
- The ISRO's current focus is on the development of critical technologies towards the realisation of a vehicle-integrated scramjet engine called the Hypersonic Air Breathing Vehicle with Airframe integrated system (HAVA).
- For the first time in India, ISRO achieved a breakthrough demonstration of free-space Quantum Communication over a distance of 300 m using the Prepare & Measure Protocol and Quantum Entanglement protocols.
- ISRO has been actively pursuing several R&D programmes related to Space Robotics Vyom Mitra (Humanoid robot), Lander and Rover for Chandrayaan-3 mission, On-orbit Satellite refuelling, Planetary Rock Sampler, Space-based robotic manipulator, Robotic arm-based umbilical systems, 3D printing in Space among others.

## Chapter 2: Startups-Revolutionising India's growth story

### Introduction:

- In recent years, startups have emerged as a key driver of economic growth in India. With the government's focus on promoting entrepreneurship and innovation, the startup ecosystem in India has been growing at a rapid pace.
- According to a report by NASSCOM, India is the third-largest startup ecosystem in the world, with over 50,000 startups.
- The country's entrepreneurial ecosystem has also seen an exponential spurt in funding activities over the past few years. Indian startups raised over \$25 billion in 2022 alone.
- Indian Unicorns are also flourishing in the fast-paced, dynamic ecosystem while developing innovative solutions and generating large-scale employment.
  - India is home to over 108 unicorns today -becoming the second-largest unicorn nation in the world.
- These startups are revolutionising India's growth story by creating new job opportunities, driving innovation, and contributing to the country's GDP.

### Increased funding:

- The spike in funding for startups was majorly led by the increased adoption of digitisation and the easy availability of capital at the early stages of growth for startups.
- Startup India has introduced various schemes to simplify and facilitate the process of raising funds at both early and mature stages.

- One such scheme, supporting early-stage funding from angel investors and venture capital firms, is the Startup India Seed Fund Scheme (SIFSS) with an outlay of Rs 945 crore, which provides financial assistance to early-stage startups for proof of concept, prototype development, product trials, market entry and commercialisation.
- Another government scheme committed to assisting startups financially is the Fund of Funds scheme launched in 2016.
- Apart from the several managerial and regulatory challenges, one of the biggest problems faced by startups is easy access to early-stage debt to finance their capital requirements. Traditional lending institutions, such as commercial banks, rely on the same old mandate.
- The Government has established the Credit Guarantee Scheme for startups for providing credit guarantees to loans extended to DPIIT-recognised startups by Scheduled Commercial Banks, Non-Banking Financial Companies (NBFCs), and Venture Debt Funds (VDFs) under SEBI registered Alternative Investment Funds.

## Chapter 3: Potential of India's Edtech sector

### Introduction:

- EdTech or Education Technology is the usage of technology - software and/or hardware, to enhance teaching and learning.
- Smartphones loaded with EdTech apps have now become synonymous with education. The potential for EdTech to reach underprivileged students in areas far and wide has played and will continue to play a big role in the sector's growth in the coming years.
- The needs of each student are different, as are the pace and style with which they learn. EdTech enables everyone to get a consistent quality of education, no matter their age or learning abilities.

### India's ICT Revolution:

- For EdTech to flourish, there is a need for the availability of and access to a robust Information and Communication Technology (ICT) ecosystem.
- The Indian ICT industry has been growing rapidly over the last quarter century. In FY 2022, the industry crossed US\$200 billion in total revenue and 5 million in total workforce. By the end of 2023, it is predicted to spend US\$144 billion on ICT.
- The services segment is expected to make up about 52% of this spending. EdTech is an important sector in the industry's transition from enterprise servicing to enterprise solution provision.
- The emergence and rapid adoption of EdTech can also be attributed to the fast-paced digitalisation of India, the expansion of ICT infrastructure, and the accessibility of gadgets and data over the last two decades.



- Between 2010 and 2022, the number of internet users in India has increased by 10x, from 92.5 million to 932.2 million. This is expected to rise to 1.53 billion by 2040.
  - This could also be attributed to the fact that India has one of the cheapest mobile data rates globally, with 1 GB costing only Rs 14, a 90% reduction from 2013.
- There has been a 27X increase in the number of smartphone users in India, from 34 million in 2010 to 931 million in 2022. This is expected to rise to 1.53 billion by 2040.
- The development of these factors and the tangible benefits that EdTech provides in the teaching-learning process have presented a significant opportunity for the EdTech sector and its diverse players to expand their presence and adaptability.

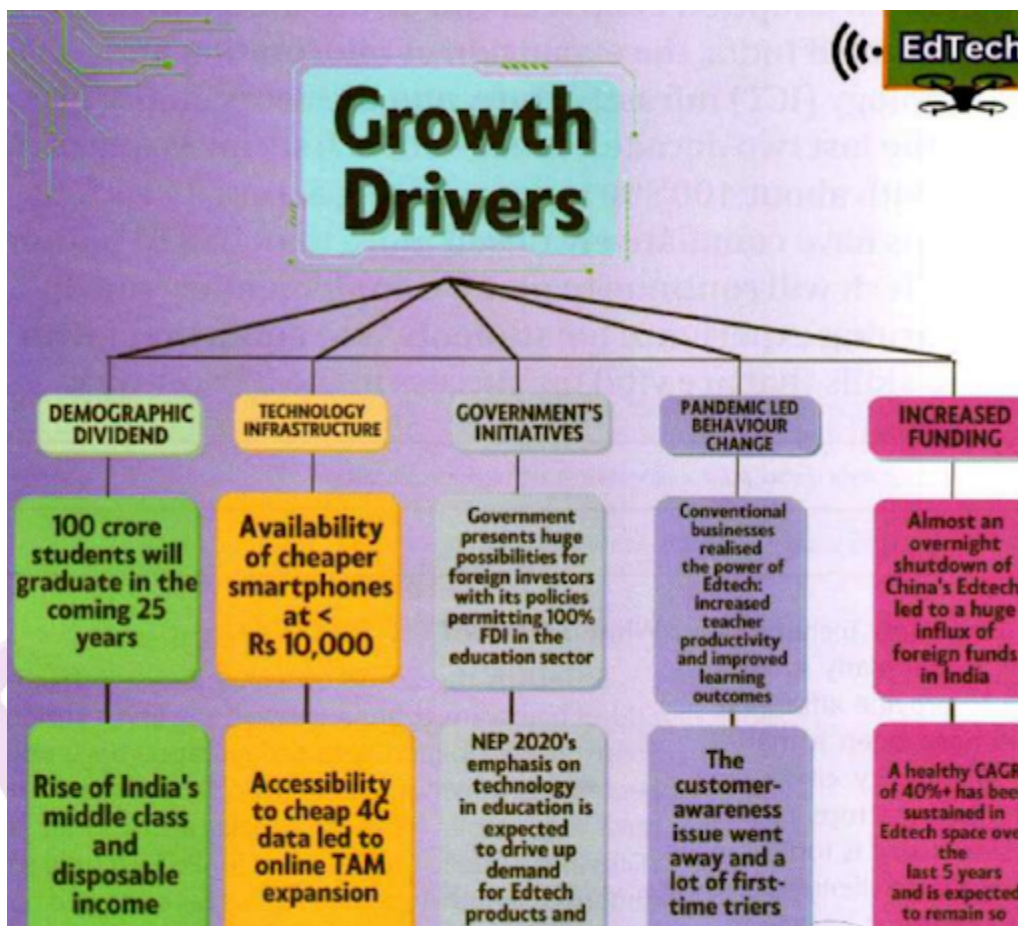


Image Source: Yojana

### Significance of Edtech to students and Teachers:

- Technology has made education inclusive and affordable for all strata of students and learners.
- Catalysed by India's digital revolution, EdTech has enabled accessibility by reaching the remotest parts of India.
- Three major benefits of EdTech for students include:

- **Learning while playing:** Gamified techniques used in EdTech, especially K-6, make concepts easier for students to understand and make learning a fun activity.
- **Classes anywhere and anytime:** EdTech makes learning inclusive by reaching the remotest parts of India, Students can access these classes at their convenience and pace. Working professionals can devote their free time to learning a new skill,
- **Access to quality teachers:** EdTech facilitates access to quality teachers in every town and village in India.
- EdTech not only benefits students but also teachers by providing engaging pedagogical practices to complement their teaching.
  - This can include interactive whiteboards, educational videos, VR/AR simulations, and other digital resources that can help engage students and enhance their learning experience.
- EdTech can also help in the process of academic administration through automated grading, classroom management tools, paperless classrooms, and eliminating guesswork.
- Classroom management tools help create a less chaotic, more collaborative environment. Paperless classrooms reduce printing budgets and promote greener policies.
- EdTech can assess student skills and needs in real time, leading to proactive plans to help struggling students, thereby eliminating guesswork.

### **Financial Potential:**

- EdTech in India can be classified into six categories based on the target user it serves.
- Most users fall within the student demographic, ranging from preschoolers to college graduates and professionals. However, teachers, schools, and universities also make up a significant user segment for EdTech B2B platforms.
- The Indian EdTech sector was valued at US\$750 million in 2020 and has grown to reach US\$ 5.8 billion by early 2023, at a CAGR of 43%.
- Furthermore, the market size is estimated to grow 3.7X over the next five years, from the current levels to \$10.4 billion. By 2027, the sector is expected to grow to US\$10.1 billion.
- This growth is driven by rising demand for non-academic courses from Tier II and III cities and the need for personalisation in the EdTech space.
- Out of the projected market value of US\$4 billion, US\$1.5 billion will focus on K-12, after-school foundational, and pre-preparation courses.
- The EdTech sector witnessed unprecedented growth and funding during the Covid-induced lockdown, when online education became a necessity instead of a luxury.
- The forecast for EdTech spending worldwide in 2019 was estimated to be US\$163 billion, growing at 13% CAGR. The number may seem large in isolation, but it was only about 3% of the total spent on education worldwide. This was forecasted to grow to US\$340 billion by 2025.
- India's EdTech sector is one of the largest in the world, with about 400 startups operating across its various sub-sectors. These startups have cumulatively raised more than US\$10 billion over the last decade. As of March 2023, 7 out of 30 global EdTech unicorns were from India.

### Challenges:

- **Psychological and Social Effects of Online Digital Education:** Online digital education can have psychological and social effects on students.
  - Lack of face-to-face interaction and socialisation opportunities can affect their mental health and social skills. It is important to consider these effects when designing online education programmes and to provide students with opportunities for social interaction and emotional support.
- **Perception of Parents:** Parents may have reservations about the effectiveness of EdTech and may prefer traditional classroom-based education for their wards. It is important to address the concerns of parents and provide them with information about the benefits and effectiveness of online education to increase acceptance.
- **Pupil-teacher Ratio:** It is important to maintain a low pupil-teacher ratio in online education programmes to ensure that students receive personalised attention, support, and mentorship from teachers.

### Road Ahead:

- To ensure the holistic impact of EdTech, it is important to strike a balance between technology and traditional education methods.
- The use of technology should not compromise the quality of education, but rather enhance it. Three critical success factors that can enhance this impact of EdTech include:
- **Integrate Practical Work:** EdTech programmes must integrate internships/ apprenticeships as part of the curriculum design.
  - This will help students develop group dynamics, team building, and interpersonal skills that are vital at the workplace.
  - This will also enable them to test the knowledge and technical skills gained online on the field and thereby enhance their confidence and self-esteem when they enter the workforce.
- **Create Multilingual Content:** According to the last Census, only 10% of the Indian population speaks English and 45% speaks Hindi. Hence, EdTech platforms need to focus on content creation in regional languages to ensure wider reach, usage, and relevance.
- **Focus on Holistic Education:** EdTech programmes must ensure that the core elements of holistic education that include environmental responsibility and sustainable development at the planet level, self-reliance at the national level, community wellbeing at the societal level, and cultivation of human values along with empathy at the individual level, are integrated into the curriculum and overall design of the programmes.



## Chapter 4: Leveraging technology for transforming healthcare

### Introduction:

- Digital health is a broad multidisciplinary framework which encompasses software, hardware, and services in an integrated platform.
- Digital health refers to the use of technology interventions for providing healthcare solutions and empowering healthcare seekers and providers (including individuals, the community or professional caregivers, doctors, the paramedical workforce, and the pharmaceutical and medical device industries), with a focus on better quality, higher efficiency, and easy access to healthcare services.
- Various terms being used are e-health, telehealth, telemedicine, tele-consultations, health apps, etc.
- Digitisation of data (including patient data), data stacks, e-registries, electronic medical records (EMR), health informatics and analytics platforms, self- health trackers, wearable health devices with sensors are all included in the large ambit of what comprises digital health.
- Newer realms of biotechnology, genomics, and AI-assisted healthcare are also being discussed in the same breath.
- Additionally, in recent times, the internet of Medical Things (IoMT) has combined medical devices and applications connecting to health IT systems that use diverse networking technologies.
  - The Internet of Things (IoT) uses range from telemedicine technology to improve communication between doctors and patients, to decreasing the potential for exposure to contagious diseases, along with various smart sensor technologies that can collect data at the user level.

### Growth of digital health interventions:

- The global market size of digital health was estimated at USD 332.53 billion in 2022, it is anticipated to peak around USD 1,694.21 billion by 2032.
- While the use of mobile-aided health interventions has been around for some time now, it is widely believed that the global pandemic gave a major push to the quick adoption of digital health innovations and mainstreamed them.
- At a time when healthcare received the highest priority and attention both from the healthcare seekers and providers, technology facilitated solutions to scale up services and also broadened them to cover a large number of beneficiaries who could access quality services often from the confines of their homes.
- The use of telemedicine platforms and remote monitoring solutions increased significantly, thereby enabling healthcare providers to remotely monitor patient health and provide care.

- It is noted that increasing smartphone penetration along with several applications related to health and fitness across the globe are expected to be key factors driving the digital health market's presence and growth.
- Furthermore, rapid investments in the healthcare IT infrastructure, particularly in developing and developed nations, is also estimated to be conducive to scaling up market growth.
- One of the major advantages of telemedicine is that it can save time and efforts especially for rural patients, who need not travel long distances for obtaining consultation and treatment.
- This is also accompanied by reduced financial costs associated with travel as travel for seeking healthcare by marginalised and disadvantaged communities is often accompanied by loss of work hours, loss of wages, and lower productivity.
- As per a recent impact study by an NGO, each tele-consultation at an Ayushman Bharat Health & Wellness centre saves an average of a journey of up to 21.58 km, and more than Rs 941 as Out-of-Pocket- Expenditure (OOPE) on healthcare.
- Women caregivers in families, especially expecting and feeding mothers, have been known to be burdened with travel related to health services.
- Digital health could contribute to achieving targets of the Sustainable Development Goals by 2030 by providing assured access to quality healthcare services to a wider cohort of population.
- Digital health solutions can help manage chronic diseases such as diabetes, cardiovascular diseases, and cancer more effectively by providing personalised care plans, monitoring patient health remotely, and improving patient engagement.
- Health apps have helped in monitoring of health parameters, thereby aiding in preventive and curative health. This would eventually help to reduce out-of-pocket expenditure for treatment and also reduce the burden on the country's health care infrastructure.
- Digital healthcare services have added to the level of standardisation and uniformity of care, by minimising ambiguity in protocols and reducing the gaps between expected and actual services provided.
- Digital health records and health stacks are gaining fast recognition and implementation as they are helpful in a useful repository of data.

### **Digital Health Solutions in India:**

- Digital health solutions are proving to be fundamental building blocks of a more sturdy and resilient healthcare infrastructure of the country.
- Increased use of digital tools is seen to result in the transformation of India's healthcare sector, adding to an enhanced citizen servicing, health seeker satisfaction, better levels of quality and efficiency, and higher transparency and accountability.
- Some of the key features of the digital interventions launched by the Government of India are inclusiveness, multilingual platforms, scalability, and interoperability. These have helped serve a population of over a billion people.
- The following are some of the initiatives that have seen a vast acceptance among people, accompanied by innumerable advantages.

- [Ayushman Bharat Digital Mission](#)
- **CoWIN:** Cowin stands for Covid Vaccine Intelligent Network. The platform was unveiled by the union government in January 2021 to launch a vaccine drive across the country.
- [Tele-MANAS](#)
- **Nikshay 2.0:** President Draupadi Murmu launched the 'Pradhan Mantri TB Mukh Bharat Abhiyan' and the Nikshay 2.0 portal to eliminate TB by 2025.
  - Nikshay 2.0 is a digital platform for community support for the persons diagnosed with tuberculosis.
  - The purpose of this portal is to provide technology backup for the Ni-kshay Scheme, which aims to mobilise communities, stakeholders, elected representatives, corporates, NGOs, and individuals to come forward as donors to help the patients through additional diagnostic, nutritional, and vocational support.
- **Health Technology Assessment (HTA):**
  - The Government of India has created an institutional arrangement called the Health Technology Assessment in India (HTAIn) under the Department of Health Research (DHR) to facilitate the process of transparent and evidence informed decision-making in the field of health.
  - It provides evaluation of the appropriateness and cost effectiveness of available and new health technologies in the country.  
HTA aims to inform the formulation of safe and cost-effective health policies that are patient focused and seek to ensure the most optimum value for money.

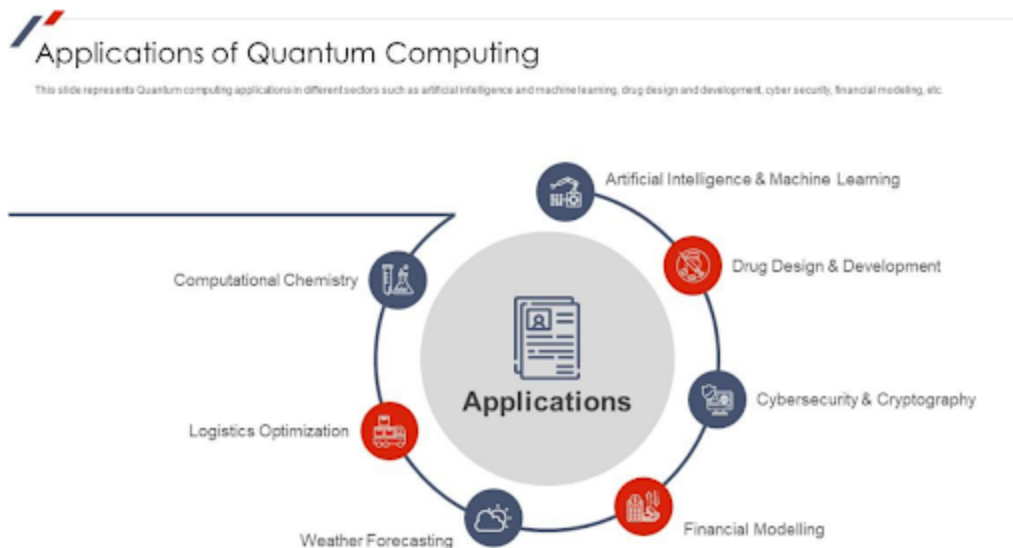
## Chapter 5: Quantum Computing-Transforming Technology

### Introduction:

- [Quantum computing](#) differs from traditional computing, which uses 'bits'—binary digits of 0s and 1s to represent information.
- However, quantum computing uses quantum bits or 'qubits' which can exist in multiple states simultaneously, instead of just two states (i.e., 0 and 1).
- This property of qubits, known as 'superposition' allows quantum computers to perform many computational calculations orders of magnitude faster than classical computing.
- Further, quantum computing also borrows inspiration from another property of quantum mechanics called entanglement, wherein two qubits could be connected in such a way that the state of one qubit intrinsically affects the state of the other qubit.
- Nations and industries are slowly and steadily gearing up to leverage the quantum computing wave through strategic collaborations and investments in research and innovation.

## Impact of Quantum Computing:

- Given India's growing capabilities in the space of information technology (IT) and IT-enabled services, the future of quantum computing is going to drastically revolutionise the skill needs and capabilities of the emerging skill force, which is gradually gearing up in the space of data science, artificial intelligence, machine learning, and decision sciences.
- ***Faster data analysis in industrial data science applications:*** Quantum computers can perform certain types of calculations significantly faster than classical computing logic. As these types of computations increase in scope and scale, this could enable faster data analysis for business problems in the era of big data, particularly for large datasets created with high velocity.
- ***Improved machine learning outcomes:*** Machine learning algorithms are increasingly being used for predictive capabilities and enhanced data-driven decision-making.
  - In the era of cognitive computing, these algorithms may focus on complex data types like images and videos for solving business and social problems through areas like computer vision.
- Quantum computers could potentially improve machine learning by enabling more efficient optimization of these algorithms so that computer vision capabilities become more efficient, accurate, and fast.
- Further, in applications of generative artificial intelligence, quantum computing could provide better recommendations since it is possible to create architectures that analyse real-time additions to the web of knowledge in the digital world to create advice.
  - The outcome of these capabilities would translate to the development of areas like driverless cars, automated management of smart city infrastructure, and digital public services.
- ***Improved optimization for complex problems:*** Many analytics problems involve finding the optimal solution to a complex problem. Quantum computers can potentially solve these problems much faster than classical computers, enabling more efficient optimization of complex systems.
- ***Improved industrialisation:*** Realisation of industrial maturity levels such as Industry 4.0 and beyond, through platforms like digital twins would be enabled through quantum computing. The Distributed computing networks, federated learning, 'Internet of Everything', blockchain, and related technologies can be envisioned to become more efficient in terms of achieving their desired objectives computationally as well as in terms of quality of outcome.
- ***Improved process efficiencies in digital transformation:*** Quantum computing may result in faster process automation by analysing real-time data generated in the organisation processes.



### Implications for practice and policy:

- Quantum computing is an advanced area where research and development are still at a nascent stage.
- However, this presents an opportunity for India to establish well-funded Research Centres of Excellence in the leading technological institutions.
- Long Term schemes of the Department of Science and Technology could possibly be introduced whereby strategic infrastructure and manpower training projects can be funded in the established technology engineering institutions.
- This would need to cover both hardware and software to further develop a homegrown quantum technology industry.

## Chapter 6: AI Chatbots-Future and Challenges

### Introduction:

- Chatbots are computer programs that use artificial intelligence (AI) to simulate human-like conversation with users via text or voice. They can be used in a wide variety of applications, such as customer support, sales, and personal assistants.
- Chatbots use natural language processing (NLP) to understand and interpret user input and generate appropriate responses.
- They can be designed to operate autonomously or in conjunction with human operators, depending on the specific use case and level of complexity required.
- They have progressed into more sophisticated, context-aware, and self-learning programmes that rely on machine learning and deep learning to create a detailed knowledge base of questions and responses.



- Consequently, they are enhancing their ability to predict user requirements and provide accurate responses over time.

### **Future of work:**

- The way we work and create content is being revolutionised by chatbots.
- Chatbots are capable of handling repetitive and mundane tasks such as customer support, appointment scheduling, and data entry. This can help businesses save time and improve efficiency by freeing up human workers to focus on more complex tasks.
- Recently, a tech giant has announced the integration of a powerful generative AI technology to its various applications. This chatbot can automate a range of tasks across multiple Apps.
- Chatbots can work around the clock, providing support to customers and employees at any time. This can help businesses stay competitive by offering faster response times and better customer service.
- One area that is facing huge change thanks to generative AI is Internet search. Internet search has been revolutionised by the emergence of generative AI, which refers to a type of AI that can generate new data or content, such as text, images, or even videos. This technology is transforming how we search for information online and is set to have a huge impact on the future of search engines.

### **Use cases of Chatbots:**

- AI chatbots can transform the healthcare sector by offering numerous services to both healthcare providers and patients. They can function as virtual aides, offering assistance to patients with their healthcare inquiries. Their 24x7 availability makes basic healthcare accessible to people at all times and all places, and reduces the workload faced by the healthcare system.
- Chatbots can be used to provide healthcare assistance, such as diagnosing symptoms and recommending treatments. For example, the chatbot on the Ada website can ask users a series of questions about their symptoms and provide a potential diagnosis and treatment plan.
- Chatbots can act as personal assistants, helping users manage their schedules, set reminders, and even order food. For example, the chatbot on Domino's website can help users place orders and track their delivery status.
- Chatbots can help automate HR processes, such as onboarding new employees and answering HR-related questions. For example, the chatbot on the Unilever website can provide information about benefits, payroll, and even help employees find nearby daycare facilities.
- E-commerce companies are using AI chatbots to help their customers locate products that match their needs by asking questions about preferences and showing relevant products. They can also help them navigate through processes such as placing orders and making payments.
  - In the post-sales scenario, they can manage automated tasks such as collecting customer feedback and processing product returns, replacements, or refunds. All of this can lead to an improved customer experience and increased sales for the companies.

- Education is a key area where AI chatbots are becoming increasingly relevant. Generative AI can help in the digital transformation of our education system and make it more efficient and accessible. It can help with content creation, the translation of educational material into multiple languages, and even play the role of a tutor or instructor where there is a lack of teaching resources.

**Challenges:**

- The biggest concern about AI chatbots is that their increasing use can result in a considerable number of people losing their jobs since AI is gaining capabilities to match human output and intelligence.
- Chatbots must be able to interpret and understand the nuances of human language, including slang, regional dialects, and context. This is an ongoing challenge, as human language is constantly evolving and changing.
- Chatbots can inherit the biases and discriminatory practices of their developers and data sources. For example, a chatbot trained on biased data may generate discriminatory responses to certain users. Developers must take steps to mitigate bias and ensure that their chatbots are fair and inclusive.
- Chatbots must be transparent and trustworthy, especially when dealing with sensitive or personal information. Users need to know that their data is being handled responsibly and that chatbots are not misusing their information.
- Chatbots can be vulnerable to security threats, such as hacking or phishing attacks.
- Chatbots must be integrated with existing systems, such as customer relationship management (CRM) software, to provide a seamless user experience. However, this can be challenging when dealing with legacy systems that may not be compatible with modern chatbot technology. Developers must find ways to integrate chatbots with legacy systems without disrupting existing workflows.

## Chapter 7: 5G Cyber Security Challenges

**Introduction:**

- 5G is the [5th generation mobile network](#). It is a new global wireless standard after 1G, 2G, 3G, and 4G networks.
- It enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices.
- Internet speeds in the high-band spectrum of 5G has been tested to be as high as 20 Gbps (gigabits per second), while, in most cases, the maximum internet data speed in 4G has been recorded at 1 Gbps.

**Geopolitics of 5G:**

- Given its potential to influence our digital future and bring economic transformation, the major world telecom leaders have taken the lead in developing 5G technology.
- However, the real thrust has come from the Chinese telecom companies, which have been aggressively penetrating new markets by commercialising the technology and offering it at cheaper rates than their competitors.
- This has sparked concerns that China may be strategically pushing these companies to capture global markets and, therefore, may establish a vast eavesdropping network.
- There are apprehensions that China might weaponise 5G technology by coercing the Chinese telecom companies to share their consumer data with the government or even force them to shut down 5G networks in times of geopolitical crisis.
  - Various instances and allegations of Chinese telecom companies engaging in cyber espionage in many countries have only reinforced these concerns.
- Consequently, in the last few years, the United States has spearheaded a campaign to counter the Chinese telecom companies' dominance in the 5G market.
- The US government has designated Huawei and ZTE as national security threats, banned American companies from using government subsidies to buy their equipment, and barred sales of semiconductor chips without a specific licence.
- These developments have shaped not only the trade dynamics between China and the United States but also the broader tech competition between democratic states and authoritarian regimes.
- As a result, there have been efforts to bring together like-minded and leading democratic states to jointly tackle the tech challenge posed by authoritarian regimes such as China and Russia.
  - For instance, former UK Prime Minister Boris Johnson floated the idea of D-10, a coalition of ten democracies, to create an alternative supply chain for 5G and other emerging technologies.
  - The Quadrilateral Security Dialogue, or the Quad (which brings together India, Japan, Australia, and the United States) too has pledged to advance interoperability and security and work on 5G supplier diversification and Open RAN, which uses software to replicate signal-processing functions.

**Cyber threat landscape:**

- 5G's cyber threat landscape extends beyond the risks of Chinese telecom companies dominance and hardware.
- The fundamental drivers (geopolitical rivalries, commercial motives, and data harvesting) behind the recently increased cyberattacks and data breaches from adversarial states and other threat actors remain intact. Therefore, they will pose threats to even 5G networks.
- Considering the potential role that 5G will play in national development and economic growth, it can undoubtedly be regarded as a critical infrastructure. Hence, 5G communication networks will represent a valuable target for cyberattacks, including sabotage.

- In addition, as mentioned earlier, the 5G network will bring about a wider proliferation of IOT-enabled devices.
- According to one estimate, by 2025, there will be approximately 27 billion connected IOT devices.
  - This magnifies the threat canvas, as these devices will offer new malware and botnet distribution vectors. These will bring increased avenues for attacks such as Distributed Denial-of-Service attacks or Man-in-the-Middle attacks.
- 5G also inherits the vulnerability from previous generation protocols, i.e., threat actors can get hold of the International Mobile Subscriber Identity (IMSI) - the number used to identify and authenticate subscribers on the mobile network. By seizing the IMSI, threat actors can intercept mobile traffic in a defined area to monitor an individual user's activity, including tracking location and intercepting calls.

### Way Forward:

- 5G offers new opportunities for digitalisation and development, but the technology and network are not secure by design. Therefore, countries, like India, adopting 5G must have a cyber resilience plan in place.
- Much depends on the cyber and information-security policies of the ecosystem's various elements. Organisations connecting to the 5G network must be cognisant of the evolving threat landscape, adopt security protocols accordingly, determine their threat posture, and secure their digital infrastructure. This will need constant updating and upgrading since threat actors continue exploiting emerging vulnerabilities.
- A critical element of this resilience will also be the awareness of end-users. Their cyber hygiene - their understanding of safe practices in cyberspace - can help them better tackle the threats and protect themselves.

## Chapter 8: Digital Publishing- Expanding the horizon

### Introduction:

- The publishing industry in India is the cornerstone of Indian culture, values, and transcendence.
- India's publishing industry contributes to India's economic growth by promoting learning and education and creates crores of employment.
- It reached the US \$ 33.2 billion mark in 2022. According to a report, the market will reach US \$ 41.6 billion by 2028 and is expected to show an annual compound growth rate of 3.4% from 2023-2028.
- An increase in the overall education expenditure in National Education Policy 2020 has also helped in the growth of the Indian publishing industry.

### **Growth of Digital Publishing:**

- With the advent of technology, there has been a significant transformation in the publishing industry.
- Traditional print media has given way to digital publishing, making it easier for publishers to reach a wider audience. Digital publishing is still in its nascent stages in India.
- It accounts for about 8-10% of the country's publishing sector. However, the digital publishing sector in India has witnessed significant growth in recent years. According to a report, digital and regional content will drive the growth of Indian media.
- The digital sector is expected to grow at a rate of 29.1% between FY 2019 and FY 2024.
- Driven by the strength of regional content, it would reach INR 621 billion by 2024. This development will certainly impact digital publishing.
- With the substantial growth of smartphones, tablets, and e-readers, access to information has become more accessible than ever.
- Unlike traditional publishing, digital publishing does not require printing, shipping, or storage expenditures. Publishers can save on production and distribution costs, which can be passed on to consumers through lower prices.
- E-books have played a significant role in the growth of digital publishing in India. According to a Nielsen report, e-books accounted for 20% of book sales in India in 2018. E-books offer several advantages over traditional books, including cost and convenience.

### **Challenges:**

- Digital publishing presents the opportunities as well as challenges. One of the main challenges is piracy.
- With digital content being easily accessible, it becomes easier for people to illegally download and distribute copyrighted material. Therefore, the publishers must take additional measures to protect their content from unauthorised distribution.
- Another challenge of digital publishing is constant updates and maintenance. Digital content should be updated regularly to ensure it remains relevant and up-to-date. It requires a significant investment in time and resources.
- With so much content available online, publishers need to make sure their content is engaging and eye-catching. This means creating high-quality content that is distinct and informative.

**Conclusion:** Digital publishing has revolutionised how content is created, distributed, and consumed in India. It has opened up new opportunities for publishers, authors, and readers alike. However, some challenges still need to be addressed before it becomes a mainstream publishing mode in India. With the right infrastructure and awareness campaigns, digital publishing can become a game-changer for the Indian publishing industry.



## Chapter 9: Use of Technology in Urban Planning

### Introduction:

- Urban planning is the process of both developing and designing open land, urban areas, and the built environment.
- Urban Planning dates back its history since the town and cities have existed. Early city planning revolved around some essential and significant elements like building structures and bastions with fortification, and has experienced a huge change throughout the centuries.
- Urban planning is a many-sided process involving infrastructure like physical and social, utility systems, communication networks, distribution chains, and more. Urban planners, also known as city planners, design cities and create plans for future improvements and growth.
- In the modern era, the rapid boom of Information Technology and Artificial Intelligence has more significant potential to incorporate diverse issues of city planning into a general platform, as well as leading to a better way to deal with the challenges of complexity.
- The use of Information Technology has helped urban planners in many aspects, especially with softwares based on GIS (Geographic Information System).

### Contemporary technologies to aid urban planning:

- There are various urban planning apps that can be used by urban planners, and that use contemporary technologies as well as open data to build up comprehensive and lively spaces for inhabitants and commercial businesses.
- There are various planning tools which help in the urban design process and assist to generate areas that the population of a city needs.
- GIS in urban planning is becoming gradually more helpful over time. With open source data, many open source Various GIS softwares have come up as a free and open-source cross-platform.
- With the help of GIS improved mapping along with locational attributes, this has been possible, which was missing in the earlier drawing and mapping software.
  - GIS is being used in all the Government offices for record keeping, such as property mapping, utility services like water supply and sewerage networks for seeing the coverage of water supply and sanitation system; it is also used in Municipal Solid Waste Management to identify the zones in order to manage the MSW Management system.
  - GIS is also used in network analysis by transport planners in order to analyse the road network, to identify the conflict points at various junctions, to identify the various road hierarchies, etc.
- Urban planners can establish a database to get information about specific metropolitan regions using cloud technologies.
- Cloud computing technologies can also aid in the planning of bigger infrastructure projects.

- Urban planners may use the internet to create cities that are accommodating to distant workers. As a result, urban designs have better transportation alternatives and reduced traffic congestion.

### **Internet of Things and Urban Planning:**

- Several fundamental IoT tools such as intelligent street lights that automatically turn off to conserve energy are already in use in India.
- Urban planners can create ideas that improve the infrastructure of cities by employing technology to establish self-management strategies to create smarter cities and put more emphasis on growing communities and neighbourhoods.
- Cities achieve more financial stability, independence, and provision of green space this way. These instances demonstrate how technology may be utilised to develop smarter city plans and foster more community participation.
- Technology will also enable urban planners to concentrate more on creating communities, leading to a higher level of municipal self-sufficiency.
- Citizens may participate more actively in the creation of sustainable and environmentally friendly cities in this way.