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Gist of YOJANA

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1

The Vice President on Science Education and Innovation

- The Vice President of India called for inculcating **scientific temper and nurturing the spirit of inquisitiveness** among the children from a young age.
 - He was addressing the 27th edition of the National Children's Science Congress (30 December, 2019) in Thiruvananthapuram. It is a flagship programme of **National Council for Science and Technology Communication, Department of Science and Technology, Government of India.**
 - He further stated that science education would **motivate children to seek truth without any bias and prejudice.**
 - It would also make children to rely on analysis, questioning and reasoning without any bias and prejudice.
 - **National Children's Science Congress:** It is the flagship programme of **National Council for Science and Technology Communication (NCSTC), Department of Science.**
- Theme:**
- **"Science Technology and Innovation for a Clean, Green and Healthy Nation"**
- Important points made by the Vice-President**
- Vice-President highlighted the contributions made by different scientists who evolved the tradition of science and technology in India including the works of former president of India, Dr. APJ Abdul Kalam such as **"Ignited Minds"**.
 - He said that India had been a lighthouse of knowledge for centuries. Our Ayurveda system of medicine can be traced back to 5000 BC.
 - Indus Valley Civilization had irrigation and sewerage systems as far back as 2500 BC. By 200 BC, South India was making high quality wrought iron and, the invention of zero and **contribution to astronomy was well known.**
 - **Aryabhatta's 'Aryabhattiyam'** is considered a seminal work, equally pioneering work is **Panchasidhhantika of Varahamihir.**
 - **Charaka and Sushruta are known as Fathers of Surgery. Rishi Kanad first spoke of "anu" (atom)** as an indestructible particle of matter in KanadaSutra while Patanjali is considered as Father of Yoga.
 - In early 20th century, Prof. Satyendranath Bose's 'Boson', Prof. Subramanian Chandrasekhar's 'Chandrasekhar limit', Sir C. V. Raman's 'Raman Effect', and Prof. Jagadish Chandra Bose's 'wireless communication' have earned global recognition.
 - He stressed on need to inculcate the spirit of science and promote scientific temper among the young minds of the country,
 - He proclaimed that in the global innovation landscape, India continued to be the most innovative economy in central and southern Asia.
 - India can make true impact on global innovation for years to come with the intellectual contribution of young generation.

2

Artificial Intelligence

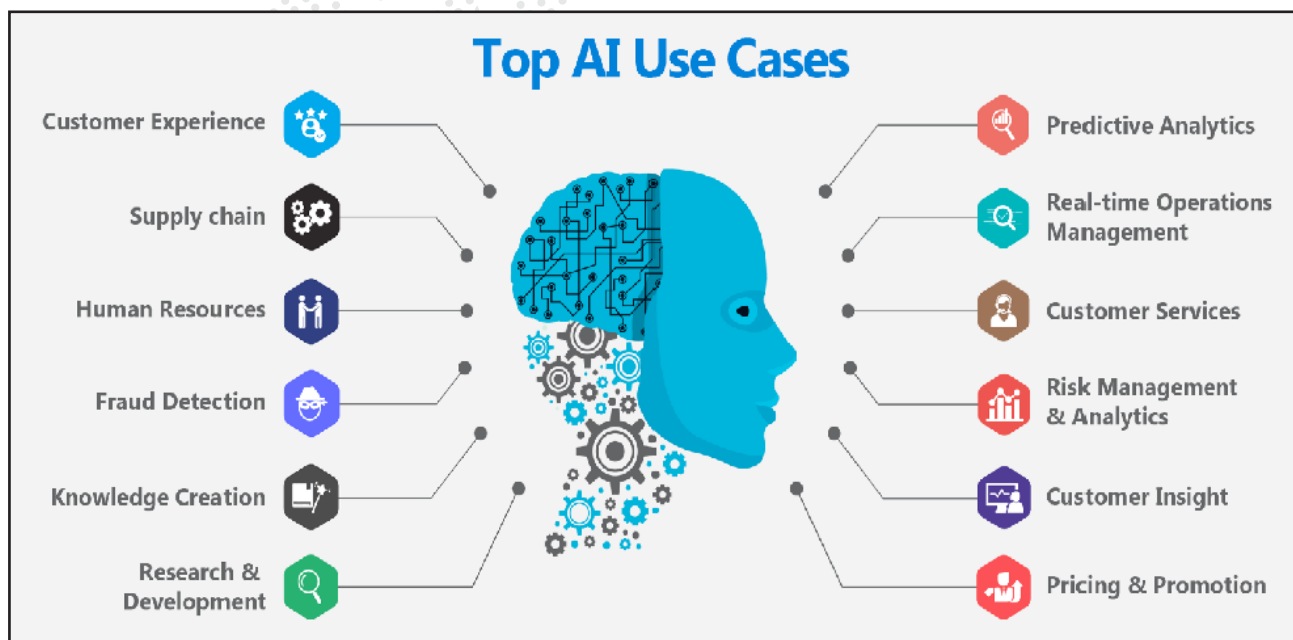
Challenges & Opportunities for India

- AI can be described as a system’s ability to learn and interpret external data via software/algorithms or machines/devices for problem solving by performing specific roles and tasks currently executed by humans.
- The term AI has been used interchangeably with other closely related terms such as *expert systems, decision support systems, knowledge based systems, machine learning, natural language processing, neural networks, pattern recognition, recommender systems and text mining..*
- Due to recent development in technology signified mainly by development of supercomputers, improved storage capability and super-fast speed

of data storage machines and robotics has enabled AI to gain significant momentum in terms of development, application and use within public and private sector organization.

Dimension of AI and its application in various fields

- The AI has the ability to overcome some of the computationally intensive, intellectual and perhaps creative limitations of humans. Therefore, it opens up new application domains within manufacturing, law, medicine, healthcare, education, government,



agriculture, marketing, sales, finance, operations and supply chain management, public service delivery and cyber security.

- Within the education sector, AI can be deployed to improve teacher effectiveness and student engagement by offering capabilities such as **intelligent game-based learning environments, tutoring systems and intelligent narrative technologies**.
- AI can impact education in three ways: **AI enabled hyper-personalization** helps in developing student-specific learning profile and in developing customized learning environments based on ability, preferred mode of learning and experience.
- The use of **smart assistants** (Amazon Alexa, Google Home etc.) and associated technologies offer significant potential to help students.
- AI systems can assist educators with secondary tasks such as grading activities, providing personalized response to students etc.

AI and Sustainable Development Goals (SDGs)

- It can be used within several other sectors for enhancing both efficiency and effectiveness. It can be used to achieve multi-dimensional Sustainable Development Goals by its utilization in an effective manner.
- It can be used in achieving good health and wellbeing (SDG 3) in rural and remote areas in developing countries where access to medical care is limited.
- In this case, AI can be utilized for conducting remote diagnosis supporting doctors to help improve health service delivery.
- AI-based systems can also help achieve the **“Zero Poverty and Zero Hunger” (SDG 2)** by assisting in resource allocation for adverse environmental conditions, diagnose crop disease and identify pests in timely manner to mitigate the risk of catastrophic agricultural events.
- Similarly, AI-Based system can be used to predict energy utility and demand to help achieving sustainable development goals such as **“Clean Water and Sanitation”(SDG 6)** and **“Affordable Clean Energy” (SDG 7)**.

Application of AI in various sectors of India

◦ Health

- ▶ India has **0.8 per thousand doctor-to-patient ratio** (UK – 2.8, Australia – 5, China – Approx. 4). **In India, doctors spend just 2 minutes per patient**, whereas in the US it is close to 20 minutes.
- ▶ AI could be a valuable assistive tool for doctors in helping reduce their workload and assisting in diagnosis.

◦ Agriculture

- ▶ **The per hectare cereal productivity in India is almost half that of China and UK (3000 kg/ha vs. over 6000 kg/ha)**. There is significant loss of productivity due to pests and diseases.
- ▶ AI-based agricultural pest and disease identification system are helping farmers in identifying the disease and advising the remedial measures.

◦ Education

- ▶ India has about 50% less teachers per thousand students when compared with developed countries (**India 2.4/thousand** vs. UK 6.3/thousand). In this scenario, AI can help in providing education in remote areas.

India’s Potential to implement Artificial Intelligence in Various fields:

- ▶ India has **1.18 billion mobile phone users with 600 million internet users** and 374 million smartphone users.
- ▶ It has one of the **cheapest data rates in the world (\$0.24/GB) and an average data speed of 6 MBPS**. These factors open up huge potential for adoption of AI technology in India.

Successful implementation of AI in India till date

- The Tamil Nadu Govt. is implementing an **innovative use of AI through face recognition for recording attendance**. The system is saving more than 45 minutes per day and is freeing up extra time for core educational activities in schools.

- The Tamil Nadu e-Governance Agency has partnered with Anna University to launch a **Tamil smart assistant called "Anil"**. The NLP-based smart assistant provides a step-by-step guide to people in helping them apply online for scores of critical government services.
- The agency has recently launched an **AI-based agricultural pest and disease identification system** and made it available to over half a million farmer families through a mobile app.
- The Tamil Nadu Govt. is implementing an **innovative use of AI through face recognition for recording attendance**. The system is saving more than 45 minutes per day and is freeing up extra time for core educational activities in schools.
- AI solutions such as radiographic diagnostics like "detection of internal bleeding in brain from CT scans" are being tried to assist doctors and increase their reach to serve remote areas of India.

Challenges and Shortcomings posed by AI in implementation

- **Lack of explainability** – Generally AI operates effectively as a black-box-based system that does not transparently provide the reasoning behind a particular decision, classification or forecast made by the systems. It causes lack of trust, transparency and confidence of using decisions made.
- **Lack of contextual awareness and inability to learn** – AI based systems are good in performing with given parameters and rules but have major limitations in terms of making decisions where context plays a critical role. Unlike human, AI system cannot learn from their environment.
- **Lack of Standardization** – AI based systems are increasingly being embedded in variety of products and services. This poses a critical question: how can the inferences delivered by different AI components be integrated coherently when they may be based on different data and subject to different ecosystem conventions? Organisations face challenges on how to ensure AI and human work together successfully.
- **Job Losses** – Increasing automation will lead to significant job losses particularly at operational and lower skill levels for repetitive tasks. This emphasizes the need for strategic management of AI transition requiring organisations to carefully consider a number of challenges: how to select tasks for automation; how to select the level of automation for each task; how to manage the impact of AI-enabled automation on human performance and how to manage AI-enabled automation errors.

- **Lack of competency and need for re-skilling and up-skilling workers** : Lack of trusts and resistance to change – Due to above mentioned issues and negative media coverage on the consequences of AI, people are generally apprehensive about its implementation.
- **Lack of trust and resistance to change:** Due to above challenges and issues posed by artificial intelligence, people are generally apprehensive about its implementation. This poses major challenges on how to establish trust among workers and stakeholders in the management of resistance to change in adopting AI systems.

Ethics

- Ethics for machines has been an area of immense interest for the researchers. However defining has proven to be problematic and difficult to make it computable.
- To tackle this we need to deal with ethics purely from AI perspective. There are two dimensions of Ethics in AI: I) Privacy and Data protection and II) Human and environmental values
- **Privacy and Data protection**
 - ▶ Privacy is possibly the topmost concern while using AI systems. User's sensitive and highly granular data is likely to be stored and shared across the AI network (For example a person's location for the day based on face recognition and CCTV feeds food habits shopping preferences movies music etc.)
- **Human and Environmental Values**
 - ▶ Any AI system has to conform to human value system and policymakers need to ask: Has the AI system been sensitized to human values such as respect, dignity, kindness, compassion, equity or not? Does the system know that it has preferential duty towards children, elderly, pregnant women, sick and the vulnerable? An important aspect which needs to be built in a AI system is the overall cost of decisions on the society.

Transparency and Audit

- In the future, many of the AI based system could be interacting with human in fields such as Finance, education Healthcare, transportation and elderly Care. The **technology providers must explain the decision making process to the user so that AI system doesn't remain the black box.**

- These AI systems must provide an audit trail of decisions made not only to meet the legal needs but also for us to learn and make improvements over the past decisions.

Digital divide and Data deficit

- Since the entire AI revolution has a data at its foundation. There is a real danger of societies being left behind.
- Countries and governments having good quantity of granular data are likely to derive maximum benefit out of their disruption.
- Countries where the data is of poor quality or poor of granularity would be left behind in harnessing the power of AI to improve lives of citizens adversely affecting low-resource communities.

Fairness and Equity

- AI can disrupt social order and hierarchy creating a new social paradigm which could damage the social fabric exposing people lower in bargaining by hierarchy with a real of exploitation and unfair treatment.
- This could lead to commoditization of human labour and chip away human dignity.
- An AI system designed with equity as a priority would ensure that no one gets left with behind in this world.
- Another key need to autonomous system is fairness. They must not exhibit any gender or racial bias and they must be designed so to stay away from social profiling.

Accountability and legal issues

- Without AI, any system designed by human is only a machine under the control of the operator. Therefore accountability has not been an issue. Almost all civil and criminal liability laws of the world fairly unanimously attribute accountability to the operator, owner and manufacturer of the machine in varying degree, depending upon the facts of the case.
- However once machines are equipped with AI and take anonymous decision, the question of accountability becomes very hard to answer more so when the algorithms are known to the designer.

Misuse protection

- Internet has been proliferated across the globe benefiting billions, but also carried along with it a beam of cybercrime, viruses, malware and violent game online games which result in loss of innocent lives of teens around the world.
- Autonomous AI system must be designed for misuse protection.

Conclusion:

AI as a technology holds tremendous potential for a country like India, which is data rich and has the requisite technological capability to create solutions for many of the problems. States like Tamil Nadu have already started deploying AI systems at large scale for addressing some of the key challenges in health, education and agriculture sectors. Public rollout of AI system need to address issues of ethics, transparency, audit, fairness, equity and accountability and misuse prevention and effective public policy framework for AI.

3

Innovation in Higher Educational Institutions

- There has been a change in attitude of researchers over the years who used to pursue research in western countries.
- Earlier students produced by premier institutes made a bee-line to destinations in the west in order to broaden their horizon.
- This change has been due to creation of innovative culture in India due to introduction of various missions such as **"Atal Innovation Mission"** and establishment of **"Atal Tinkering labs"** in different parts of country.
- Initiatives from institutes such as "Centre for Innovation" by IIT Madras have created an innovation culture in India.
- The center for Innovation was set up to provide an outlet for students to try out their passion without the burden of grades or exams.
- It has started modestly with a seed Grant from the 1981 aluminum batch, which was used for setting up a student-run tinkering wrap and a maker space which now serves to empower students who have the passion and motivation to try out an idea and bring life to it. The center was set up with motto "Walk in with an idea and walk out with a product".
- The ideas and projects range across all domains of science and engineering and span various stages of development from breadboard proof of concepts to full-fledged finished products.
- Recently the CFI team **"Avishkar"** became the only Asian team to qualify and was placed within at the top 25 in the **hyper loop competition held at SpaceX**.
- Further the development emphasizes on a frugal engineering mindsets where performance is fully made despite cost.
- There are many student Formula racing car teams in the country such as **IITM Raftar**, that routinely participate and win in competitions across the world.
- These student teams are pushing the boundaries and testing their mettle in emerging technologies such as autonomous vehicles, drones for services robotics, computer vision, data analytics, genetics etc.
- Further **the centre such as CFI also promote student interest clubs, which also enable contextual use of technology by exploring social needs** in our country.
- Some of themes that are explored include disaster recovery, smart agriculture, rehabilitation, education for underprivileged etc while students explore various topics across domains, the higher educational Institute serves as the launch pad for these students to dream big and gives them confidence so that they can achieve what they set out to do.

Innovation as Catalyst

- These innovation centres also foster team spirit and the ability to work beyond the classroom lectures. It prepares the students to take collective ownership of outcomes and work on the multi-generational products.
- While individual merit brought them to these institute, working on innovation and bringing

complete product to life prepares these students for the real world.

- Innovation comes to life when the inventions are developed further in the recent context of the societal needs and wants.
- Higher educational institutes such as **IITs and IISc are all gradually transforming themselves into research and development powerhouses catering to the needs of the country.**
- The Quantum of a students pursuing post Bachelorette degrees are now more than those in entering at the undergraduate level.
- Many centres of excellence in various domains of national importance has been set up at these institutes.
- **Robert Bosch centre for data Sciences and artificial intelligence** is a fine example of these types of institute.

“Innovation Ecosystem”

- The innovation ecosystem can be divided in to four buckets: 1. Ideate 2. Pre-incubate 3. Incubate and 4.Support
- Among these, the incubation and support ecosystem are highly instrumental.
- **Society for Innovation and Entrepreneurship (SINE) in IIT Bombay** is one of the earliest incubators in an academic setting in India supporting tech start ups and socially relevant projects.
- IIT Madras established India’s first university based research park, collocating established companies with start-ups.

Loopholes in “Innovation Ecosystem” of India

- The challenge for our higher educational institutions is to **enable routine transformation** of these **intellectually stimulated individuals** to deep tech entrepreneurs and innovators solving societal problems of today and tomorrow.
- It is often very hard to take a step back from a **narrowly defined academic problem definition to identify broad opportunities** where the research or technology developed might meet a market need.

Usefulness of incubators

- Incubators offer **mentoring, networking, and funding support for early stage start-ups along with business acceleration support.**
- Ideation and technology development is taken care of by the research and tinkering lab.
- In the United States, **the National Science Foundation (NSF)** had pioneered the concept of lab to market through the Innovation Corps (I-Corps) program.
- **I-Corps accelerates the economics and societal benefits of NSF** funded basic research programs by training scientists and engineers to extend their focus beyond the university laboratory and look at commercialization.

Conclusion:

Our institutions will have to imbibe the spirit of entrepreneurial thinking, which includes rapid adaptation to the societal needs, developing and scaling in resource constrained environments and serving as focal points or nodes of innovation and entrepreneurship, to reach our national goal of a \$5 trillion economy.

4

Education & Technology for Blind

A Chronology of Educational Services for Blind in India

- 1887 – A facility for the blind was launched in Amritsar
- 1944 – **Lt. Col. Sir Clutha Mackenzie** played a major role in writing the GoI report on blindness.
- 1947 – A unit for visually impaired was established in the Ministry of Education
- 1951 – India adopted the **uniform Braille codes** for various Indian languages
- 1952 – First ever Braille printing plant of India was established in Dehradun
- 1954 – Braille appliances manufacturing unit was set up
- 1959 – Govt. set up its first school for blind children in Dehradun

- Despite remarkable contributions made by different visually impaired persons such as **Soordas, Gattu Maharaj, Swami Brijanand, Swami Gangeshwarnanda e.t.c** historically, India was not particular about their issues until a few decades ago.
- Blind people in India were provided education from the 19th century.
- **Miss Annie Sharp**, an Anglician was instrumental in launching a facility in Amritsar for the blind in the year 1887. It imparted basic training in bead work, reed work and reading of religious scriptures.
- Similarly, Miss Jane Askwith was an educationist herself who desired to impart good education and training to visually impaired.
- **Miss Millard** also contributed by imparting education to the poor blind people and caring them during drought in Bombay presidency in 1900.

Problems which pre-existed during independence in schools for blind people

- Educational institutions were limited to primary level only.
- There was a lack of all India Braille code.
- Absence of Braille printing unit in the country.
- Lack of production facility even for simple equipment needed by the blind.

Initiatives taken for blind people in post-independence India

- A unit of education and rehabilitation for blind people was created in 1947 in Ministry of Education.

- India requested UNESCO for initiating actions for making a uniform Braille code across the world.
- **Central Braille Press** was established at Dehradun in 1952 and financial assistance was provided to four other regional Braille press by the government of India.
- **Manufacturing facility for Braille appliances** was setup in 1954 to provide simple equipments such as Braille slate and stylus, arithmetic boards add required types and some recreational items, needle threader e.t.c.
- With the availability of uniform Braille code, Braille press and simple equipment though in a limited measures, the number of schools for blind registered a rapid growth around the same time.
- Government setup is first school called **Model School for Blind in 1959 at Dehradun**.
- These types of institutions all over India went up from 115 in 1964 to 250 by 1995.
- Teachers for these special schools were also trained in large numbers.
- India launched **Integrated Education for Disabled Children (IEDC) scheme** to be implemented through government schools. It provided financial assistance for special teachers and equipments to these children.

Other initiatives taken by India in this fields

- India enacted the **Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995** to give effect to the decisions taken in the Beijing meeting in 1992.
- The act provided for education in special as well as normal school and informal settings, research and resources required for the disabled among other facilities.
- Recognizing the prevailing environment, this law allowed free and **universal education for the disabled up to the age of 18 years**.
- Other components such as **Sarva Siksha Abhiyan** and **Rashtriya Madhyamik Siksha Abhiyan** also have components for visually impaired and differently able people.

Conclusion:

Apart from different domestic obligations, India aims to fulfill different international commitments such as meeting stipulations of UN Convention on Rights of Persons with Disabilities (UNVRPD). To attain these goals and meet these targets government enacted Rights of Persons with Disabilities Act, 2016. The types of disabilities have been increased from existing 7 to 21 and the Central Government will have the power to add more types of disabilities. It has included persons with 'Low Vision', a new category of blind people.

5

Quality Education for Weaker Section and Disadvantaged Groups

- **The Right of Children to Free and Compulsory Education (RTE) Act, 2009**, entitles every child of age 6 to 14 years to a right to free and compulsory education in a neighbourhood school till completion of elementary education.
- **Section 12(1)(c) of RTE Act** provides that all specified category schools and unaided schools shall admit **at least 25% children belonging to weaker section**.
- **Samagra Siksha, an overarching programme for school education sector** extending from preschool to class XII, aims to ensure inclusive and equitable quality education at all levels.
- It envisages the 'school' as a continuum from pre-school, primary, upper primary, secondary to senior secondary levels.
- The '**Padhe Bharat Badhe Bharat**' is a sub-programme of erstwhile **Sarva Siksha Abhiyan (SSA)** which is continued under the new integrated scheme Samagra Siksha to ensure quality at the foundational years of schooling.
- It promotes early writing and reading comprehension skills in children along with basic numeracy skills.
- These include adoption of NCERT model of early reading material and development of state specific models for early Maths and early reading.
- The objectives of the programme are to promote early reading and writing with comprehension skills in children, and also basic numeracy skills.
- **The Navodaya Vidyalaya Scheme** provides for opening of one JNV in each district of the country to bring out the best rural talent.
- Its significance lies in the selection of talented rural children as the target group and aim to provide them quality education comparable to the best in a residential school system.
- **The Draft National Education Policy 2019** is presently under consideration. The revision of curriculum, syllabi and textbooks for school education would depend on the finalization and approval of the New Education Policy.

6

Key Initiatives in Education

- In pursuance of the Government's vision for '**Transforming India**', MHRD took a leap forward in transforming the education sector.
- Department of Higher Education of the Ministry has released a **five-year vision plan named Education Quality Upgradation and Inclusive Programme (EQUIP)**.
- **SWAYAM 2.0, Deeksharambh and PARAMARSH** are some of the major schemes of this department.

Major reforms taken to reform education sector in India:

- **NISHTHA:** A National Mission to improve learning outcomes at the elementary level through an **Integrated Teacher Training Programme** called **NISHTHA – National Initiative for School Heads'** and **Teachers' Holistic Advancement** was launched.
- It aims to build the capacities of around **42 lakh teachers** and heads of school, faculty members of SERCTs and DIETs, Block Resource Coordinators e.t.c
-
- **DHRUV:** The **Pradhan Mantri Innovative Learning Program** (DHRUV) was launched to identify and encourage talented children to enrich their skills and knowledge.
- The programme Dhurv will act as a platform to explore the talent of outshining and meritorious students, and help them achieve excellence in their specific area of interest such as science, performing

arts, creative writing e.t.c.

-
- **Shagun:** One of World's largest Integrated Online Junction for – School Education 'Shagun' is an overarching initiative **to improve school education system by creating a junction for all online portals** and websites relating to various activities of the Department of School Education and Literacy.
- Report cards of **15 lakh schools all over the country will be available on the newly created junction.**
- Common people can directly give their feedback about schools which will further increase the public participation and will ensure accountability and transparency.
-
- **Unified District Information System for Education Plus (UDISE+):** To ensure quality, credibility and **timely availability of information from all the schools in the country, the revamped UDISE+** has been launched. The GIS based mapping portals give information about location of more than 15 lakh schools in the country along with some silent highlights.
- The Data Analytics portal gives information about the aggregate position of the school.
-
- **Digital Infrastructure for Knowledge Sharing (DIKSHA) 2.0:** DIKSHA portal was launched in 2017 for providing **digital platform to teachers** giving them an opportunity to learn and train themselves and connect with teacher community.

- This programme has tried to improve the content for the teachers concerned and **more than 67000 of content pieces** have been hosted on DIKSHA and more than 10.5 crore scans.
- **Operation Digital Board (ODB):** The aim is to provide by March 2023, two smart classrooms for every Secondary/Senior Secondary schools in 101967 Government and 42917 aided schools in all states and UTs in all States/UTs and 1704 KVs and NVs making a total of 1,46,588 schools.
- **SWAYAM PRABHA – DTH Educational Channels:** It is a project to **telecast high-quality educational programs through 32 DTH channels on 24/7** basis to reach out to students/learners of India with wide reach and minimal cost.
- It also aims to provide dedicated channels '**IITPAL**' to assist the students of XI and XII standards aspiring to join premier educational institutions in the country.

Other key Reforms in Higher Education

- **Five-year vision plan 'Education Quality Upgradation and Inclusion Programme' (EQUIP)**
- EQUIP is a vision plan aiming at ushering transformation in India's higher education system by **implementing strategic interventions** in the sector over five years (2019-24).
- **Institution of Eminence (IoE) :** Ten institutions in public sector and 10 institutions in private sector have to be declared as IoE. Each IoE will be eligible to **receive Rs. 1000 crore during next 5 years.**
- **SWAYAM 2.0 :** It is initiated with enhanced features and facilities to offer online degree programmes through SWAYAM by top ranking universities.

Implementation of Quality Improvement Programme

- **Deeksharambh:** A guide to **Student Induction Programme** has been launched. Total 319 HEIs have implemented the Student Induction Programme.
- **Learning outcomes based curriculum framework (LOCF) revision:** New Curriculum in 16 subjects which is based on LOCF has been uploaded on UGC website to facilitate universities to revise the curriculum.
- **Scheme for Trans-disciplinary Research for India's Developing Economy (STRIDE) –** Launched for promoting quality research by faculty and creation of new knowledge.
- **PARAMARSH –** A scheme to mentor institutions seeking **National Assessment and Accreditation Council accreditation.**

7

Open & Distance Learning

A Futuristic Approach

Specifications of Open & Distance Learning

- Open & Distance Learning (ODL) is distinct because of its teaching methodology. In it, the presence of learners is not mandatory except in practical-based programmes and ultimately communication takes place in one way leading to dropouts in number of cases.
- In Distance Education teaching is done with a variety of "mediating process" used to transmit content, to provide tuition and to conduct assessment or measure outcomes.
- ODL can be made more interactive through the use of technology like managing the virtual classroom with the use of internet, development of web-based hypermedia, use of interactive teleconferencing and radio counselling etc.
- In the virtual classroom the learners and the teachers meet in the cyberspace, a question and answer session follows.
- The web-based study helps the learners and teachers to access the information at their own choice of time and convenience. In addition, regular interactive teleconferencing, which is one-way video and two-way audio satellite-based learning facility and radio counseling sessions, may be used for the learners.

Importance of Information Technology in imparting Open and Distant learning Education

- IT can promote **the opportunities of restructuring the teaching-learning process** and transform it

by offering alternatives to the teacher in providing information, access to virtually unlimited resources, and opportunities for real world communication, collaboration and competition.

- Web can enrich the learning resources and help institutions refocus from teaching to learning, from teacher to learner. It can create learning environment throughout the world by networked learning communities.
- Networks may create **educative environments embedded in democratic philosophy** of instruction and helping learners learn. ICT is a potentially powerful tool for extending educational opportunities, both formal and non-formal.
- For developing countries ICT has the potential for increasing access to and improving the relevance and quality of education. The use of computers in ODL has provided new **pedagogical strategies in distance learning** as well as giving more autonomy to the distance learners.

Future Course of Action to reform digital education

- In using technology which can be integrated into the distance education system, the following factors should be considered: **accessibility, cost effectiveness, human acceptance, and pedagogical suitability**. In the era of information technology teachers will be spending more time in facilitating students rather than delivering lectures in the classrooms.

- They would be working in groups, ***preparing and evaluating instructional materials and organizing data into meaningful information and accessible forms.***
- They will also be demonstrating the potential of skill development in students by using information in problematic situations.
- Certain skills capabilities of using different information technologies are necessary for of the

students and teachers. We have to think about the uses of media and technology in regard to appropriateness and acceptability in the society as well as on the ability of the institution offering the programme.

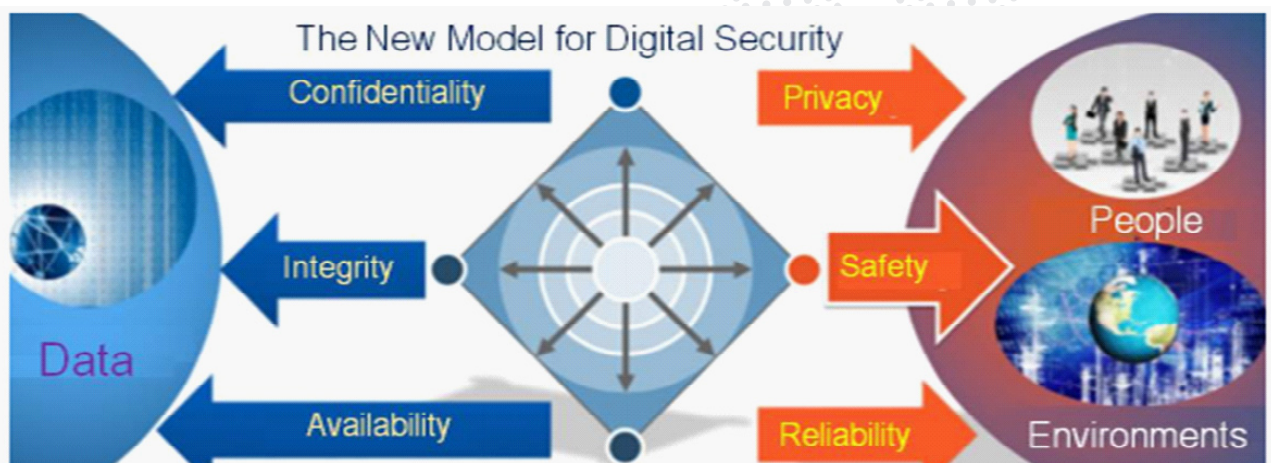
- The socio-economic and cultural background of a person influences their ability to learn from different media technology.



8

Cyber Security

Issues and Challenges



- The world we live in is **highly connected and digitally exhaustive**. Today, social networks have become one of the main communication channels. Of the 7.6 billion humans on the earth 3.6 billion are online.
- Today, social networks have become one of the main communication channels. Within relatively short social media has empowered people and connected them.
- But, at the same time, they have also provided platforms for some decidedly unhealthy and destructive behavior. There are many problems like bullying, cybercrime, copyright issues, security threats and social unawareness among others.
- In the year 2016, there were a total of **758 million online attacks worldwide**, which amounts to around **2 million in a single day**. Every organization, be it big or small, has been the victim of cyber-attacks.

Different types and forms of cyber attacks

- **Bots**: Bots and fake followers are **a big concern in the social media environment**. These programs target specific hash tags and work by **auto-commenting and auto-liking** in order to attract followers who are mostly fake bot accounts.
- Bots were developed **primarily for companies to engage with their users automatically** for increasing customer engagement. However, bots are now being used much beyond their harmless cause and are misused for manipulating a conversation to creating a mirage of someone's personality and much more.
- In this age of misinformation, **bots possess the power to hijack a conversation, troll someone, promote propaganda and even cause security issues**.

- **Terrorist Attacks:** Terrorists have always sought attention and this is what they receive from the social media. **Social media spread the horror far and wide and unknowingly amplify the chaos** that the terrorists intend to spread.
- Extremists use the social media to make an impact. They even use it **to recruit, propagate and to connect**. The rapid spread of false **information through social media is among the emerging risks identified in Global Risks Report**.
- Social media sites have now initiated reporting procedures that **allow users to flag any kind of content that supports terrorism** which can be then removed. Also, the social networking sites today are playing an important role in counter-terrorism operations. For example, Assam State Police opened a cell to monitor social media and keep track of the spread of rumors.
- **Cyber Security Challenges:** Some new threats have also come up like organized cybercrime, cybercrime trading, **smishing (phishing with SMS), hacktivism (hacker with activism) etc**. Another type of attack that is rising recently is distributed denial of service (DDoS) attacks.
- Here the intruder is not interested in actually stealing one's information but in bombarding his/her server with unnecessary traffic thereby crashing it.
- **Mobile Technologies:** There are different types of personal information on one's mobile. This raises an important question – what if a hacker is able to build one's digital profile by collecting all these censored information and the data from the third-party apps and use it against that person?
- **Internet of Things (IoT):** It is another such challenge posed by the new technology whereby every object we use is equipped with the capabilities to identify, locate, sense its surrounding, compute and communicate.
- **Ransomware:** This ransom demanding malware is a virus which gets into your computer, either when you download an attachment containing the virus or

when you visit any such website and click on a link. Once it gets into your computer, it starts to encrypt all your files thereby rendering them useless. The only way to unlock your files is to get a secret key from the hacker by paying a ransom.

- **Big Data:** We are actually living in exponential data times. In **Just 60 seconds 149,513 emails can be sent, 3.3 million FB posts can be made, 3.8 million Google searches can be performed**. As a result, it has become lot easier to hack people using social engineering techniques and make them reveal information rather than using tools and technology.

Protection against cyber-crime

- Avoiding malicious downloads done by mistake.
- Avoiding malicious installs done by mistake.
- Preventing from being a victim to **Man In The Middle Attack**(MITM)
- Protection from phishing.
- Protection from damage that trojan horses may cause. Some **Trojan Horses** are built in a way that the majority of the code is for doing useful and seemingly innocent things while a small portion does something nasty like acting as backdoor or escalating privileges.

Need for a secure cyber-space

- Digital literacy is a broader concept that consists of developing new skills and knowledge which provides awareness and advanced level thinking skills. It is extremely essential to be digitally literate for appropriate utilization of digital information resources.
- It is the responsibility of each one of us to understand and use the cyberspace sensibly and responsibly. This will definitely ensure that the netizens are not only techno-savvy and socially existent but also digitally safe.

9

Global Synergy in Higher Education

- India aims to become a **five trillion dollar economy by 2024-25**; the realization of this goal is incumbent upon the capability of its education and training institutions to equip young Indians with knowledge and skills relevant to an evolving job markets.
- It needs quality, excellence, innovation and constant upgradation. India's **draft National Education Policy** aims at **increasing the gross enrolment ratio (GER)** in higher education to at least 50% by 2035, which would mean that one in four graduates in the world would be a product of the Indian higher education system.
- The **current GER stands at just 26.3%**, and doubling it in the next 15 years will require significant reforms both at planning and execution level. **India's GER is lower than the global average of 36.7%**.
- India enjoys a **demographic dividend**. It is **world's youngest country with an average age of 29**. This comes at a time, when rest of the world is ageing. Average working age in US is 40, Western Europe is 46 and Japan is 47 years.
- Thus, India will not only have a young workforce to fulfill its domestic needs, it also has the opportunity to be the global hub for skilled workforce.
- Market forces have played a major role in the higher education landscape. Of the **993 universities in India, nearly 39% are privately managed**. Of the 39,931 colleges, 78% are from private sector.
- Private colleges cater to **66.4% of the total enrolment in higher education**, which means that a mere 22% of govt. colleges are catering to a disproportionately large number of students who could not afford to seek higher education in private Higher Education Institutions (HEIs).
- Increasing social aspirations have made the education divide between urban and rural centres more obvious.
- The **college density (per one hundred thousand eligible population) is 28 nationally, it varies from 7 in Bihar to 53 in Karnataka**.
- The opportunity cost of higher education (commute, hostel fees etc.) for disadvantaged section is often too high and hinders the education process.
- Low employability of graduates, poor quality of teaching, weak governance, insufficient funding, and complex regulatory norms continue to affect the Indian higher education sector.
- The number of international students is generally a reliable indicator of the quality and robustness of a higher education system.
- As of 2018-19, only **47,427 foreign students were enrolled** in the Indian higher education system (China – more than 400000, Germany – More than 3,00,000). Globally India caters to less than one per cent of all International students.
- Indian institutes have **failed to feature in the top**

Higher Education – Critical Challenges for India

- The above-mentioned opportunity also presents a challenge. If we fail to create a suitable environment, this dividend will be converted into demographic burden.

100 of world university rankings published by reputed ranking frameworks.

- The outflow of Indian students for education abroad is itself more than 15 times the inflow of international students to India.

Need to upgrade education in India upto a global standard

- Getting the right education is critical for India to maximize the potential of its demographic dividend. India will not have the capacity to meet this demand on its own.
- NITI Aayog and several other organizations have developed policy documents on higher education that have stressed on the need of **international assistance in higher education**.
- India's recently released draft National Education Policy 2019 **proposes inviting the top 200 global universities to establish foreign branch campus in India**.
- MHRD developed a **five-year action plan named EQUIP (Education Quality Upgradation and Inclusion Programme)**. The initiative is made to bring transformation in the higher education system in the upcoming 5 years.
- NITI Aayog has more recently favored the **development of Exclusive Education Zones (EEZs)** akin to SEZs in a few select cities in Bengaluru, Hyderabad, Ahmedabad, Pune, Chandigarh and parts of Sikkim, to boost growth in the flow of foreign students.

Opportunity for Deeper Engagement

- International education is **Australia's third largest export industry. As a world class provider of education and training, Australia is well positioned to partner with India in the higher education sector.**

- Linkages between HEIs and industries with diversified course offerings can prepare students for the job market.
- Global education institutes may also consider looking at building partnerships, beyond **HEIs in metro cities of tier 2 and tier 3 cities and regional/state institutions**, which offered tremendous possibilities because of large number of students with untapped potential and lack foreign collaborations currently.
- The joint student-academic mobility programmes, joint research, international **collaborations boost rankings**.
- India is also seeking to attract international faculty into the country for short-term research and teaching visits. Indian government initiatives like the **Global Initiative of Academic Networks (GIAN)**, which provides funding for teaching at selected Indian higher education institutions and **Scheme for Promotion of Academic and Research Collaboration (SPARC)** are opportunities to be explored.
- However, **lack of knowledge of India's higher education sector, including how to address regulatory issues, contributes to low faculty participation in mobility schemes**.
- **Partnership may look beyond silos** and into areas where Australia has an advantage and India has a need, for instance, **in mining safety, bio engineering, signal processing, AI, cyber security, climate change etc.**
- Increasing the **level of mutual cultural understanding and developing a strong knowledge base** for India and Australia can further bolster these relations.
- Increased focus on **vocational and professional led education can help India find ways to up-skill 400 million workers by 2022**.
- However, what is needed is targeted and granular advice from governments to assist providers to identify, from the mass of possibilities, viable opportunities that match Australian strengths with Indian needs.
- Also, Indian students' expectations around cost and employment outcomes need to be understood carefully.

10

MISCELLANEOUS

Role of Space Technologies in improving Education System

Satellite Instructional Television Experiment (SITE)

- Satellite Instructional Television Experiment or SITE was an experimental satellite communications project launched in India in 1975, designed jointly by **NASA and the Indian Space Research Organization (ISRO)**.
- The project made available **informational television programs to rural India**. The main objectives of the experiment were to educate the financially backward and academically illiterate people of India on various issues **via satellite broadcasting**, and also **to help India gain technical experience in the field of satellite communications**.

EDUSAT Programme

- GSAT-3, known as EDUSAT is meant for distant class room education from school level to higher

education. This was the **first dedicated "Educational Satellite"**.

Imparting Informal Education to Farmers

- During SITE programme, **TV documentaries on agriculture made in vernacular languages were beamed to farmers on improving agricultural practices**.
- Later during APPLE and INSAT utilization programmes, TV documentaries specific to various subjects on agriculture were made and telecast through satellites and they have been continuing.
- Weather monitoring satellites like **Kalpana and INSAT – 3D** have become instrumental in the accurate weather prediction. Remote sensing satellites have enabled our agricultural scientists to detect crop diseases, accurately estimate crop acreage, crop yield, soil quality, which ultimately will bring benefits to the farmers.
