**Role of Science and Technology in development of the Nation**

**INTRODUCTION:**

* Science and Technology hold the key to the progress and development of any nation.
* Technology plays a fundamental role in **wealth creation**, **improvement of the quality of life** and real economic growth and transformation in any society.
* Science, technology and the development of nations and society are all **proportional to each other.**
* Development is always linked with technological disruption, and it happens when there is an advancement in the scientific field.
* **Nation-building refers to how national identities are constructed and communicated.** The term nation-building is often used simultaneously with **state-building**, **democratization,** **modernization**, **political development**, **post-conflict reconstruction**, **and peacebuilding.**Nation-building can take many forms, including education policies or major infrastructure development to trigger economic growth and political stability.
* Nation-building is a challenge in post-colonial states, especially in territories that were primarily used by the colonial power to extract resources or obtain other economic benefits.

*Let us delve into the path that India has traversed in the journey of Nation-Building.*

**HISORICAL PERSPECTIVE:**

* After nearly **two centuries of despotic British rule**, India gained independence in 1947. The British left India as a poor, dependent, underdeveloped, socially, and economically backward nation. A few hold this opinion that **nation-building is an autonomous process** that would develop itself after independence. But past and later experiences indicate that this was a complex challenge.
* Nehru, the first Prime Minister of India in his address to the Indian Science Congress said, **“New-born India needed inputs of science not through hollow words, but through concrete efforts directed at building the necessary infrastructure from scratch.”**The cultivation of science and its benefits to humanity were crystal clear to Nehru even before independence. He became the first non-scientist to preside over the Indian Science Congress.
* Some of the greatest names of the time, including Homi J Bhabha, Sir C.V. Raman, Satish Dhawan, Nalini Ranjan Sarkar, J.C. Ghosh, Meghnad Saha and S.S. Bhatnagar, were given a free hand in establishing the country’s best institutes of scientific learning. J.L. Nehru, in consultation with Bhabha, established the **Atomic Energy Commission (AEC)** of the country on August 10, 1948, with **Bhabha as its head**.
* In India, science and technology have been given importance in nation-building since independence with the establishment of institutes like **DRDO, IITs, CSIR labs** and the establishment of the **Department of Science and Technology (DST).**

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| **Challenges Faced by the Newly Independent India**   * Rehabilitation of Refuges & Communal Riots * Integration of Princely States * Stability & Security of India * Establishment of Representative Democracy & Civil Libertarian Political Order * Restoration of Law & Order after partition * Economic Development * Social, Political and Economic Equality |

* It was the vision of Pandit Nehru, the first prime minister of independent India, and the need of India at that time that led to the foundation of the **Indian Institute of Technology** in **1950 after only three years of independence.**These institutes, with assistance from international institutes, promoted research in India. Nehru aimed to **inculcate the scientific temper** among the Indians. He also aimed “**to convert India’s economy into that of a modern state, and to fit her into the nuclear age and do it quickly”.** The **Department of scientific research and natural resources** was also set up by him.

**ROLE OF SCIENCE AND TECHNOLOGY IN NATIONAL DEVELOPMENT:**

* Science and technology have been central to the progress and development of virtually all the nations of the world. It contributes immensely to various sectors of the economy. **Science and technology are intimately connected with development** because and share a **symbiotic relationship**. It leads to healthier, longer, wealthier and more productive lives and alleviation of poverty becomes possible. The many ways in which **science and technology impact poverty alleviation** across various sectors and economic growth merit attention.

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| **Technology can be broadly classified into two major categories namely:**   1. **Material Technology**- where knowledge is embedded into technological products such as tools, equipment, agro-chemicals, improved plant varieties or hybrids, improved breeds of animals and vaccines. 2. **Knowledge-Based Technology-** such as technical knowledge, management skills and other processes which are needed to successfully produce products or grow crops. |

**ROLE OF SCIENCE AND TECHNOLOGY IN SPACE EXPLORATION:**

* Dr Vikram Sarabhai, who is considered as **founding father of the Indian space programme**, quickly **recognised**the **benefits of space technologies for India**. With the **help of Dr Vikram Sarabhai, the Indian space research organisation (ISRO) was set up in 1969.**

**Since its inception, the Indian space programme had three distinct elements:**

1. Satellites for communication and remote sensing
2. Space transportation system and
3. Application programmes.

**Achievements:**

* **Aryabhatta, the first Indian satellite**, was launched by the Soviet Union in 1975.
* Lately, ISRO has conducted two successful space projects, **Chandrayaan,** and **Mangalyaan** in 2008 and 2014 respectively. At present, India’s main priorities are **Chandrayaan-3 and Gaganyaan mission”.**
* **GSLV Mk III:**GSLV MkIII, chosen to launch Chandrayaan-2 spacecraft, is a three-stage heavy-lift launch vehicle developed by ISRO. This was the first testing of the indigenous cryogenic engine.
* **Mars Orbiter Mission (MOM):** Marking India's first venture into the interplanetary space, MOM will explore and observe Mars surface features, morphology, mineralogy and the Martian atmosphere.

**ISRO's commercial arm, NewSpace India Limited (NSIL):**NSIL, incorporated in March 2019, got mandated to **undertake operational satellite missions** on a **demand-driven model,** wherein it has the **responsibility to build, launch, own and operate the satellite and provide services** to its committed customer.

**Application of Space Technology:**

* **Cyclone Warning Systems:** The cyclone **forecast accuracy has significantly improved** in recent years as has been demonstrated during cyclones Phailin (2013), Hudhud (2014), Vardah (2016), Titli (2018), Fani& Bulbul (2019) and Amphan, Nisarga&Nivar (2020) and Tauktae, Yaas, Gulaab & Shaheen and Jawad (2021).
* **Indian Tsunami Early Warning System (ITEWS):** It comprises a **real-time network of seismic stations**, tide gauges and a **24X7 operational tsunami warning centre** to detect tsunamigenic earthquakes, **monitor tsunamis** and **provide** **timely advisories** to vulnerable communities.
* **Remote sensing applications** in India now cover diverse fields such as the **agricultural crop acreage and yield estimation**, **drought warning and assessment**, flood control and damage assessment, land use/land cover mapping, wasteland management, urban development, mineral prospecting, forest survey, etc.

**Space technology can provide solutions to the problems of man and society**. Space technology will enable **e-Education,** **integrated healthcare schemes** and connectivity to community activities for **sustainable economic development.** This will lead to **employment generation, higher literacy, availability of clean energy** and **wealth generation** for the welfare of the society with **improved quality of life.**

* Knowledge about space, gained through scientific studies can have enormous economic and social benefits that contribute to meeting many societal needs, from human security to sustainable development. It has the potential to contribute immensely toward the character building of people and thereby in nation-building.

**ROLE OF SCIENCE AND TECHNOLOGY IN THE HEALTH SECTOR:**

* **Advances in scientific knowledge** and its application have helped slow the trend of high fertility, high mortality and led to increasingly better health for people in India.
* In the Indian context, over the past century, science and technology provided the basis for the largest ever aggregate improvements in human health.
* In **1950-51, there were 725 Primary Health Centres** and in **1999, these rose to 22,446**. As per the **Rural Health Statistics-2019,** a total of **30,045 PHC both in rural and urban areas have been functional in the country.**It marks a big achievement for India.
* **National Family Health Survey (NFHS-5) for 2019-21** has revealed a mixed picture in terms of the **health indicators in the country**. On the one hand, it observes a **reduction in the Infant Mortality Rate (IMR)** (40.7 in NFHS 4 to 35.2 in NFHS 5) and **0** (49.7 in NFHS 4 to 41.9 in NFHS 5) and on the other hand, there is an **increase in anaemia among women and children,** which in turn will have implications on malnutrition in the future.
* The **life expectancy** of an average Indian was 33 years in 1951 which increased to 69.66 years in 2019.
* Stronger primary health care is essential to achieving the health-related **Sustainable Development Goals (SDGs)**and universal health coverage. It contributes to the attainment of other goals beyond the health goal (SDG3).

**Control of Communicable Diseases:**

* The number of deaths from diseases like Malaria, Smallpox, Tuberculosis, has been declined.
* **Smallpox:**India had eradicated this disease from the country since April 1977. It was a big achievement of the health care programme**.**
* **Polio:**India received **'Polio-free certification'** from World Health Organization on 27 March 2014, with the last polio case being reported in Howrah in West Bengal on 13 January 2011.
* **Malaria**: At the time of independence malaria killed more than 10 lakh people every year. It is due to development in science and technology together with better planning we were able to control it. The government took a major step to address the disease by launching the National Malaria Eradication Programme in 1958.
* **Tuberculosis:** It is commonly called TB. To control TB, National TB Control Programme was started in 1955. A number of TB hospitals have been opened across the country. Revised National Tuberculosis Control Programme was launched in April 1977. **National Strategic Plan for Tuberculosis Elimination (2017–2025)**purposes to achieve a rapid decline in the burden of TB, morbidity and mortality while working towards the elimination of TB in India by 2025.
* **Ayushman Bharat Digital Mission (ABDM): It was**launched in **September 2021 is a necessary intervention to enable a National** Digital Health Ecosystem. Implementation of this mission has manifold implications. Creating a **digital health ecosystem**, for one, will enable the creation of health provider registries, thereby aiding in the **elimination of quackery**. **Digital prescriptions** can help prevent unauthorised doctors from prescribing to patients.
* The provision of a **unique health ID for every individual,** there are benefits of tracking patient case history, diagnostic tests taken and their reports, interval between tests, etc., all of which is irretrievable in a **pen-and-paper system** and lack of awareness/knowledge among patients.
* With **5G on the anvil**, the healthcare delivery will change forever and India may lead the way in showing the world how tech can transform healthcare and make it more outcome-driven.

**Budget 2022-23** has acknowledged the **real potential of information technology (IT)** in addressing the gaps in the health system. Therefore, the **CAPEX under the Department of Health and Family Welfare has gone up from Rs2,508 crore in FY2021-22 to Rs5,632 crore for FY2022-23**, a more than **100% increase** to building strong foundations for the health system.

* ‘**Make in India’** initiative is encouraging domestic manufacture of medical devices and helping lower the prices patients pay for products such as stents and implants, which in the past were imported.
* India’s health care industry is becoming more and more attractive for investors, with technology-led innovations.

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| **Three ‘B’s of Health Care:**   1. **“Biology,”**where technology could help **lower the costs of genetic testing** and facilitate targeted treatments, precision medicine and preventive care. 2. **“Bytes” or**the steady drop in the cost of computing, driven by Moore’s Law (the number of transistors on a microchip doubles every two years while the cost of computing in that period is halved). 3. **“Bandwidth”**in digital communications, which along with India’s growing teledensity could expand health care access for rural India. |

* **Telemedicine:** Development in ICT and the spread of internet connection has helped education reach the corners of the nation through video lectures, interactive sessions with distantly located teachers and educators. The health sector also reaps benefits from expanding its network through Telemedicine.
* **CoWIN Platform:** During the pandemic, the platform has proven to be successful in India where it has also handled 2.5 crore vaccinations in a day, with a load of over 800 vaccinations per second. Achieving the **100 crore vaccines milestone** in record time would not have been possible for India in the absence of it.

India has made its digital platform (**CoWIN Platform)** for Covid19 vaccination drive, CoWIN, open-source for all countries to access, adapt and use. This was perhaps the **first time that any country** is made a **software platform developed by its public sector open for the world.**

* **Covaxin:** The development of Covaxin has instilled self-confidence in us that India is now much more than the pharmacy of the world. It is also a vaccine superpower.
* **Vocal for Patent Waiver: Despite not getting much support** India's pushed for **COVID vaccine patent waiver, medicines at WTO**. This approach not only suggests the importance of healthcare in **nation-building** but also how India looks at the world as one family and translates the underlying principle of ‘**Vasudhaiva Kutumbakam’.**

**ROLE OF SCIENCE AND TECHNOLOGY IN AGRICULTURE:**

* Advances in science and technology have **facilitated higher yields**, **greater efficiency** and **greater nutritional content**. Science and technology have played an important role in India’s evolution since its independence.
* India went through **famine,** **starvation in many parts** and national calamities and **looked for ships to come to our ports**with**wheat from western countries**. After Independence, India looked forward to development through Five Year Plans. Today India is in the knowledge age which provides an opportunity to become a **developed nation with a strong economy.**

**The era of stagnation in agriculture (the 1950s):**A period marked by limited or insignificant growth, agricultural production during this period witnessed.

* Low growth in crop and grain production (0.4 and 0.1 percent p.a.)
* Foodgrain production of 59.2 MT in 1952–53, with a yield of 579.8 kg/ha
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**The 1960s-1980s:**A good transition from stagnancy to high agriculture production, this period was characterized by:

* Pioneering work of agricultural scientists and efforts of farmers that led to the **Green Revolution**
* **High Yield Variety (HYV) of seeds**, increased use of fertilizers and irrigation, resulting in a significant spike in production
* **Food security** and **reduced import of food grains**

**The 1980- 2000s: Surplus production and exports:**During this period, India transitioned from achieving just food security to surplus production. **The key highlights of this period include:**

* Expanding cereal production
* Economic reforms introduced that provided greater encouragement to exports
* Surplus of production of agricultural commodities over domestic demand
* India emerged as a net exporter of agricultural products
* Increase in population and strong income growth

**2000 Onwards: Economic Reforms, Technological Advancements and Disruptive Transformation**

2000 and beyond saw a great push to agricultural production with the introduction of supporting reforms, new policies and adoption of technology. Some key highlights from this period include:

* Better technology adoption
* Rise in institutional credit for agriculture
* NFSM to increase the production of commodities
* Schemes like National Horticulture Mission (NHM) and Bringing Green Revolution in Eastern India (BREI) helped achieve record production.
* The National Mission on Oilseeds & Oil Palm
* Commodity exchanges that helped in fair pricing of commodities

**Agricultural Progress under the various Five-Year Plans:**

* **Third Plan**: The Government introduced the new agricultural technology known as the Intensive Agricultural District Programme of using improved seeds, viz., ***High Yielding Varieties Programme (HYVP).***The new agricultural technology was expected to usher in the green revolution.
* **Fourth Plan:**A systematic effort to extend the application of science and technology to improve agricultural practices
* **Sixth Plan:**It is hailed by the Indian Government as the **second green revolution**. The Second Green Revolution from 1983-84 was said to be from expansion in supplies of inputs and services to farmers, agricultural extension and better management.

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| **Green Revolution:**   * The Green Revolution was an endeavour initiated by Norman Borlaug in the 1960s. He is known as the 'Father of Green Revolution' in the world. * It led to him winning the Nobel Peace Prize in 1970 for his work in developing High Yielding Varieties (HYVs) of wheat. * In India, **the Green Revolution was mainly led by M.S. Swaminathan.** * The introduction of high-yielding varieties of seeds after 1965 and the increased use of fertilizers and irrigation are known collectively as the Green Revolution, which provided the increase in production needed to make India self-sufficient in food grains, thus improving agriculture in India. **Famine in India, once accepted as inevitable, has not returned since the introduction of Green Revolution crops.** |

**Other applications of Technology in Agriculture:**

* **India’s Rainbow Revolution:**The rainbow revolution concept is a combination of Green Revolution, White Revolution, Blue Revolution, Yellow Revolution and Brown Revolution. It was after these revolutions, that Indian agriculture slowly shifted from traditional behaviour to scientific behaviour.
* **Soil Health Card:**The campaign to provide soil health cards with nutrient information of soil would help the farmers to educate about the most viable and appropriate cropping pattern suiting the climatic conditions in the region. Shortage of infrastructure like soil testing labs is hindrances but it’s a move in the right direction.
* **APMC farmers go cashless (2017):**In January 2017, Indore Agricultural Produce Market Committee (APMC) adopted a cashless payment policy and farmers started accepting alternative modes of payments such as cheques and RTGS.
* **Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyan (PM KUSUM):**
* Ministry of New and Renewable Energy (MNRE) launched the Pradhan Mantri Kisan Urja Suraksha evem Utthan Mahabhiyan b Scheme for farmers for the installation of solar pumps and grid-connected solar and other renewable power plants in the country.

**Digital Initiatives By The Indian Government in Agriculture:**

* **E-sagu:** One of the latest digital initiatives, it provides expert suggestions to the farmers. By leveraging the internet and audio-visual communication, insights from experts are provided to the farmers regularly on the various techniques to increase farm productivity
* **Community Radio (CR):** Community Radio fulfils the information needs of the farmers using radio station facilities by providing the **latest information on weather and farming practices.**
* **Digital Green:** The initiative disseminates **agricultural information using online videos.**
* **National Agriculture Market (e-NAM):** It provides an **e-marketing platform** at the national level and supports the creation of infrastructure to enable e-marketing. The platform also ensures better price discovery, brings in transparency and empowers farmers to get fair remuneration for their produce
* **The Kisan Call Centre (KCC):** This initiative **provides information to farmers through a toll-free telephone helpline**. Under this project, call centre facilities have been extended to the farmers by establishing call centres in different states so that ***farmers can get the information in their native language.***

**NEW-AGE AGRI REVOLUTION IN INDIA:**

* **Artificial Intelligence (AI) systems**:
* AI Systems are helping to improve the overall harvest quality and accuracy – known as precision agriculture. AI technology helps in detecting disease in plants, pests and poor nutrition of farms. AI sensors can detect and target weeds and then decide which herbicide to apply within the region.
* **Accurate AI forecasts** and analytical tools help farmers better plan their farming habits and help them avoid losses, while also helping them better their yields with crops that could thrive in particular weather.
* **Kisan Drones:**It will be used to boost the agricultural sector in the country, the use of Kisan Drones will be promoted for crop assessment, digitization of land records and spraying of insecticides and nutrients.
* **Smart Farm Machinery:**Smart Farm Machinery is about producing more with less. Smart machines and technological breakthroughs have the potential to increase output, lower costs and boost farm incomes.
* **Micro Irrigation:**frees the farmer from vagaries of seasonal monsoon while also conserving the limited water resources. With agriculture consuming about 80 per cent of the total renewable water resources, the adoption of micro-irrigation practices will help conserve our precious water reserves and also boost yields and productivity.
* **Precision Farming:**an approach to farm management that uses information technology to access real-time data about crops, soil, weather etc. to ensure crops and soil receive exactly what they need for optimum health and productivity.
* **Digitization in agriculture** is catching up fast. From platforms like eNAM to projects like Agri Udaan, the commitment to the use of technologies in agriculture is strong and clear. It is now important for investors and stakeholders to utilize this opportunity and ride the tide of long-overdue digital transformation in the agriculture sector.
* **Earth Observation Satellites (EOS):**These are nothing but another **Radar Imaging Satellite (RISAT)**. Land and forest mapping and monitoring, mapping of resources like water or minerals or fishes, weather and climate observations, soil assessment, and geospatial contour mapping are done through these satellites.

**The agricultural sector plays a strategic role in the process of nation-building by:**

* Contributing to National Income
* Ensuring Source of Food Supply
* Pre-Requisite for Raw Material
* Provision of Surplus
* Creation of Infrastructure
* Helpful to Reduce Inequality
* Source of foreign exchange
* Employment opportunities for Rural People

Numerous raw materials, regardless of whether it’s cotton, sugar, wood, or palm oil, come from the agriculture sector. These materials are fundamental for major industries. **Adequate provision of Agricultural education programmes**, also helps a nation meet the challenges of food insecurity, poverty and unemployment which has posed threats to the corporate existence and stability of the nation. We need a new phase in Indian agriculture that will be defined by innovation and technology; an age where we will look to balance productivity and economics with social and environmental considerations. This age will usher in an era of unprecedented productivity and prosperity for farmers.

**ROLE OF SCIENCE AND TECHNOLOGY IN AFFORDABLE/CLEAN ENERGY:**

* The **power sector plays a vital role** in the **economic growth and human development** of any country. It **improves the quality of life of human beings** and the biotics of this sphere. Electricity consumption is one of the most important indices for measuring the development level of a nation.
* The power sector in India has grown significantly since independence, both in the Installed Capacity and Transmission & Distribution (T&D) system. The total Power Generating Capacity has increased from a meagre **1362 MW in 1947** to about **393 GW at the end of March 2021.**
* The Per Capita Electricity Consumption which was a mere **3 units in 1947**, has increased to **1208 units in 2019-20.**

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| **Scope of Technological intervention in the Power Sector:**   * **National Smart Grid Mission (NSGM)** * Integrated metering, billing and collection systems * Energy accounting system to conduct an energy audit * Complaint handling * Increased Efficiency in the Distribution sector * Evolved grid system * **Smart Metering** * Digital Asset Management * Sustainable Energy * **Technological Up-gradation/Digitisation** * **Energy Storage** * **Renewable Energy** |

**Renewable Energy (RE) Capacity of India:**

* Production Linked Incentive Scheme “**National Programme on High-Efficiency Solar PV Modules”** was introduced to promote manufacturing of high-efficiency solar PV modules, including the upstage vertical components like cells, wafers, ingots and polysilicon in India and thus reduce the import dependence in **Solar PhotoVoltaic (PV) sector.**
* **National Hydrogen Energy Mission (NHM):**India's ambitious goal of 175 GW by 2022 got an impetus in the 2021-22 budget which allocated Rs. 1500 crore for renewable energy development and NHM.
* Modern clean, renewable energy technologies (e.g., solar, wind, modern biomass) need to be developed further and there needs to be an increase in the efficiency and sustainability of energy use in transportation, industry, and housing. Power is one of the most critical components of infrastructure and crucial for making the **process of “nation-building” steady and sustainable.**

**ROLE OF SCIENCE AND TECHNOLOGY IN EDUCATION:**

* To make India a **front-line country and economy**, the government has launched schemes such as **Digital India** and **Make in India**, which require the education system **especially higher education** to gear itself to the task of realising these missions. Hence, education becomes the fuel to achieve the other goals in the process of nation-building.

“Education is the most powerful weapon, which you can use to change the world.”—**Nelson Mandela**

* One of the core principles **guiding the education system** would be the **‘extensive use of technology in teaching and learning, removing language barriers, increasing access,**and**education planning and management.**
* With the **internet penetration rate** estimated to **reach above 55 per**cent by the end of 2025 in India, **digitisation of education** is the future of education. **National Education Policy (NEP) emphasizes digitisation**besides the use of technology in education. But increased use of technology in education also creates a digital divide, as not everyone has equal access to technology.

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| **Bridging the digital divide:**   * The shift to online education also brings forward the conversations around the digital divide and the digital readiness of every stakeholder and institution. **The digital divide in schools is significantly higher than in higher education institutions.** * Work is being done to make education accessible through digital means for all school students, irrespective of their location, financial background, and internet and bandwidth connectivity. * **National Digital Educational Architecture (NDEAR):**The NDEAR aims to offer distinct education ecosystem architecture for the advancement of digital infrastructure in the country and guarantee the autonomy of stakeholders, especially states and UTs. |

**Initiatives by the Government:**

* **PM eVIDYA Programme:**The government introduced the PM eVIDYA programme in May 2020 to make e-learning more accessible for Indian students and teachers and promote & strengthen digital education in India.
* **DIKSHA (Digital Infrastructure for Knowledge Sharing):**National portal for school education, to offer school curriculum-based engaging learning materials to students, teachers, and parents. The portal supports >18 Indian languages and has been implemented by 35 states/UTs.
* **SWAYAM (Study Webs of Active Learning for Young Aspiring Minds):**It offers an integrated platform for online courses at affordable costs to all citizens, especially the underprivileged section in the country.
* **SWAYAM PRABHA:**In 2017, SWAYAM PRABHA, a group of 34 DTH (Direct-to-Home) channels dedicated to broadcasting educational programmes 24x7, was introduced.
* **E-Pathshala Portal:**In 2015, the government launched the ePathshala portal to build a resource store for educational videos, audios, flipbooks, etc.
* **NISHTHA:** In FY21, the National Initiative for School Heads and Teachers’ Holistic Advancement (NISHTHA) - Phase II was launched at the secondary level to tailor modules for online education.
* **OLabs:** To offer students a lab learning experience via the internet, the government introduced OLabs in November 2014 for those who do not have access to the physical lab.
* **Virtual Labs:** The Government of India introduced a pilot virtual lab in 2009 and the main one in 2010 to enable undergraduate and post-graduate students (pursuing science and engineering courses) remotely access the labs and enhance their study experience.

**ROLE OF SCIENCE AND TECHNOLOGY IN ECONOMIC GROWTH:**

In economics, it is widely accepted that **technology is the key driver of the economic growth of countries, regions and cities.** Technological progress allows for the more efficient production of more and better goods and services, which is what prosperity depends on. The role of technology in economic development can be summarised as follows:

* **Time is Money:**Technology can save the time it takes to produce a good or deliver a service, contributing to the overall profits of a business.
* **Efficiency:** Technology can contribute to the efficiency of a business's output rate, allowing for larger quantities of products to be moved or of services to be rendered.
* **Specialization:** Technology has to lead to an increase in the division of labour and specialization of jobs within a business, further contributing to the efficiency with which a business can run.
* **Natural Resources:** Technology has a huge effect on the ability of businesses and governments to access natural resources and use them in the most effective ways possible to benefit both the business and the economy.
* **Industrial Expansion:** Thanks to the increased efficiency of labour with the ever-improving state of technology, businesses can increase total output, which in turn leads to higher profits and greater economic development.
* **Research:** Better technology has led to further research into nearly every sector of business and science, meaning businesses can benefit from all sorts of technological advancements.
* **The Internet and International Trade**: Information technology is the single most important element in the success and growth of international trade and job market growth, allowing businesses to share information and conduct trade in less time than the blink of an eye.

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| There are three distinct pillars sustaining any nation-building process.   1. **The Government,** which also could be categorised as political leadership 2. **The Civil Society**, and 3. **The Business** 4. **The three work in tandem to drive the process forward.** |

**Impact of Technology in Indian Economy:**

**Market Operations:**

* The Telecom sector constitutes a **critical building block of the country’s infrastructure**. Broadband wireless is going to be the order of the day and mobile money transfer and mobile commerce are going to open up endless possibilities.
* Digital technology in capital markets is changing the market operations. The new technology-aided solutions are only adding to the human capacities in the capital market scenario. **Machine learning** and **artificial intelligence** are part of financial institutions among other aspects like **investment trading.**
* Technology is further **democratizing trading.**Investors no longer have to rely on experts as data science produces trading strategies that resolve investment challenges.

**Banking Sector:**

* The requirement for **computerized banks in India** was felt in the early 1980s. The Indian banks applied the process at the branch level. Various national committees were formed by the government to modernize the banking system in India.
* In the late 1980s, the then deputy governor of the Reserve Bank of India (RBI) **Dr C Rangrajan implemented the concept of core banking in India**. It formed a platform for facilities like telebanking, off-site ATMs and customer terminals.
* In the 1990s, core banking was transformed when private sector banks and foreign banks started having access to the Indian banking industry.

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| **Objectives of Core Banking System:**   1. It aims to provide convenient banking to its customers where the customers can access banks anytime and from anywhere. 2. Another objective of the core banking system is to make informed decisions with facts and figures. |

* **Advanced Self-Service Capabilities:** With fintech banking solutions, self-service capabilities provide customers with operational processes that were previously only available via a physical branch.
* **Application Programming Interfaces (APIs):**A decade ago, the Reserve Bank of India (RBI) introduced NEFT and RTGS, followed by the National Payments Corporation of India (NPCI) introducing IMPS. This was followed by API-led banking. In a nutshell, an API is a bridge that helps banks and third parties to connect safely and leverage each other’s offerings in real-time.
* **Instant Payments:** Point of sale or POS terminals had begun to see acceptance only around 2016, the rapid penetration of mobile internet services and demonetisation played a role in Indians’ larger acceptance of digital payments.
* **BHIM (Bharat Interface for Money)**: It is an Indian mobile payment app developed by the National Payments Corporation of India (NPCI), based on the Unified Payments Interface (UPI).
* **RuPay Payment Network:**RuPay is the first of its kind global card payment network of India with wide acceptance at ATMs, Point of Sale Devices, and e-commerce platforms across the country.

The government has recently approved a Rs 1,300 crore ($170 million) plan to promote domestic **RuPay debit cards** and **low-value digital transactions** to boost their use in marginalised populations, in a move that could challenge the **clout of rivals like Visa and Mastercard.**

* **Aadhar:** It is a 12-digit unique identity number that can be obtained voluntarily by the citizens of India and resident foreign nationals. **Aadhaar is the world's largest biometric ID system. Today, 99% of Indian adults have an Aadhaar identity number.**The government further interlinked the identity system with bank accounts and mobile numbers, resulting in the JAM **(Jan Dhan-Aadhaar-mobile phone) trinity.** JAM has become the fundamental digital architecture ushering in holistic financial inclusion.

**CONCLUSION:**

Nation-building is constructing or structuring a national identity using the power and resources of the state. Nation-building aims at the **unification of the people within the** state so that it remains **politically stable and viable in the long run. Growth in GDP is not the real measure of a nation’s progress**. The aspect that matters most is the rate at which economic wealth is translated into less poverty, more opportunities, better health etc.

Technology simply put is a **means of harnessing and exploiting** our **understanding of nature and resources**to improve the human condition, the natural environment or to carry out other socio-economic activities. Therefore, science and technology (S&T) intervention becomes even more relevant for any successful economy, especially today when**knowledge-based economies** are emerging stronger. In a nutshell, science and technology is associated with modernity by all means and is essential to nation-building and the rapid development of their subjects.