

WHAT IS QUANTUM COMPUTING?

In a paper published recently, researchers at Microsoft announced that they had figured out a way to create an elusive kind of particle that could potentially revolutionize quantum computing.



About Quantum Computing:

- It is an area of computer science that uses the principles of quantum theory.
- Quantum theory explains the behaviour of energy and material on the atomic and subatomic levels.
- Quantum computers have the capability to sift through huge numbers of possibilities and extract potential solutions to complex problems and challenges.

How does it work?

- Where classical computers store information as bits with either 0s or 1s, quantum computers use qubits.
- While classical bits always represent either one or zero, a qubit can be in a superposition of one and zero simultaneously until its state is measured.
- In addition, the states of multiple qubits can be entangled, meaning that they are linked quantum mechanically to each other.
- Qubits can be made by manipulating atoms, electrically charged atoms called ions, or electrons, or by nanoengineering so-called artificial atoms, such as circuits of superconducting qubits, using a printing method called lithography.

What is Superposition and Entanglement?

- They are two features of quantum physics on which quantum computing is based.
- They empower quantum computers to handle operations at speeds exponentially higher than conventional computers and with much less energy consumption.

- **Superposition:**
 - A qubit places the quantum information that it contains into a state of superposition.
 - This refers to a combination of all possible configurations of the qubit.
 - Groups of qubits in superposition can create complex, multidimensional computational spaces.
 - Complex problems can be represented in new ways in these spaces.
 - **Entanglement:**
 - Pairs of qubits can be made to become entangled.
 - This means that the two qubits then exist in a single state.
 - In such a state, changing one qubit directly affects the other in a manner that's predictable.
 - Quantum algorithms are designed to take advantage of this relationship to solve complex problems.
 - While doubling the number of bits in a classical computer doubles its processing power, adding qubits results in an exponential upswing in computing power and ability.
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WORLD TRADE ORGANISATION

WTO (World Trade Organisation)

- It is an international institution that oversees the rules for global trade among nations.
- WTO has 164 member countries [with Liberia and Afghanistan the most recent members, having joined in July 2016] and 25 observer countries and governments.
- It officially began operations on **January 1, 1995**, in accordance with the 1994 **Marrakesh Agreement**, thus replacing the 1948 General Agreement on Tariffs and Trade (GATT).
- The major **functions of WTO** are:
 - Administering WTO trade agreements.
 - Forum for trade negotiations.
 - Handling trade disputes.
 - Monitoring national trade policies.
 - Technical assistance and training for developing countries.
 - Cooperation with other international organisations.

Organizational Structure of WTO

- The highest authority of the WTO is the **Ministerial Conference**, which is composed of all member states and usually convenes biennially (every two years) and **consensus** is emphasized in all its decisions.
- The daily work is handled by three bodies whose membership is the same. The only difference is the terms of reference under which each body is constituted.
 - The General Council
 - **The Dispute Settlement Body**
 - The Trade Policy Review Body

The Dispute Settlement Body (DSB)

- **The General Council convenes as the DSB** to deal with disputes between WTO members. The DSB has authority to establish dispute settlement panels.
- DSB decides the outcome of a trade dispute on the recommendation of these panels and possibly on a report from the **Appellate Body** - that hear appeals from reports issued by panels.
- **Only the DSB has the authority to make these decisions**, panels and the Appellate Body can only make recommendations.

WHAT ARE QUADCOPTERS?

Security forces in Manipur found the Meitei and Kuki factions using quadcopters to track and target their opponents in certain areas of the state.



About Quadcopters:

- It is an **unmanned aerial vehicle (UAV)** or drone with **four rotors**, each with a motor and propeller.
- A quadcopter can be **manually controlled** or can be **autonomous**.
- It's also called a **quadrotor helicopter** or **quadrotor**.
- It belongs to a more general class of aerial vehicles called **multicopter** or **multirotor**.

- **Principle:**
 - **The main principle** behind the flight of a quadcopter is **Newton's Third Law of motion**, which states that **for every action there's an equal and opposite reaction**.
 - A quadcopter's **propellers push air downwards**. This causes an **opposite reaction called thrust** that pushes the quadcopter upwards against gravity.
 - **Air movement comes from Bernoulli's Principle**, with larger propeller blades and faster rotation creating more thrust.
 - **When the propellers rotate (for example clockwise), the quadcopter will tend to rotate anti-clockwise**. **Rotational force is called torque**. Helicopters solve this by using a tail rotor.
 - **Quadcopters solve this by driving two diagonal propellers clockwise and the other two anti-clockwise**. Thus, torque from one pair cancels that of the other.
 - When each diagonal pair of propellers rotates in opposite directions, **their thrusts will be in opposite directions**. **The quadcopter will not be able to lift up** or fly.
 - **This is solved by having the blades of each diagonal pair of propellers shaped as mirror images of the other pair**. Effectively, all propellers will push air downwards regardless of the direction of rotation.

Applications:

- They provide **stable flight performance**, making them **ideal for surveillance and aerial photography**.
- Quadcopters, after being airborne, **have the ability to hover in place**, whereas fixed-wing aerial drones have to be on the move constantly.
- Other application areas include **delivery, land surveys, crop assessment, weather broadcasting**, and more.

[PERFORMANCE GRADING INDEX FOR DISTRICTS \(PGI-D\)](#)

Recently, the Department of School Education and Literacy (DoSE&L), Ministry of Education released the Performance Grading Index for Districts (PGI-D) combined report for 2020-21 & 2021-22.



About Performance Grading Index for Districts (PGI-D):

- It assesses the performance of school education system at the **district** level by creating an index for comprehensive analysis.
- Based on the success of State PGI, **83-indicator based** PGI for District (PGI-D) has been designed to grade the performance of all districts in school education.
- The data is filled by districts **through online portal**.
- It is expected to help the state education departments to identify gaps at the district level and improve their performance in a decentralized manner.
- The indicator-wise PGI score shows the areas where a district needs to improve.
- PGI-D report for **2018-19 and 2019-20 has been released** so far, the current one is combined report for 2020-21 & 2021-22.
- The PGI-D structure comprises of total **weightage of 600 points across 83 indicators**, which are grouped under **6 categories**, Outcomes, Effective Classroom Transaction, Infrastructure Facilities & Student's Entitlements, School Safety & Child Protection, Digital Learning and Governance Process.
- These categories are further **divided into 12 domains**.
- PGI-D grades the districts into ten grades viz., **Highest achievable Grade is Daksh**, which is for Districts scoring more than 90% of the total points in that category or overall.
- The **lowest grade** in PGI-D is called **Akanshi-3** which is for scores upto 10% of the total points. Ultimate objective of PGI-D is to help the districts to priorities areas for intervention in school education and thus improve to reach the highest grade.

ONE DISTRICT ONE PRODUCT (ODOP) PROGRAMME

Recently, One District One Product (ODOP) programme under Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce & Industry collaborated with an e-commerce player, Groyyo to onboard aggregators selling ODOP-identified products on its platform.



About One District One Product (ODOP) programme:

- It was launched by the **Ministry of Food Processing Industries in 2018**.
- **Objective:** To help districts reach their full potential, foster economic and socio-cultural growth, and create employment opportunities, especially, in rural areas.
- This initiative aims to turn every **district in India, into an export hub** through promotion of the product in which the district specialises.
- The initiative plans to accomplish this by scaling manufacturing, supporting local businesses, finding potential foreign customers and so on, thus helping to achieve the ‘Atmanirbhar Bharat’ vision.
- The ODOP Initiative has identified a total of 1102 products from 761 districts across the country.
- This initiative is carried out **with the ‘Districts as Exports Hub’ initiative** by the Directorate General of Foreign Trade (DGFT), Department of Commerce.

What is the process?

- Under the ODOP initiative, all products **have been selected by States/UTs** by taking into consideration the existing ecosystem on the ground, products identified under Districts as Export Hubs (DEH), and GI-tagged products.
- The finalized list is communicated to the Department for Promotion of Industry and Internal Trade (DPIIT) by the relevant Department of States/UTs.

WHAT ARE CLUSTER BOMBS?

Recently, the decision by the United States to supply Ukraine with cluster bombs has caused concern among key US allies.



About Cluster bombs:

- A cluster bomb is a type of weapon that is **designed to disperse smaller bombs** over a large area.
- They are also known as cluster munitions, with the smaller bombs referred to as submunitions or bomblets.

- They can be **dropped from air or fired from ground/sea**, dispersing dozens or hundreds of bomblets across a large area.
- These explosions pose a grave threat to anyone in the vicinity, causing death or severe injuries.
- Some bomblets **fail to detonate immediately**, leaving behind unexploded ordnance that can harm or kill people for years to come
- The use of cluster bombs **has been widely condemned internationally**.
- Over 100 countries have ratified the **Convention on Cluster Munitions**.

Key Facts about Convention on Cluster Munitions

- It was adopted in Dublin on 30 May 2008 and opened for signature in Oslo on 3 December the same year.
- It prohibits all **use, stockpiling, production and transfer of cluster munitions**.
- Separate articles in the Convention concern destruction of stockpiles, clearance of contaminated areas, assistance to victims, submission of transparency reports, and adoption of domestic legislation.
- The Convention **became binding international law** when it entered into force on 1 August 2010.
- Till date a total of 123 States have joined the Convention – 111 States Parties and 12 Signatories.
- **India is not a signatory** to this convention.

CAN WE CAPTURE CARBON AND STORE IT: EFFORTS, CHALLENGES

Why in news?

- As per experts, carbon capture and storage is sorely needed to cut pollution in sectors where other clean technologies are far behind.

What is carbon capture and storage?

- Carbon capture and storage (CCS) is a way to catch carbon and trap it beneath the earth.
- It is different to carbon dioxide removal (CDR) — where carbon is sucked out of the atmosphere.

- CDR brings down the level of carbon dioxide in the atmosphere, cooling the planet.
- On the other hand, CCS in fossil fuel plants and factories prevents the gas from getting out in the first place.
- Scientists see a big role for CCS in factories that make cement and fertiliser, as well as in plants that burn rubbish.

How well does CCS work?

- For many years, engineers have captured carbon from concentrated streams of gas — pushing it into tanks, scrubbing it clean and using it in industry or storing it underground.
- Some bioethanol plants, where the gas stream is pure, already report capturing more than 95% of the carbon emissions.
- But when it comes to capturing carbon from dirtier gas streams, like those from factories and power plants, **CCS projects have repeatedly under-delivered.**
- Some kind of chemical is needed to grab that CO₂ from dirtier sources. Such technology has been successfully demonstrated.
- However, it has not been fully commercialised at scale.
- While a handful of test facilities have managed to capture more than 90% of emissions from some dirty gas streams, commercial projects have been plagued with problems.

Why is CCS controversial?

- **Uncertain effectiveness**
 - The technology does not seem to work as advertised. This is true especially in the case of dirty gas streams.
 - There are concerns about the long-term storage capacity and stability of captured carbon dioxide, as well as potential leakage risks that could undermine the intended climate benefits.
- **License to burn fossil fuels**
 - CCS also allows companies that want to continue burning fossil fuels to gain support from policymakers and a **social license to continue their operations.**

- Instead of using carbon capture as a climate solution, these companies use it to extract more oil by injecting carbon dioxide underground in a process called **enhanced oil recovery**.
- In the past, the primary use of captured carbon has been for this purpose of increasing oil production from depleted wells.
- **Delays transition to renewable energy**
- Critics argue that efforts and funding are being directed towards an expensive and unproven technology like CCS.
- This could delay the transition to a low-carbon future.
- **Cost effectiveness**
- CCS technology is expensive to develop, implement, and operate.
- The high costs associated with building and maintaining CCS facilities raise concerns about its economic viability, particularly when compared to other renewable energy options such as wind and solar power.
- **Energy consumption:**
- CCS requires a significant amount of energy to capture, transport, and store carbon dioxide.
- This energy requirement can reduce the overall efficiency of power plants and potentially increase their environmental impact.

Way forward

- In Norway, German industrial giant Heidelberg Materials is building the first facility to capture carbon from cement and store it underground.
- The company claims a capture rate of close to 100% is possible.
- To make the technology grow cheaper and work better, governments need to tax carbon, make it easier to approve CCS projects and help set up the infrastructure around it.
- There needs to be a subsidy for green steel and green cement, because that is really going to push the people who can accelerate the development of CCS.