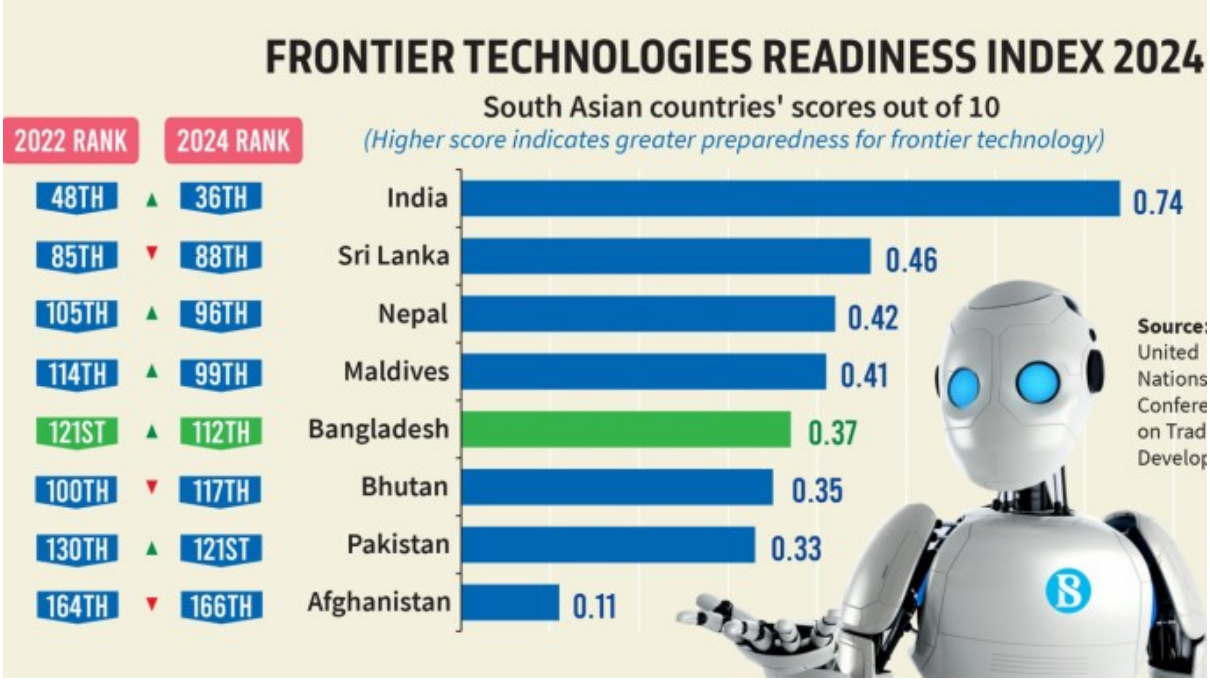
FRONTIER TECHNOLOGIES READINESS INDEX - REPORT

NEWS: India ranks 36 out of 170 nations in the Frontier Technologies Readiness Index.

WHAT'S IN THE NEWS?

India's Performance in Frontier Technologies Readiness

1. **Significant Rank Improvement**:
   In the 2025 **Technology and Innovation Report** by **UNCTAD**, India has improved its position on the **'Readiness for Frontier Technologies' index**, moving up to **36th place in 2024** from **48th in 2022**, showing notable progress in its preparedness for emerging technologies.



2. **Purpose of the Index**:
   The index serves as a valuable tool to assess how well countries are positioned to **adopt, utilize, and adapt to rapidly advancing frontier technologies** that are transforming global industries and economies.

3. **Index Composition – Key Pillars**:
   The index is calculated based on five important components that reflect a country's technological ecosystem:
   • **Information and Communications Technology (ICT) deployment** – availability and usage of internet, mobile networks, and related infrastructure.
   • **Skills** – the presence of an educated and tech-ready workforce.
   • **Research and Development (R&D)** – the intensity of innovation activities.
   • **Industrial Capacity** – the manufacturing and production strength to absorb technologies.

• **Access to Finance** – availability of capital and investments to support tech innovation.

4. **India's Category-wise Global Rankings**:
   • **ICT Deployment** – India ranks **99th**, reflecting scope for improvement in tech infrastructure and connectivity.
   • **Skills** – At **113th**, India shows a pressing need to enhance education and workforce training in high-tech fields.
   • **R&D Activity** – India ranks **3rd**, indicating strong innovation output and active research institutions.
   • **Industrial Capacity** – At **10th**, India showcases a robust manufacturing base to support new technologies.
   • **Access to Finance** – Ranked **70th**, indicating moderate support from financial systems for tech-based ventures.

Global Investment Trends in Frontier Technologies

5. **AI Investment Leadership**:
   The **United States** continues to dominate **private investments in Artificial Intelligence**, showcasing its strong private sector and innovation ecosystem.

6. **India Among Top Investors in AI**:
   India ranks 10th globally for private sector investments in AI, placing it among the top developing countries investing in future technologies, alongside **China**, which holds the **second position**.

7. **Leading Developing Countries in Tech Readiness**:
   According to the report, **Brazil, China, India, and the Philippines** are outperforming many other developing nations in overall frontier tech preparedness due to proactive policies and investments.

8. **Advances in Human Capital**:
   Countries like **Bhutan, India, Morocco, Moldova, and Timor-Leste** have made gains in **human capital**, attributed to improvements in **education levels** (years of schooling) and **increased share of high-skilled employment**, which boosts their ability to engage with emerging technologies.

Understanding Frontier Technologies

9. **Definition and Role**:
   The **United Nations Climate Change** platform defines **frontier technologies** as innovative tools that have the **potential to revolutionize industries, reshape communications**, and **offer solutions to pressing global challenges** such as climate change. These technologies can disrupt traditional systems while offering scalable solutions.

10. **Key Examples of Frontier Technologies**:

    Blockchain Technology:
    A decentralized digital ledger system that ensures **data transparency, immutability, and security**. Information is stored in a series of blocks linked by cryptography, making it **tamper-proof** and ideal for secure transactions and recordkeeping.

    Augmented Reality (AR) & Virtual Reality (VR):
    • **VR** replaces real-world environments with **fully immersive digital experiences**, often used in gaming, education, and training.
    • **AR** overlays digital elements on real-world surroundings, enhancing the user's environment with additional information or visuals, used in fields like retail, medicine, and architecture.

- **Internet of Things (IoT)**:
  IoT refers to a network of interconnected devices that **collect, share, and analyze data**. These devices can range from household gadgets to industrial sensors. For example, a fitness tracker that monitors your heartbeat and syncs with your smartphone illustrates how data moves across connected systems.

- **Quantum Technology**:
  Based on **quantum mechanics**, this area involves **quantum computing and quantum communication**. By utilizing principles like **superposition** and **entanglement**, quantum technologies can perform complex computations faster and more efficiently than traditional computers.

- **3D Printing (Additive Manufacturing)**:
  A technique of creating **three-dimensional physical objects layer by layer** using digital designs. It's used in various sectors like **healthcare (prosthetics), aerospace (engine parts), and automotive (custom parts)**, due to its ability to produce customized and precise components quickly.

- **Artificial Intelligence (AI)**:
  The ability of machines and software to mimic **human intelligence**.
  • **ANI (Artificial Narrow Intelligence)** – Designed for specific tasks like voice assistants, image recognition, or recommendation systems.
  • **AGI (Artificial General Intelligence)** – A more advanced form that can **perform any intellectual task** a human can, involving reasoning, learning, and adapting across different fields without pre-programming.

India's National Efforts: NITI Aayog's Frontier Tech Hub (NITI-FTH)

11. **NITI-FTH – A Dedicated Frontier Tech Initiative**:
    To accelerate India's leadership in emerging technologies, **NITI Aayog launched the NITI-FTH (Frontier Tech Hub)** as a specialized action tank to **strategize, coordinate, and promote India's role in frontier innovation**.

12. **Vision and Goals**:
    • The hub aims to **position India as a leading frontier tech nation**, aiding economic and societal development aligned with **Viksit Bharat** aspirations.
    • It supports a **human-centric development model**, promoting technologies that serve **human welfare and environmental sustainability**.

13. **Strategic Collaboration and Foresight**:
    NITI-FTH will work closely with **industry leaders, academic researchers, and policymakers** to gain **early insights into global tech trends**, assess their **domestic impact**, and provide **policy recommendations and roadmaps** to ensure India's readiness and proactive participation in future technology landscapes.

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