REPORT

GEOPOLITICS OF TECHNOLOGY
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INTRODUCTION

On the eve of India taking the G20 presidency, Carnegie India, in collaboration with the Ministry of External Affairs, Government of India, organized its seventh annual Global Technology Summit (GTS), themed Geopolitics of Technology, from November 29 to December 1, 2022.

This GTS was designed to explore, debate, and expand the conceptual and practical boundaries of the themes that will shape India’s G20 presidency. These include data for development, digital transformation in everyday life, and how India’s deep investments in digital public architectures, with in-built democratic principles, can shape the future of digital public goods (DPGs).

In addition, several other pressing issues such as semiconductors, India’s national quantum mission, the interoperability of cross-border payments, cyber-resilience, biosafety and biosecurity, sustainable technologies, financial inclusion, the geopolitics of data transfers, India’s growing space sector, and the India-U.S. tech alliance were discussed at the summit.

The summit also brought together leading ministers and other government officials, tech experts, industry leaders, public policy professionals, entrepreneurs, civil society representatives, and scholars from India and abroad to deliberate on three sub-themes—India’s Digital Way: The Road to G20, Navigating Partnerships and Alliances for the Future, and Fragmentation and its Effects.

The summit commenced with an inaugural address by, and conversation with, Dr. S. Jaishankar, the external affairs minister of India, and over three days, witnessed contributions from more than 100 speakers from across the world.

Hosted at The Oberoi in New Delhi, the GTS was attended by more than 600 experts. The public sessions were livestreamed on the GTS website and our digital and social media platforms, attracting more than 7,000 registrations to attend the discussions virtually and more than 1.4 million views across platforms. And the specially curated website, which had details of the latest agenda, speaker lineup, and a dedicated resource library, was accessed by more than 58,000 users from close to 170 countries in 33 languages.

Carnegie India’s Twitter, Google network, and YouTube garnered 2.2 million, 2.5 million, and 495,000 impressions, respectively.
In addition to the Ministry of External Affairs with whom the summit is co-hosted, the event received support from the Government of Karnataka, K-Tech, Startup Karnataka, Tata Trusts, Meta India, Amazon India, Intel India, Salesforce, NPCI International, Microsoft, and Google. Further, some of the public and closed-door sessions this year were organized in collaboration with knowledge partners including the Bill and Melinda Gates Foundation, The Rainmaker Group, NTI Bio, and Reserve Bank Innovation Hub.

Notably, at this edition of the GTS, Carnegie India inaugurated an initiative called GTS Young Ambassadors, aimed at socializing students and young professionals on the key issues informing global decisions on technology and geopolitics to equip future stakeholders in this space with the necessary knowledge and capacity. With this in mind, GTS 2022 welcomed the first cohort of GTS Young Ambassadors consisting of young professionals from Bhutan and students from IIIT Bangalore, the Kautilya School of Public Policy, and the Indian School of Public Policy. They met delegates from the government, academia, industry, and civil society, and participated in sessions on key issues.

GTS 2022 received extensive media coverage, with more than 130 news reports by regional, national, and global news organizations across both print and broadcast. These included NDTV, The Hindu, The Times of India, Hindustan Times, Maharashtra Times, Indian Express, Economic Times, ThePrint, Tribune, Business Insider, Republic World, Zee News, Times Now, Asianet News, and WION. As the broadcast partner for GTS, WION also featured key sessions across its TV channels globally, reaching approximately 82 million households in Africa, Asia, Australia, the UK, Europe, and North America. At the summit, WION also held interviews with some of the speakers, and these garnered more than 1,00,000 views.

As the media partner for GTS, Asianet News carried content via articles and social media posts on its regional platforms in six languages—Tamil, Malayalam, Kannada, Bangla, Telugu, and Hindi—and reached more than 70 million users across the country.

With our digital partner, ThePrint, Carnegie India curated a series of eleven dedicated opinion pieces around the theme Geopolitics of Technology. ThePrint also carried some discussions from the summit on its YouTube channel. Additionally, DD News and ANI, the Indian government’s media networks, carried certain discussions from the summit on TV.
Inaugural Address by S. Jaishankar

Conversation on ‘Geo-digital’ and its Effects

Video message by Melinda French Gates

Keynote address by Amitabh Kant
DISCUSSION HIGHLIGHTS

Day 1: November 29, 2022

The first day of the summit, themed *India’s Digital Way: The Road to G20*, began with an inaugural address by Hon’ble S. Jaishankar, the external affairs minister of India. He emphasized that technology is at the heart of geopolitics and the rise of India is deeply linked to the rise of Indian technology. He highlighted six points in his opening remarks:

1. Technology is not agnostic, and there is a very strong political connotation built into it. Therefore, all our choices [in this area] will have strategic implications.
2. The broader context of globalization is about economy, technology, and mobility. The debate should not be for or against globalization but between collaborative globalization and one dominated by a few players.
3. The Westphalian model of international relations is not the final word. In the era of technological penetration, trust and transparency among partners are key.
4. The Nagoya model of supply-chain cooperation is also under challenge. In the era of Covid, conflict, and climate change, resilience and reliability in supply chains are essential.
5. In a world of civil-military fusion, the definition of strategic technologies has changed in India. Building deep strengths alone will determine our capabilities and will drive rebalancing.
6. Geopolitics ultimately comes down to partners and choices. For India’s geopolitical positioning, the key criteria are who gives access, who provides markets, and who collaborates.

The minister followed his address with a conversation with C. Raja Mohan, Senior Fellow, Asia Society Policy Institute, titled *Geo-digital and its Effects*. The minister highlighted that the world needs a more decentralized globalization and emphasized that de-risking the global economy will entail de-risking the technology and the production sources associated with it. He added that we can no longer compartmentalize the world of national security from the world of market economics and business. He further underlined that while no country can be an island, each needs to identify trusted partners and geographies, where they have reasonable confidence that the possibility of misuse of data is much reduced because of potential safeguards in those societies. Therefore, instead of turning inwards, nations need to collaborate with trusted partners to grow their own capabilities and be mutually beneficial to their partners.

Next was a video message by Melinda French Gates who highlighted India’s investments in digital ID and digital payment systems. These existing infrastructures were primarily leveraged to transfer emergency cash to 300 million+ people, including more than 200 million women during the coronavirus pandemic in India. This, she said, was one of the reasons that India’s most vulnerable people avoided the worst of economic shocks. She spoke about how digital public infrastructure (DPI) is not just about economics but can also be used to improve healthcare. It enables health systems to provide greater access and better patient care, and to track health threats in real time. Digital tools can also be used to tackle food insecurity and the effects of climate change by providing farmers with critical information on weather and soil, she explained. Speaking about India’s G20 presidency, she expressed excitement to see how governments will explore the potential of an equitable and inclusive DPI, how tech firms will build the right tools, and how non-profit organizations will ensure that nobody is excluded.
Panel on India’s Digital Way: The Road to G20 and Beyond

Video Message by Nandan Nilekani

Panel on Digital Identities: Foundational Architectures for a Digital Society

Keynote address by R.S. Sharma
In his keynote address, India’s G20 Sherpa Amitabh Kant highlighted two key priorities for India’s G20 presidency: India’s digital transformation agenda and women-led development. He added that India is an undisputed leader in technology and the world believes in its capabilities. This, he said, was seen during the pandemic, when it attracted vast amounts of capital when capital was fleeing countries across the world. Unlike developed countries, India has adopted an unprecedented and powerful approach in policy governance through the adoption of DPI. This has enabled India to leapfrog digitally, with the public sector playing a key role in defining the regulatory guardrails and the private sector innovating and competing in the marketplace. DPI is an area where an emerging market like India has created a unique model for the world, converging both privacy and innovation, he said, adding that this model will create a new economic divide between countries that are leapfrogging ahead with DPI and the rest of the world. Therefore, at G20, India will work with countries to promote DPI to deepen financial inclusion, improve the efficiency of public services, and enhance women’s development.

Building on this was a panel discussion titled India’s Digital Way: The Road to G20 and Beyond, in which speakers elaborated on the need for digital transformation in facilitating access to government benefits and transforming the health and agriculture sectors. They discussed how India’s digital stack can be used as an instrument of soft power. They examined if India has the resources to attract other countries to adopt the India model, and whether it can persuade international financial institutions to provide money to countries to adopt the Indian solution. The discussion veered towards how DPGs could serve as a backbone for many private entities and be a solution for countries outside the advanced OECD economies that do not have a highly sophisticated technology sector. Speakers emphasized that the India model might be more lucrative because of its low-cost and open-source architecture. They added that India could use its G20 presidency to address larger issues such as global hunger, bridging the digital divide, and strengthening its relationship with Africa in a more meaningful way.

Next on the agenda was a video message by Infosys and UIDAI’s Nandan Nilekani, who highlighted the evolution of India’s unique approach to developing DPI and DPGs. Starting with Aadhaar, a digital ID system that can be used to authenticate a person through biometrics or one-time password, he spoke about how India has enabled direct benefit transfer to more than a million beneficiaries. He also discussed the democratization of payment systems in India, with Unified Payments Interface (UPI) as one example of advancing peer-to-peer payment systems. He highlighted three big things that India will establish in the next decade. The first is Open Network for Digital Commerce (ONDC), which will allow e-commerce to be much more inclusive and disaggregated for millions of small suppliers to sell on this network and for millions of small retailers to participate as small sellers. Second, the account aggregator framework, which will empower individuals and small businesses who generate the data to use their data to access multiple services like credit. Third, the transformation in logistics due to government initiatives such as GST, Fast Tag, and the e-way bill, which have simplified the movement of goods on highways. The speaker stressed that India is not aggregating data for advertising or social media but is helping individuals and small businesses use their digital footprints to grow and create jobs.

The next panel discussion, titled Digital Identities: Foundational Architectures for a Digital Society, highlighted the significance of digital identities in accessing public services such as opening a bank account, registering a new mobile SIM, receiving welfare payments, and formal employment. A key point of debate was whether centralized ways of delivering development work better than a
Panel on Digital Health Solutions: Road to Sustainable Healthcare Delivery

Address by Harsh Vardhan Shringla

Conversation on initiative on Critical and Emerging Technology (iCET) between India and the U.S.

Panel on A Connected World: Aligning Principles for Cross-Border Payments
decentralized digital ID system in which users have more control over the amount of information they share, especially in the context of cyber-threats by insiders. Speakers debated whether a centralized approach is conducive to authentication and expressed concerns regarding data privacy, interoperability, and surveillance issues, especially in the absence of a data protection law.

This was followed by a keynote address by R.S. Sharma, who explained the objective of the Ayushman Bharat Digital Mission (ABDM) to deliver affordable, quality, and accessible healthcare. The CEO of India’s National Health Authority (NHA) noted that openness, scalability, interoperability, and frugality, along with open standards, is the architectural principle of the health DPG. Of the many building blocks of the mission, the speaker focused on Ayushman Bharat Health Account, through which a citizen’s health information can be linked to a specific number and can be kept secure with a consent mechanism. He also emphasized that instead of just end-user applications, India’s digital health architecture has a flexible framework to suit innovation and maximum participation. For instance, CoWIN, a portal that was developed for COVID-19 vaccine registration, is now being repurposed for children’s universal immunization, blood, and organ donation; and the Unified Health Interface (UHI), built along the lines of UPI, has been created with a completely interoperable architecture to enable search, booking, and availing of health services. This way, the doctor and the patient, with different apps on their devices, can seamlessly undertake virtual consultations. Addressing privacy concerns, the speaker clarified that data is stored in a federated data structure while only the link is stored in the system’s consent manager, where it is secured in a multi-layered system and can be shared with a doctor or service provider only with the user’s consent.

Health was also the focus of the next panel discussion titled *Digital Health Solutions: Road to Sustainable Healthcare Delivery*, which highlighted how countries that had invested in digital health identities prior to the pandemic performed better during COVID-19. The panel spoke about how healthcare systems cannot be solely run by the government and emphasized that private players should be included with the right incentives, as seen in some African countries. Acknowledging the benefits of digital health solutions, the speakers discussed that some of these solutions are built by small and agile teams that sometimes lack access to stable funding. They also emphasized that it is important to increase awareness regarding the difference between interoperability and integration. While the former is expensive upfront, the latter is cheaper, but as systems become more and more complex, integration becomes very expensive, and interoperability suddenly has solid return on investment. A key aspect of the conversation was how standards, application programming interface, and scale are the three crucial prerequisites to developing sustainable digital health solutions.

In his keynote address, India’s G20 Chief Coordinator Harsh Vardhan Shringla highlighted that given strong global polarizations, expectations from India’s presidency of the forum would likely be onerous and extraordinary. India’s experience in handling pressing development-related issues and its achievements in providing inclusive and accelerated development to its citizens would help us to provide answers to the global challenges, he noted. Therefore, developing countries that have felt the adverse impact of the pandemic and consequences of the Ukraine conflict in the form of rising costs of food and energy imports look to India’s presidency for aspirations and solutions to stimulate macroeconomic and financial stability. The speaker underscored that if digital architecture is made widely accessible, it can bring about socio-economic transformation and the proper use of technologies can become a force multiplier in the decades-long global fight against poverty.
Curtain Raiser on Data Empowerment and Protection Architecture

Panel on The Next Decade of India Stack

Panel on The World We Live In

Video Message by Amandeep Singh Gill
The next session saw Tarun Chhabra, Senior Director, Technology and National Security Council, The White House, explain the guiding factors for the **Initiative on Critical and Emerging Technology (iCET) between India and the United States**. He highlighted that the conversation between India and the U.S. had evolved from discussing bottlenecks and challenges to brainstorming areas of opportunities and cooperation. Therefore, the iCET can be a catalyst to activate, accelerate, and rejuvenate existing dialogues between both countries that share a recognition about vulnerabilities in certain technology supply chains and have the mutual desire to build resilience in their systems. The world, according to the speaker, is undergoing geostrategic, digital, and industrial strategy transformation, and most nations will take time to adapt and ensure alignment with like-minded countries. He also emphasized the importance of welcoming initiatives with stakeholders outside the government. Elaborating that private capital is looking to de-risk investments, he stated that a clear signal from governments about their priorities would encourage newer stakeholders to be involved in the ecosystem.

The next panel discussion, titled **A Connected World: Aligning Principles for Cross-Border Payments**, highlighted that the intensification of trade in goods and services, along with the mobility of people and capital, has contributed to the growing importance of cross-border payments. Faster, transparent, and cost-efficient cross-border payments, especially real-time ones that are both initiated and settled instantly, can immensely benefit people and economies worldwide and further financial inclusion. While acknowledging the pros of these payment systems, the discussants highlighted that there are three layers to facilitate interoperability: the business layer, the semantic layer, and the technical layer. While technical and semantic interoperability are easier to align, business interoperability is difficult because countries have historically built their legal structures, compliance structures, and liability settlement mechanisms between different operators, based on their own understanding of the payment landscape. The panelists also highlighted that merchant payment systems should be considered independent of real-time payment systems, given the varying risk liabilities.

In the curtain raiser on the **Data Empowerment and Protection Architecture (DEPA)**, Rahul Matthan, Partner, Trilegal, explained that DEPA is not simply a consent framework to replace the consent that we provide when we sign up for a service that requires consent. It is a way to split consent into the consent that you collect when you sign up and the consent that you need when you port or transfer your data. He stated that the DEPA is a framework that lets users share data and infrastructure in a safe manner, and this applies equally to emerging, developing, and developed markets. He emphasized that DEPA should be highlighted and promoted under India’s G20 presidency because it is probably the only digital infrastructure that allows regulators to regulate and innovators to innovate, thereby balancing policy and market.

**The Next Decade of India Stack** was a panel discussion focused on ways to deepen the Stack’s impact in India and widen its reach internationally. While highlighting that the India Stack is not only open, free, inclusive, and democratic but is also not owned by big tech companies or the state, the discussants added that the involvement of the private sector and tech talent has been crucial in widening the adoption of the digital stack within Indian society. The panelists also acknowledged that there is global recognition of the fact that the India Stack reflects certain political ideals and aspirations and has served as an instrument of social and economic transformation, inclusion, and
Panel on Digital Public Infrastructure: Building Collaborative Partnerships and Alliances

Ministerial Address by Michelle Donelan

Panel on Cyber-resilience: Security of the Internet Infrastructure

Ministerial Address by Meenakashi Lekhi
empowerment. On the internationalization of the India Stack, they suggested that the purpose of this should be clear from the beginning and highlighted that collaboration on the foundations of trust is important but challenging, particularly in a world that is increasingly fractured and underpinned by great technological disputes. They further noted that it might also be challenging because of different political, policy, administrative, institutional, and market structures.

This was followed by a panel discussion titled *The World We Live In*, which highlighted that in the next ten to twenty years, emerging technologies such as artificial intelligence and quantum computing will have the potential to transform the future of work, industry, and service delivery, but will be intrinsically dual use, especially because of their applications in the defense sector. One of the arguments raised was that if the world securitizes everything, then the flow of capital will not be viewed as a commercial or public good but as a national security issue. Speakers also suggested that in the tech world, while countries will want to work with trusted partners, they would look for avenues that don’t tie them up with one system or another. India, which has been traditionally linked with democratic nations, will also look for backup plans, they added, noting that the geopolitics of technology is certainly becoming a priority and a concern for all private companies and multilateral organizations like the United Nations. During the framing of the High-level Panel on Digital Cooperation, panelists acknowledged, India took the lead to include the language around DPGs in the global vocabulary, which led to the creation of the Digital Public Goods Alliance (DPGA). This, they said, shows that there are areas where we can delineate between geopolitics and collective action.

The United Nations Secretary-General’s Envoy on Technology Amandeep Singh Gill addressed the summit via a video message. He highlighted how over the past few years, interest in DPGs and DPI has grown and countries with resilient DPI were able to respond in a more inclusive and impactful way to the pandemic through subsidies and other government assistance. He pointed out that as India takes over the G20 presidency from Indonesia, which will be followed by Brazil and South Africa, it is important to highlight the complex social and economic challenges that persist in developing economies. But, he added, there is a great opportunity for interesting developments to take place owing to the digital maturity of the developing countries within the G20. He reiterated the UN’s belief that a safe, inclusive DPI can enable the development and adoption of safe, inclusive DPGs globally. The world is lagging on all the seventeen sustainable development goals (SDGs), but the ongoing digital transformation is an opportunity to accelerate progress on this front.

The next panel, titled *DPI: Building Collaborative Partnerships and Alliances*, focused on the benefits of DPI while addressing related privacy and cybersecurity risks. Clarifying the difference between DPI and DPGs, speakers mentioned that DPI refers to the horizontal cross-sectoral enabler—the foundation that other things are built on top of, which is typically governed by the government and operates at a national scale. DPGs, on the other hand, are economically non-rivalrous and non-excludable, meaning that anyone can adopt and adapt them. As an example, Aadhaar is indeed a DPI, which operates at a national scale. But another country cannot freely adopt it. Although, there is an open-source version inspired by Aadhaar, called MOSIP, which is a DPG. The discussants also touched upon the unintended consequences of exporting DPI to autocratic states, which might not have the same checks and balances as democratic countries.

This was followed by a virtual ministerial address by Michelle Donelan, the UK’s secretary of state for digital, culture, media, and sport, who emphasized that technology will only deepen the relationship between India and the UK, and that there were for two reasons for this. First, India is a
Panel on What’s New IN-SPACe?

Conversation with Nick Clegg

Talk on India as a Startup Nation

Panel on Startup 20: An Agenda for G20
huge player in the digital space, has a thriving digital economy, and is home to the biggest social media base in the world, with great influence to shape the global future of technology. Second, as the largest democracy in the world, India can support the UK government that is determined to use its international influence to make sure that the digital world reflects their value. She highlighted four key areas to deepen India-UK engagement. The first is data, where India and the UK can jointly realize the benefits that the flow of data can offer while ensuring continued data protection rights. The second is telecom, where India can play a role in supporting UK’s telecom market. The third is cyber, where the UK would want to use India’s tech expertise to improve the security of apps, devices, and other digital services. And the fourth is online safety, where the UK wants to work with the international community to protect users everywhere around the world, including in India.

The last discussion of the day, Cyber-resilience: Security of the Internet Infrastructure, focused on the evolution of the cyber-risk landscape. From small-scale actors who use cyber for their advantage, we have moved to large actors, with it being looked at an offensive capability for nation-states to disrupt, deflect, and detract people or destroy or degrade the infrastructure. The panelists highlighted three specific areas of concern: cyber-attacks, which are conducted to degrade or destroy infrastructure; cyber espionage, which is to steal intellectual property; and cyber influence, which uses the internet to influence people’s thoughts and emotions about certain issues. In sum, speakers emphasized that cyber is now being used as a complement or supplement to actual war.

Day 2: November 30, 2022

The second day of the summit, themed Navigating Partnerships and Alliances for the Future, began with a ministerial address by Minister of State for External Affairs and Culture of India Meenakashi Lekhi. She highlighted the digital transformation initiatives spurred by the Government of India in the last decade, noting the underlying principles of these: inclusivity, ease of doing business, ease of understanding for the layperson, and enhancing efficiency by rooting out pilferage of welfare benefits. She submitted that the scale and success of these initiatives and policies offer lessons on the application of technology and technological solutions for the benefit of common people, not just for India but for other developing countries seeking to improve governance through tech. She also stressed the need for countries to recognize that technology, in addition to commercial opportunities, also provides a way to reach the unreached. She offered examples of DPGs that are provided free of cost, like DigiLocker (which enables storage of digital documents), INCOIS (Indian National Centre for Ocean Information Services, an autonomous institution under the Ministry of Earth Sciences, which provides ocean data, information, and advisory services), and DPGs like CoWIN (the government’s platform for vaccine registration) that were shared freely with other countries during the Covid-19 pandemic.

The day’s first panel was titled What’s New IN-SPACE? and focused on several reforms introduced by the Indian government to open the space ecosystem to greater private sector participation and investments, including the setting up of Indian National Space Promotion and Authorization Center (IN-SPACe). A key point made was that there are still some steps required to streamline the approval process, especially related to clarity on timelines, transparency, and inter-ministerial or inter-departmental coordination. Further, there is a need for more government-to-government engagement, at the levels of the Department of Space, Ministry of External Affairs, and NITI Aayog. Also
Talk on Ayushman Bharat Digital Mission

Conversation on Healthcare.AI: Disrupting Healthcare for Bharat

Keynote address by Margrethe Vestager

Panel on Technology & Trade: Opportunities & Challenges
highlighted were the steps needed to improve investments and innovation in the Indian space ecosystem to increase India’s overall share in the global space economy. The panelists viewed that India must consider a multilateral approach rather than the more mini-lateral approach of the Artemis Accords led by the U.S. Moreover, they noted, India is already collaborating with around sixty-one countries on its space program. If it must, India could consider joining the Artemis Accords provided the terms are acceptable to the country.

This was followed by a conversation with Nick Clegg, the former deputy prime minister of the UK and the current president of global affairs at Meta. He spoke about the future of the Metaverse and how the next decade will probably see heavy investments in augmented and virtual reality technologies. The speaker further stated that these technologies will evolve in such a way that the physical hardware will increasingly become almost invisible and organic. On balancing governance and regulation with innovation, he noted that related to basic rules around the privacy, safety, and sovereignty of data individuals, other fundamental questions will involve who will enforce those rules in the Metaverse, what rules will apply for a seamless movement of actors and commerce between multiple metaverses, and how we will manage the distinction between the real world and the Metaverse from a governance perspective. He also suggested that the three techno-democratic jurisdictions (the U.S., the EU, and India) should broadly align on the principles that should underpin the governance of the internet. He also stressed the importance of greater communication and understanding between technologists and politicians.

Mohandas Pai, chairman, 3one4 capital, then spoke about India as a Startup Nation, spotlighting the country’s strengths, status, and opportunities in the startup ecosystem, which, he stated, is the third largest in the world and will eventually create a ten trillion-dollar economy. He explained that India’s key strengths are some of the largest databases in the world, technological prowess (as seen in innovation in digital payments and DPGs), a conducive policy environment (for example, Startup India and Invest India), and the largest concentration of tech talent that powers both India and the U.S. He also mentioned the rise of digital monopolies located largely in the U.S., the attendant challenges related to control and accountability of such monopolies, and the control of, and access to, data. Addressing the challenges of control and access will be particularly important given that competition in the future will occur in transversal technologies, he concluded. He recommended a Universal Declaration of Digital Rights to tackle the challenges, especially where such monopolies hold the power to exclude, even erase, individuals from the digital world.

The next panel, titled Startup 20: An Agenda for G20, focused on three principal elements that are imperative to successful innovation ecosystems. First, research universities that generate technology as well as founders and entrepreneurs; second, research laboratories at the levels of national government, independent non-profits, and corporates, with the last focusing largely on applied research; and third, access to investment at various stages, from angel to late-stage growth capital. These three elements are situated relatively close to each other in the Silicon Valley, the speakers noted. While it is difficult to replicate this model, panelists discussed, each country comes with its own competencies and comparative advantages. For example, the emerging market model for digital innovation is the creation of public platforms as they enable the creation of data and low-cost usage for their populations. With digital public platforms like the India Stack, India does provide an alternative working model.

This was followed by a talk by Basant Garg, additional CEO of the NHA, on ABDM that explained the design, principles, and architecture of India’s flagship national mission on digital health. The main
Panel on Creating Public Infrastructure for an Open Digital Economy: The Indian Experience

Conversation on National Quantum Mission

Talk on Building Unique Collaborations for Innovation

Panel on Bridgital USP: Building Unique Semiconductor Partnerships
challenge in the health sector, he said, is the fragmentation of the sector and health records, even where the latter are digitized. Therefore, a principal aim of the ABDM is to promote low-cost digital health solutions and enable interoperability between various platforms for sharing health records. He pointed to the key challenges to implementing ABDM, including lack of infrastructure, software, resources, behavioral constraints relating to patients’ lack of awareness or trust in technology, doctors’ perceived need for physical facetime with patients, and the fear of permitting access to transactions or financial records where they may be off the books. Further, technological constraints include lack of interoperability and standards, privacy and security concerns, fear of the state, and financial exploitation. He stated that the ABDM is designed to use cloud-based technologies to ensure security and scalability, leverage India’s familiarity with QR-based payment systems to introduce a QR-based consent model, adopt standards for interoperability, and design better customer interfaces, including offline, for greater reach and inclusion.

The next conversation, titled Healthcare.AI: Disrupting Healthcare for Bharat, highlighted the disruptive role that tech can play in ensuring easy access to affordable and quality healthcare through the lens of a startup. One, in a system that is currently peer- or doctor-centric, digital highways or connectivity will ensure access to healthcare for a significant portion of customers or patients who don’t live in urban areas where most doctors reside. Two, tech and newer business models will enable higher efficiency and productivity (that is improving access with same or higher quality of service) per capita or per healthcare provider. The three big advantages that position India uniquely in creating AI in healthcare models, for both itself and the developing world, are: the absence of a legacy system that will enable India to create and shape digital access to healthcare; rich data, especially as digitization of data speeds up, which will help create models that others haven’t; and talent. The speaker stressed that policymakers must be nimble, and that clear direction, a multidisciplinary approach, and policy and regulatory certainty are key to growing the startup ecosystem, building new skills within the policy space, and catering to the complex issues involved. Moreover, given the multiple agencies involved in this space, policy and regulatory coordination is crucial. Finally, anonymized datasets and infrastructure are imperative for startups to innovate and build healthcare models and solutions.

Next was a keynote address by Margrethe Vestager, Executive Vice President, European Commission for a Europe Fit for the Digital Age, titled Contours of Building an EU-India Trade and Technology Council (TTC). The principal intent behind this TTC is to establish a strategic coordination mechanism at the highest political level between India and the EU to tackle challenges and advance cooperation in trade, trusted technology, and security, and to catalyze joint action in emerging technological fields like 5G, artificial intelligence, climate modelling, and health. She offered a key insight on the developments in the EU—the impending adoption of a declaration of digital rights and principles that will ensure the same rights are available online as offline and that these are embedded in the regulation of digital platforms. She also underlined the common values that underpin relations between India and the EU, such as democracy, the rule of law, and the support for a rule-based international order. She noted that the EU-India TTC should unite the complementary visions and economic potential of India and the EU while enabling mutual efforts to advance a human-centric approach to digital technologies. She also reiterated the EU’s support to India’s G20 presidency.

Technology and Trade: Opportunities and Challenges was the title of the next discussion, and the subject was explored via three themes: fragmentation, on account of agreements and ideas of the functioning of digital trade, including on cross-border data flows and data localization; the opportunity that exists, especially for India, amid or despite such fragmentation; and the form or
Talk on Responsible Artificial Intelligence (AI): We Have the Principles, We Need the Tools

Panel on Responsible AI: A Strategic Imperative

Book Discussion on After Tiananmen: The Rise of China

Conversation on G20 Troika: Indonesia, India, Brazil
shape of international coordination as India takes the G20 presidency. In the context of the under-negotiation EU-India Free Trade Agreement (FTA), the panelists discussed the contrasting approaches to devising regulatory frameworks in the EU and India. The European perspective favors a global or multilateral solution over bilateral agreements, even at the scale of EU and India, to avoid fragmentation. In this regard, the World Trade Organization (WTO) would be the preferred forum to pursue this. The EU’s hope would be that India joins this process at the WTO and develops a global agenda in this space as the G20 president. On the other hand, the Southeast Asian and East Asian perspective, including India’s, believes that the analogy of international trade in the traditional sense of freer flow of goods, services, capital, and people would not apply to the digital economy and trade. This is because not only the digital divide is stark in this part of the world but also the allocation of work in digital trade is distributed globally and defies the traditional gravity model of trading that seeks partners based on geographical proximity.

The next panel, titled Creating Public Infrastructure for an Open Digital Economy: The Indian Experience, examined five global trends to show how technology impacts geopolitics. First, the mainstreaming of digital technology in the geopolitical discourse. Second, the openness or the development of open-source technologies that would probably give India an opportunity to showcase its progress during the G20. Third, sovereignty and how we define its boundaries in a digital world. Fourth, interdependence, which has evolved from being between companies to between countries and is growing. companies to between countries and is growing. And finally, shifting power dynamics—some Big Tech companies that used to have just economic powers now also have political powers. The panelists noted that as India looks to share its unique position and success in designing and deploying open DPI and DPGs with other countries, especially the global south, these architectures and goods should be designed in a context-specific manner and customized to local values, conditions, and concerns. Additionally, from an institutional point of view, the element of trust will be crucial. India has a particular challenge here because the local circumstances are such that the best way to instill trust and scale public technologies is to make it government tech, the discussants viewed, adding that this may, however, not hold true outside India. So, India has the challenge of creating “fiercely Indian non-governmental institutions” that are accepted around the world.

Principal Scientific Adviser to the Government of India Ajay Kumar Sood then spoke about India’s National Quantum Mission. He focused on the key aspects of the National Mission for Quantum Technologies and Applications (NM-QTA), explaining that this is an inter-ministerial undertaking led by the Department of Science & Technology and will house four verticals: quantum computing, quantum communication, quantum sensors and metrology, and quantum materials and devices. It will follow a hub and spoke model with four hubs, one for each vertical, housed in institutes or universities that will be selected on a competitive basis. Each hub will be responsible for the research and development of its vertical throughout the country, will form linkages and involve industry and startups from the outset, and will train talent. Moreover, the speaker noted, international collaboration is this field is important and has scope as the difference in the progress of different countries in this space is relatively minor, and the commercial angle (that can lend itself to competing interests and secrecy) is yet to develop. One of the biggest challenges in this field, he cautioned, is the uncertainty as to which quantum technologies or applications (sensors or computing, for example) the talent should be trained in. He also stressed that given the long timeframes and uncertainty involved in developing these technologies, continuous funding, especially from the government, will be crucial.

In her talk titled Building Unique Collaborations for Innovation, Nivruti Rai, who is the country head at Intel India and vice president at Intel Foundry Services, introduced the idea of “trust-based
Ministerial Address by James Cleverly

Ministerial Address by Josephine Teo

Panel on Save the Data: Localization as Democratization?

Ministerial Address by Sanae Takaichi
digital geographies” to bring together the relative advantages and contributions of different stakeholders. She also presented the concept of “digital neighbors” who will bring about, or occupy, such digital geographies. These neighbors have less to do with geographical proximity; the emphasis is instead on trust—so, it means those whom an entity trusts and is willing to share data with. Importantly, technology will play a key role in establishing such trust. As a data-rich country, she said, India can build collaboration infrastructure under its G20 presidency to establish trust-based digital geographies for data, with privacy, security, and safety. She enumerated three technologies that will enable this: federated learning, where the data is not moved from one place to another and instead depends on a distributed model; homomorphic encryption, which enables one to work on encrypted data; and differential privacy, which permits access to only such data as is needed for the task at hand without exposing other details. The importance of building such a collaborative infrastructure is crucial as it will enable data sharing and will allow more countries to participate, create value, and solve real-world problems in diverse fields such as health, diagnostics, and smart mobility, she added.

In the next discussion, titled Bridigital USP: Building Unique Semiconductor Partnerships, the panelists averred that semiconductors are both one of the most widely traded products as well as national security assets. They discussed that while the Indian semiconductor policy is compelling, the country needs to: be more globally competitive, especially as other countries are also providing similar incentives; promote the value or opportunity present here; and identify specific products or use cases, and their market, to establish business viability to attract investments. Several countries, including the U.S., through the CHIPS and Science Act, are focusing more on manufacturing and less on design and other aspects. From the point of view of competition, a subsidy race with China on manufacturing (of fabs) will be infructuous since China is likely to outcompete on that front. Therefore, a smarter policy would be to properly target subsidies, and by this, target activities other than manufacturing in the supply chain, such as chip design and packaging. The latter of these, which was seen as a low-tech and low value-added component of the supply chain, is a key upcoming trend in the industry referred to as advanced packaging.

Matt Sheehan, Fellow, Carnegie Endowment for International Peace, then took the stage for his talk titled Responsible Artificial Intelligence (AI): We Have the Principles, We Need the Tools. He submitted that the world has now entered the third phase of principles and tools for governing AI. The first, the table-setting phase, from around 2016 to 2021, was largely about identifying principles and plans. This phase saw several countries releasing national AI plans as well as the articulation of international and ethical principles. The next phase, around 2021-22, saw the conversion of principles into plans, or release of legislations. Now, in the new phase that began in 2022, Sheehan stated that we need to build the tools to convert these principles and legislations in a way that they “place real demands on companies and on developers and on researchers.” He illustrated this through the example of two policy demands. The first is explainable AI—that is, to provide a human, understandable explanation on why an AI system made the decision it made. The difference, he explained, is that while you can read a software code and identify the outcome, it is difficult in machine-learning models, especially deep-learning models, as they go through “a giant statistical space.” Plus, a lot depends on the data these models are trained on, among several other factors. The second demand is ethical AI to prevent hate speech or violent imagery. This is also hard, and the industry is trying to respond with red teaming exercises. But these are unsolved technical problems and untested policy tools, the speaker said, and building out these technical and policy tools is the next step.
Panel on Lessons from the War in Ukraine

Panel on Promoting Sustainability: Transitioning to a Net-Zero Economy

Conversation on Building Technologies for a Sustainable Global Food Chain

Panel on Local Content: Instrument of India’s Soft Power Globally
On the heels of the previous talk, the next panel, *Responsible AI: A Strategic Imperative*, covered a multitude of issues: global and local alignment of principles, developing universal regulation or principles collaboratively in the current geopolitical context, the dual-use nature of AI, separating good from harmful applications, the fundamental tension between regulation and innovation, and the role of various stakeholders in all of this. The speakers highlighted that while AI has the potential to address some socio-economic problems at scale, it also carries security and strategic implications. They discussed that the urgent need for policy and regulatory focus given the speed at which AI models and applications are being developed and deployed across the world, and the different approaches to them—one that seeks to secure and perpetuate control, and one broadly built upon open, ethical, and democratic principles.

The day ended with the launch of Vijay Gokhale’s book *After Tiananmen: The Rise of China*. The author highlighted his principal motivations for writing the book. One, to fill the gap that exists when it comes to an India-specific perspective on China, and to improve the quality of public discourse on this subject in India, which is otherwise both superficial and prejudicial. This, he said, is important given that the two countries are proximate neighbors and India, being an emerging economy, would face different issues with China than the developed world. During the discussion on the book, the panelists agreed that having an Indian frame of reference would be essential to deal with China, but equally, it was important to learn from China’s experience in terms of economic growth and development. Mr. Gokhale also pointed out that the period from 1990 to 2010 is typically seen as an interregnum between the reigns of two towering personalities, Deng Xiaoping and Xi Jinping, but actually, this was when China laid the groundwork for its rise to power. Be it in terms of culture, science and tech, the economy, or national security, Chinese leadership took significant political risk during this period to undertake reforms and really leapfrogged in these two decades. He added that one of the features of this period was the relaxation of authoritarian control.

**Day 3: December 1, 2022**

The final day of the summit marked the first day of India’s G20 presidency. Under the sub-theme *Fragmentation and Its Effects*, the day’s sessions began with a virtual conversation titled *G20 Troika: Indonesia, India, and Brazil*. Amitabh Kant and Sarquis José Buinain Sarquis, India’s and Brazil’s respective G20 sherpas, spoke extensively about the use of data for development as one of the key drivers of India’s term. India’s G20 sherpa elaborated that data for development means unleashing the vast potential of data and data flows to foster growth and innovation keeping in mind the sustainable development goals (SDGs), especially in the global south, by bringing the power of digital technologies and data-driven insights to areas like agriculture, health, education, and green transition. Welcoming this principle, the Brazilian sherpa emphasized that Brazil and India share a common agenda on digital transformation. He also highlighted that data governance must be addressed multilaterally and that the G20 should recognize and promote these negotiations. Speaking about strengthening financial resilience to achieve the SDGs, both sherpas pointed out that public sources of funds might not be enough to bridge the investment gap in developing countries. The developed world, private sources of funds, and multilateral development banks are therefore critical to enhance credit flows to developing countries to reduce risks.

James Cleverly, the UK’s secretary of state for foreign, commonwealth, and development affairs, then delivered a ministerial address, in which he focused on how emerging technologies are fundamentally reshaping the world’s economy. In addition to unlocking unimaginable gains in global health and prosperity, advancements in technology are presenting new challenges to our values and security, he
Panel on Architecture for Biosafety and Biosecurity

Ministerial Address by Rajkumar Ranjan Singh

Keynote address by Rajesh Bansal

Panel on Open-Network Technologies: A Driver of Financial Inclusion
added. According to him, India and the UK are ideally placed to use their science, technology, and digital leadership to meet these challenges and maximize opportunities for cooperation—for example, through trade investment. Both countries have two of the biggest herds of tech unicorns in the world, a superb academic and research base, and some of the greatest AI capabilities. He also acknowledged that India and the UK are working together in multiple ways to mobilize technology to fight against disease and climate change and argued that other democracies should address other challenges in the digital age.

This was followed by another ministerial address by Josephine Teo, Singapore’s minister for communications and information, who acknowledged that data is a critical resource in the digital domain, but unlike many other experts who often describe data as the new oil, she argued that this is a flawed analogy. She explained that unlike oil, the nature of data is not finite and does not deplete. It is quite the opposite of oil because we can unlock new value by resharing or reusing data, and its innovative application can drive the digital economy, inform policymaking, and improve the experiences of people. She also noted that free data flows across borders enable businesses to digitally serve many markets, create efficiencies, and drive innovation. There are legitimate concerns about data being mishandled or abused, she said, but countries should find the unique balance between data innovation and data protection. She appreciated that India’s strength in the digital domain (for example, the India Stack) puts it in a good position to lead global efforts on digitalization through the G20.

Next up was Save the Data: Localization as Democratization, a panel discussion that became even more pertinent in the context of India’s recently introduced Draft Digital Personal Data Protection Bill, 2022. The panelists highlighted that India's data localization imperative has been whittled away through versions of this bill over the years. As per the latest version of the draft, the Indian government will presumably identify a list of countries (whitelist) where data can be transferred; by implication, there will be a blacklist of countries to which data cannot be transferred. However, sectoral localization mandates, such as the RBI's recent payment localization obligation, are an independent factor that this law cannot account for. The panel discussed that for businesses, the data localization mandate brings economic costs and technological challenges to providing seamless real-time services. The panel also noted that the concerns of law enforcement agencies regarding access to data stored outside India are likely to remain even if this bill is passed by Parliament. Thereafter, the panelists talked about how the new draft offers a more streamlined definition of personal data than the previous version, no longer having the categories of critical personal data and non-personal data, which were unclear in earlier drafts. Also, it is not a prescriptive law, and therefore has a degree of flexibility embedded in it. However, it is still unclear on what will be prescribed by subordinate legislation or rulemaking.

In the next ministerial address, Sanae Takaichi, Japan’s minister of economic security, noted that while digital technology is bringing about significant changes in the world, people are becoming aware of the importance of economic security. The coronavirus pandemic and Russia’s aggression in Ukraine had a major impact on the global supply chain. The global economy before these two major events focused on economic efficiency and international division of labor. As a result, supply chains were established without considering geopolitical risks, which caused too much dependence for critical materials on a specific country and increased the risk of supply-chain disruption. She added that because tech innovation and other current dynamics have expanded the security base toward the economic field, it is important to take appropriate economic measures to secure the safety of a country and its citizens. Elaborating the Japan example, she explained that science, technology, and
Ministerial Address by Isa Ali Ibrahim Pantami

Address by Oddmund Hoel

Conversation on Personalized Cancer Care

Book Launch: Grasping Greatness: Making India a Leading Power
innovation is not only serving as engines of economic growth but are also working to ensure economic security. While free and open research activities must be encouraged to promote innovation, it is important to strengthen research integrity, to protect the values on which research activities are based. She also added that like-minded countries should expand and deepen cooperation with each other, as this is crucial to maintaining a rule-based international order. She noted that India and Japan share values of freedom and democracy and stressed that the two countries should deepen cooperation on economic security when Japan leads the G7, and India leads the G20.

Lessons from the War in Ukraine was the next panel discussion, in which the discussants stressed that this geopolitical crisis was a rude reminder for the international community that nuclear weapons still matter and that the challenges for non-proliferation have been magnified. Russia has demonstrated that nuclear coercion pays off, they noted, and the responses of both adversaries and bystanders can be shaped according to their own political interests. While the nuclear debate in India is very deep and rich, it had been pushed to the periphery in the last decade, the speakers accepted. On the lessons that India could draw from this war, the experts agreed that technology is not a silver bullet and excessive focus on it could distort policymaking. This is because military effectiveness is a complex function of how diverse capabilities are synergized and used in complex operations. They also said that India should create and invest in layered defense mechanisms like aerial surveillance. They also noted that not siloing secret information but sending it to people on the frontlines enabled fast and responsive movement in Ukraine. The Ukrainian military gathered information from all sources, including locals in villages, about the movement of Russian forces and sent that to its commanders. Speaking about collaboration with the private sector regarding the indigenization of defense technology, the panelists highlighted that the Indian defense establishment is slowly starting to adopt new ideas and technologies, and traditional organizations like the Defense Research and Development Organisation should provide their tech requirements, while the private sector and startups should reciprocate with innovation, creativity, energy, and enterprise.

The next panel, titled Promoting Sustainability: Transitioning to a Net-Zero Economy, was framed as an economic opportunity for India and the world. The key pillars regarding sustainability transition discussed were the requirement of capital; skills for India; technology; enabling policies; and strategy with defined roles of stakeholders. It was highlighted that as G20 countries emit 80 percent of the world’s carbon emissions, the forum’s actions can hugely impact sustainability issues. Businesses can significantly reduce emissions by adopting cloud computing, especially if sourced entirely from renewable energy, instead of data servers. With cloud migration, 60 million metric tons of emissions reduction can be enabled by organizations globally this decade. Specifically, Big Tech must also measure, monitor, and use data efficiently to address sustainability issues. With a rising demand for sustainable skills, India can be the global digital human capital (talent hub) with trained sustainability skills to achieve climate targets. On the diplomatic front, India has developed green strategic partnerships worldwide, such as the International Solar Alliance set up in collaboration with France and the One Sun One Grid program launched with the UK. On technology, mechanisms like Carbon Capture Utilization and Storage, studied by NITI Aayog, are expensive and need the private sector’s support in funding, said the speakers.

In the next conversation titled Building Technologies for a Sustainable Global Food Chain, the speaker spoke of how the price paid to farmers in the agriculture sector is dependent on quantity and quality of the produce. Agriculture is probably the only profession where there is inflation on the input side and deflation on the output end, observed one of the discussants. While the quantity can be digitized, he said, quality is totally subjective in food value chains across the world. So, the world
Conversation on Grasping Greatness: Making India a Leading Power

Closed-door Discussion: Aligning Principles for Real-Time Payment Systems

Panel on Grasping Greatness: Making India a Leading Power

Closed-door Discussion: Semiconductors: The Connecting Corridor Between Policy and Investments
needs to develop a platform that leverages new technologies to analyze the quality of food in less than a minute using computer vision and spectral sciences. This platform is based on trust for the buyer and incentive for the seller. In India, this platform has been adopted in almost 1,600 locations where technology analyzes the produce that has been bought, and this data is also indicative of the quality of produce coming in from different locations throughout the country. It can slowly cascade into a tech stack, which can then be incorporated into the Agristack that the Indian government is building to ensure that the entire value chain is digitized.

In the next panel titled *Local Content: Instrument of India’s Soft Power Globally*, the speakers exchanged ideas on how new technologies and streaming platforms can deliver content to a range of people who may not have had easy access to it in the past. While the OTT platforms have existed for a while, the adoption rose meteorically during the pandemic, especially in India, which has a young demographic more attuned to watching content on demand, has ubiquitous availability of mobile phones, and has the cheapest data in the world. The panel acknowledged that India has been creating content in nine or ten languages and that Indian content is slowly starting to match global standards. This a great opportunity for India to expand its soft power and think about creative ways to address typical copyright issues and share content with each other, especially with respect to south-south cooperation. They also noted that the OTT revolution has changed how people visualize content and has transformed how it can be shared globally. The speakers averred that it has become easier to create segmented stories for different audiences now. Moreover, the linguistic palette of the Indian audience has become much broader.

Following this was *Architecture for Biosafety and Biosecurity*, in which the panelists took note of how advancements in biotechnology, such as the ability to read, write, and edit the genetic material, along with strides in AI and automation, have the potential to build the bioeconomy. But at the same time, these innovations can be used to tinker with living systems, for example, to make pathogens more virulent, transmissible among human populations, or vaccine resistant. While discussing legitimate reasons to conduct scientific research, the panel acknowledged the growing risks that failures in safeguarding research facilities can lead to—accidents or exploitation by malicious actors such as terrorist groups. A cost-benefit analysis was recommended for all stages of biological research to reduce the chances of accidents or deliberate misuse of technology. Also, while the scientific community is regularly engaged in research, the security community is more interested in addressing its dual-use implications, said the discussants, noting that in some cases, scientists are unaware of these implications, while sometimes they might be aware but also worried about oversight that might stifle research. The two communities do not communicate with each other, and this gap needs to be bridged. Participants discussed the different levels of legislation, governance frameworks of biosecurity, and biosafety regulations that prevail worldwide, and identified that no overarching organization looks at emerging risks from biotechnology at an international level. According to some speakers, this necessitates the establishment of independent international fora, such as the International Biosecurity and Biosafety Initiative for Science (IBBIS). India’s G20 presidency was viewed by the panel as an opportune time to develop common practices, mechanisms, and standards to address and mitigate biological risks.

Rajkumar Ranjan Singh, India’s minister of state for external affairs and education, then took the stage for his ministerial address, in which he gave an overview of the role of emerging technologies in innovating the education sector and facilitating access to better education services in India. He noted that the New Education Policy (NEP) of 2020 has been designed to transition the education sector in India toward the core areas of the fourth industrial revolution. The focus, therefore, is on the
Closed-door Discussion: Central Bank Digital Currencies: The Future of Global Financial System

Closed-door Discussion: Meet the Ayushman Bharat Digital Mission

Closed-door Discussion: Safeguarding Modern Science and Biotechnology Innovation: The Road to G20

Closed-door Discussion: Improving Access to Welfare Through DPGs
application of emerging technologies such as AI, machine learning, augmented and virtual reality, and the use of smart-board-adaptive computer learning platforms. Telecasting high-quality educational programs through the DTI channel has been introduced as a cost-effective approach to reach students in India. To address linguistic diversity in India, the speaker emphasized that all courses are translated into thirteen languages. The minister also highlighted that National Digital Libraries have been introduced to provide core books, audiobooks, articles, videos, audio lectures, and other digital content. Virtual labs with state-of-the-art computer simulation technology have been set up to create real-world problem-handling capabilities. The NEP also envisions setting up a National Education Technology Forum for the free exchange of ideas on the use of technology to enhance learning, assessment, planning, and administration for school and higher education. Concluding, the speaker mentioned that the deliberations of the meeting at the G20 educational working group should help identify appropriate policies and practices.

Next, Rajesh Bansal, the chief executive officer of the Reserve Bank Innovation Hub (RBIH), delivered a keynote address titled *Customer at the Center of Innovation*, in which he explained the RBIH’s aims and objectives. Leveraging India’s public digital infrastructure, the primary mission of the RBIH is to enable frictionless finance for a billion Indians, which involves working with banks, the fintech industry, academia, and tech companies. He said that rather than data or technology, the focus should be on the customer, to address the challenges people face or might face with their banks. To reduce human intervention and minimize corruption, he mentioned, it is important to reengineer and digitize the entire process. This will enable a frictionless, paperless journey with a reduced turnaround time. Toward the end, he argued that the customer experience should be reimagined to make sure that it is interesting for the digital-native generation and the apps should be accessible in multiple languages. It is, therefore, important to focus on behavioral insights to identify customer needs and create tailored products, the speaker added.

Building on the keynote address, the next panel, titled *Open-Network Technologies: A Driver of Financial Inclusion*, noted that India has been able to grow from instant payment systems, starting with IMPS in 2011, to the current UPI-based payment systems because of open-network or open-source technologies, which offer sovereignty over (financial) infrastructure. This means that dependency on a particular vendor’s business model is reduced, and change is possible. These technologies also have the potential to bring down costs throughout the financial chain—for participant financial institution and for the hub operator, such as NPCI in India. Reduced costs enable a focus on customer centricity to develop tailored products and promote financial inclusion. The panel saw a lively discussion on defining financial inclusion itself, and the criticality of technology’s role in achieving it, through multiple lenses. Unpacking the definition of financial inclusion, speakers divided it in different phases. First, access to the formal financial system; second, daily engagement with the formal financial system; and third, the ability to equitably leverage the formal financial system to demand credit or insurance. The panel said that in addition to technology, the human element at the end of delivery service is crucial to advise and build trust among the financially excluded. In illustrating financial inclusion through open-source technologies, the speakers discussed India, where the challenge has been with intermediaries who often block people’s access to services. While open-network technologies do not replace advisory services or the trust provided by a human element, they remove the potential of people that might block access. The panelists remarked that DPI has enabled India to leapfrog from the traditional economic evolutionary process. They explained that India is at the forefront of a journey that has showcased how tech can replace tangible collaterals with information collaterals, which in the long run might allow poor people or small businesses to use their data to empower themselves. They further discussed that advanced economies
Closed-door Discussion: Unpacking the Draft Digital Personal Data Protection Bill, 2022

GTS Young Ambassadors

GTS 2022: Audience View

GTS 2022: Audience View
could learn from India to use this architecture for the greater good, and India can use its G20 presidency to push for common data principles that are human-centric.

Up next was a ministerial address by Isa Ali Ibrahim Pantami, Nigeria’s minister of communications and digital economy, who spotlighted on the importance of cybersecurity in the digital age. He observed the worrying rate at which cybercrime is happening globally and cited research conducted by HP to highlight that a new malware is being created every 4.2 seconds in the world, which is released to compromise the security of information and communications technology—its infrastructure and related activities. It is rather challenging for cybersecurity experts to deal with the total number of malware applications. Furthermore, cybersecurity ventures have predicted that more than $10.5 trillion will be lost to cybercrime if adequate attention is not given to this threat. It is important to be proactive to deal with cybercrime on one hand and strengthen cybersecurity on the other. The minister said that countries should be proactive in teaching and providing hands-on training to develop digital armies to protect them from cybercrimes. He also outlined four keys to achieve cyber resilience—the security of infrastructure, the security of deployed applications, the necessity to safeguard operations, and the need to involve professionals trained in cybersecurity.

Next was an address by Oddmund Hoel, the state secretary of the Norwegian ministry of education and research, who focused on Indo-Norwegian collaboration in higher education and research, highlighting the bilateral joint working group, which is linked to the bilateral agreement on science and technology and consists of members from the two nations’ ministries. Explaining Norway’s Panorama strategy, he noted that its purpose is to increase the quality and relevance of Norwegian higher education, research, and innovation through internationalization and through cooperation with the industry. The strategy clarifies overall priorities for cooperation with strategic countries and introduces measures aimed at specific challenges. He also spoke about a new initiative of reviewing the Indo-Norwegian Cooperation Program (INCP) in higher education, which concluded that INCP is a pilot program to motivate cooperation between India and Norwegian higher education institutions.

This was followed by a conversation titled Personalized Cancer Care, in which the speakers highlighted the importance of affordable access to life-saving therapies. They remarked that India has a comparative advantage to provide these therapies at lower costs when compared to other countries. Also, India’s diverse clinical burden and vast clinical ecosystem provide a significant opportunity for translational research. India needs to invest in its infrastructure to run clinical trials in a manner that will maintain the privacy of patients while also accurately reporting the quality and the effectiveness of the trials. India also needs to invest in more innovative research rather than focusing on re-engineering what has already been discovered, the speakers noted. There is a great need to invest in deep science research and incentivize this research to make use of the large research talent pool, they added.

The summit concluded with the launch of Grasping Greatness: Making India a Leading Power, edited by Ashley J. Tellis, Bibek Debroy, and C. Raja Mohan. The book launch began with a conversation with the external affairs minister of India, S. Jaishankar, followed by a panel discussion.

Explaining the enduring principles that guide India’s rise as an emerging great power, the minister plotted them on an axis. The X-axis signifies ambition, and it is important for India to relentlessly look at the international situation and identify opportunities to grow. The Y-axis shows capacities
because these constrain choices, and between ambition and capacity, it is imperative to identify ways to grow. The Z-axis depicts the constant struggle to harmonize, reconcile, or optimize short-term or long-term goals. He recommended two steps that India should take to achieve ambitions of greater space, greater presence, and greater influence on rulemaking in the next decade. First, it is important to keep finding the right combination of partners for India’s interests, and to look at global contradictions and assess the possibility of utilizing them for India. Second, the ability to get a 360-degree view of the world and its visions and pick and choose issues where India can either shape, go ahead, be a little prudent, or be in the middle. He further stressed that India should focus on ways in which commonality can be established in a competitive world and argued that larger vision yields concrete benefits. Calling India’s perspective on a global agenda internationalist nationalism, the minister said that it is in complete harmony with India’s national prospects. Discussing the parameters to use force, he averred that countries should be cautious, and that India has mostly used force defensively when it is threatened, almost always with its own borders, with limited experience of using force outside its national jurisdiction.

During the panel discussion, it was noted that despite India being in the top ten economies until the 1970s, the assumptions of its trajectory were fundamentally constrained by pessimism about its prospects, both externally and internally, which had a lot of consequences. The panel's experts discussed the journey of this pessimism into unbounded optimism, especially after the 1991 reforms. The panelists emphasized that India is the fastest-growing large economy in the world today and is home to one of the largest markets, making it one of the most favored destinations for both domestic and foreign investors. On defense and security challenges, they discussed three fundamental issues that are going to drive the desire and ability to transform the Indian military. First, capacity development; second, transformation and restructuring; and third, the ability to keep pace with technology. They argued that unless India engages in serious leapfrogging, the asymmetry vis-à-vis India’s principal military adversary will widen excessively. Therefore, to transform the military, India should enhance firepower, increase battlefield surveillance, rebalance and reconfigure offensive formations, and build its special forces’ capability. India would have to play a very delicate balancing act between coping with this highly securitized regional and global environment and its long-term objectives of unbridled economic growth, leading to a fully developed status. Furthermore, while India still does not have the capacity, it is through coalitions and other partnerships that can begin to influence the international system and rework the rules in a way that benefits it and the larger international system.
CLOSED-DOOR DISCUSSIONS

In addition to public sessions, nine closed-door discussions were organized during the summit.

1. A Track 1.5 discussion on the U.S.-India Initiative on Critical and Emerging Technologies (iCET) was held to explore future avenues of cooperation in areas such as science and tech research, civilian space tech, quantum computing, and semiconductors. The roundtable brought together representatives from government, industry, academia, and think tanks—that is, current and potential stakeholders in the iCET—to discuss practical and functional ideas on how to take the initiative forward. Participants highlighted that given its unique structure, the iCET could serve as a cornerstone for deeper cooperation between India and the U.S. They suggested setting up a steering council to provide oversight and facilitate interaction between stakeholders. They also recommended moving beyond government-to-government partnerships and forging academia-to-academia, industry-to-industry, and even academia-to-industry partnerships between the two countries. Participants also highlighted the importance of trust, data security, and data sharing in building a robust tech partnership between India and the U.S. They noted that for Indian and American companies to collaborate on an equal footing, U.S. export control measures need to be eased so that intellectual property and dual-use technologies can be shared with Indian partners, especially those pertinent for semiconductors and space technology.

2. A discussion called Aligning Principles for Real-Time Payment Systems saw participation from more than forty experts, including those from more than half a dozen central banks (Brazil, Thailand, Kenya, Canada, Morocco, Bhutan, and Singapore), the Bank for International Settlement, NPCI International Payments, the Reserve Bank Innovation Hub, SWIFT, the International Finance Corporation, and the International Monetary Fund. The discussion was divided into two segments: learnings from experiences of building domestic real-time payment systems and making progress on cross-border payments. In the first segment, experts shared best practices for making real-time payment systems work. Several countries have implemented these systems, but there are many different models. There are important differences in technology choices, pricing regulations, participation criteria, and so on. On cross-border payments, the experts discussed how progress could be made by aligning messaging standards, using central bank digital currencies, overcoming regulatory hurdles, and more.

3. A roundtable titled Semiconductors: The Connecting Corridor Between Policy and Investments brought together senior industry representatives, government officials in charge of vetting investments, and think-tank experts to discuss India’s recently introduced semiconductor policy that deals with fabrication and chip design. Just like fabrication firms, industry representatives noted that fabless companies in India could also codevelop with foreign firms. While acknowledging India’s early-mover advantage in rolling out a semiconductor policy, participants pointed out that it is not the only country wooing semiconductor companies, so it would be beneficial for India to identify products that will drive domestic demand. This will determine what kind of nodes or chips are needed and may allow India to focus on that segment of the fabrication ecosystem. Some participants also highlighted that Vietnam is part of regional trade arrangements like the Regional Comprehensive Economic Partnership (RCEP), and if semiconductor companies based out of China were to diversify, they are unlikely to face major changes to the tariff scheme applicable to their components in case they were to move to Vietnam. This is because there is
likely to be more uniformity when countries are part of the same regional trade arrangement. Therefore, India’s trade policy stance also bears relevance. Furthermore, it was noted that India could consider partnering with like-minded countries such as the U.S., and for this, synchronization is needed between India’s semiconductor policy and the U.S. CHIPS and Science Act. In addition to aligning policies between the two countries, India could provide prototyping facilities for the U.S. companies to test their chip designs.

4. A discussion called **Central Bank Digital Currencies (CBDCs): The Future of Global Financial System** had stakeholders from the Indian government, international standard-setting organizations, industry, and academia. The goals of the discussion were to broadly identify the key emerging use cases and risks related to CBDCs, both in the domestic and international context, as well as principal areas where global consensus, cooperation, or coordination will need to emerge. The discussion prompted several important insights and raised some key questions. Speakers noted that multicurrency technical platforms for CBDCs like the mBridge project can address money-laundering risks—a key risk that other private digital currencies like cryptocurrencies and stablecoins don’t address (efficiently enough). However, from a practical perspective, platforms like mBridge that span multiple countries may be challenging to achieve as they will require an underlying multilateral understanding between sovereign countries. Digital currencies issued by commercial banks by tokenizing deposits could be an alternative. Going forward, it is likely that CBDCs, bank deposit-backed digital currencies, and well-regulated stablecoins (that is, those backed by full reserves) will compete for the following use cases: cross-border transfer and settlement of assets and buying digital assets. Also, while there is broad consensus on the case for public and private partnerships in the implementation of CBDCs, there could be some differences in the form and shape this could take. The digital yuan or for that matter, instant bilateral cross-border settlement of currencies through technological advancements, could diminish the dollar’s strength to enforce sanctions or affect how the U.S. banking system is used currently. This could be considered a threat from a U.S. national security perspective. A key question raised was about our vision of the digital economy as democracies, and the values of this new financial infrastructure. Another risk factor pertains to the trade-off between privacy and security observed in (some of the) CBDC pilots or experiments, where it is unclear if the trade-off is deliberate or pursuant to the maturity of the distributed ledger technologies employed. A more explicit threat modelling was called for, or alternatively, better communication to external research and the academic community was suggested to help identify research gaps here. It was also suggested that all countries must try to achieve a global consensus over the next five years.

5. A roundtable titled **Meet ABDM** brought together healthcare and technology professionals as well as representatives from think tanks and international organizations to introduce them to the purpose and guiding principles of the ABDM. Participants noted that the ABDM rollout would reduce operational costs and increase the efficiency of healthcare services by reducing the turnaround time. They also discussed that the ABDM would enable stakeholders in the healthcare ecosystem to create and derive value for themselves. They elaborated on various challenges that the ABDM model has faced and how it has evolved to adapt to them. Further, participants discussed the tech components of the ABDM including the ABHA Number, Healthcare Professionals Registry, Health Facility Registry, and the UHI. Participants were also given a live demonstration of a user’s interaction with healthcare providers through an application that is integrated with the ABDM and the UHI. The discussion concluded with
participants examining issues related to payments, settlement of claims, and the role of private players and their participation in the ABDM.

6. In a discussion titled **Principles for Digital Health Architectures**, representatives from the health ministries of India, Thailand, Uganda, and Burkina Faso, and healthcare and digital health professionals from non-profit organizations, academic institutions, and international organizations spoke about the different approaches countries follow to develop their digital health architectures. Most participants appreciated the GAPS approach, adopted in the Philippines, to building digital health architectures. This refers to governance, architecture, people and program management, and standards and interoperability. The experts highlighted various facets of digital strategy, implementation plans, enablers, and barriers to digitization in healthcare. While emphasizing the importance of patient-centric models and engagement of private healthcare providers, they noted that other essential enabling elements, such as the value of good governance and ample financial support, are imperative. They agreed that the digital journey is not linear and that efforts must be concentrated on several digital architecture components concurrently to achieve the best results. While the significance of data security and privacy, as well as standards for data sharing and interoperability, underpinned the discussion, the discussants also noted that academic involvement and suitable courses are required to capitalize on the data collected and to boost system efficiency. They believed that the goal of all digitization and improvement efforts must be to improve health outcomes while putting enough emphasis on sustainability and equity. Noting the enormous potential for delivering universal health coverage and promoting health for all through digitization, they concluded that it must be a priority for governments across the world.

7. The next roundtable titled **Safeguarding Modern Science and Biotechnology Innovation: India’s Road to G20** convened scientists, academicians, government representatives, international civil servants, independent disarmament consultants, and the private sector community to discuss how to develop a common understanding of bio risks. They discussed the current state of national and international governance architectures and identified solutions to tackle emerging bio risks. The starting point, according to the expert panel, is to develop a common understanding of bio risks and raise awareness among the scientific and industry community about the dual-use implications of their research. They further highlighted the importance for a life-cycle approach to risk assessment. From planning, project implementation, and project execution in research labs or commercial facilities to publishing and sharing of the findings and commercialization of technology, a risk-benefit analysis should be conducted at all stages. While governments have recognized the risks and have taken the lead to develop oversight mechanisms, participants underscored the need for an all-hands-on-deck approach, which requires collaboration between governments, academia, civil society, scientists, research labs, and private actors to safeguard biological research. They also discussed the importance of developing independent international fora that can help scientists understand the bio risk of parts and processes used in research and industrial processes and can also work with multilateral bodies such as the World Health Organization. Participants noted that India’s G20 presidency is an opportune time to develop common practices, mechanisms, and standards to mitigate bio risks.
8. A discussion titled *Improving Access to Welfare Through DPGs* provided insights into how DPGs should be used as a tool to empower citizens and countries, in addition to being used as an instrument for welfare. Participants acknowledged that DPGs should be developed in a way that ensures gender parity. For this, they suggested that technologists should address questions about invisibility, biometric design considerations, and other such biases during the design phase and continuously evaluate their architectures through all stages leading up to implementation. In cases where DPG creators and governments are co-creating digital tools, both parties should engage in equal partnerships to retain the autonomy of all stakeholders involved, improve user trust, sustain the tech design, and maintain efficiency. Finally, to kickstart such processes, trust in the system should be initiated by governments, and other ecosystem actors should play active roles, improve course correction, and maintain an objective perspective. While this session spoke about DPGs in general, several philosophical and design principles were highlighted as key fundamentals of the design of the MOSIP (Modular Open-Source Identity Platform), further strengthening the need for interoperability, freedom from vendor lock-in, and co-creation with governments.

9. A discussion called *Unpacking the Draft Digital Personal Data Protection Bill, 2022* brought together lawyers, industry leaders, academicians, government officials, and privacy experts to deliberate on the latest draft of this bill. The discussion was largely focused on the construction of the bill itself but also covered its larger implications on data protection, and how the new draft is different from its predecessors. Among others, the bill has changed the approach to cross-border data flows. It has recommended a data protection board instead of the previously proposed data protection authority. The discussants agreed that the new bill has a more principle-based approach and examined other provisions in the bill such as the age of consent being eighteen, whether consent was the right mechanism to protect privacy, notices in case of data breaches, and the importance of checks and balances on the government exercising its powers. There were multiple issues with the way many clauses were framed, including the provision on deemed consent and data transfers, which would require further efforts on the part of lawmakers, submitted the speakers.
POLICY PATHWAYS

As the summit achieves prominence in global technology and policy debates with its theme Geopolitics of Technology, Carnegie India endeavors to continue bringing together diverse stakeholders to shape public dialogue on the future of emerging technologies. Several concrete substantive recommendations emerged from the discussions at this edition of the summit, the most significant of which are the following:

Digital Identities: Foundational Architectures for a Digital Society

1. While most countries are in the process of either developing new data protection regulations or updating the existing ones, it is important to ensure that independent agencies continuously review these regulations to tackle transparency and trust concerns with respect to digital identity systems and share experiences with each other.
2. Talking about introducing digital identity systems in low-resource settings, where breeder documents such as birth certificates don’t exist, it is important to identify devices that will connect people, simplify the registration process, build robust and flexible authentication processes to include people in those areas without an additional cost, and develop infrastructures that support these systems.
3. To ensure the interoperability of digital identities systems, it is important to initiate dialogue among policymakers and technologists that deals with the socio-economic aspect, the technology aspect, and the policy aspect of digital IDs.

Digital Health Solutions: Road to Sustainable Healthcare Delivery

1. Governments need to have a clear vision while developing digital health solutions. These solutions should be patient-centric and should speak to health outcomes and not technology outcomes.
2. In addition to developing standards around exchanging patient data and health information, there must be a government mechanism to ensure that the public and the private sectors comply with these established standards.
3. Data must be stored in a federated manner to establish interoperability between open-source projects that are aimed at providing healthcare solutions.

A Connected World: Aligning Principles for Cross-Border Payments

1. Rather than taking a comprehensive or sweeping approach to promote interoperability between payment systems, it is important to identify a specific problem and find an alignment keeping in mind the relevant user segment. For example, to address the complexity of capital control rules, countries should consider creating conducive policies to promote an interoperable business layer, which can allow small-value transfers from migrant workers sending money back home.
2. Addressing the interoperability of cross-border payment systems at a bilateral level is an exhaustive process and is difficult to scale. It is therefore important to think of alternatives,
such as the Nexus Project by the Bank for International Settlements, which is a blueprint for instant cross-border payments.

3. The cost of building a domestic payment infrastructure is huge, and many countries can't afford it. It is therefore important to think of other ways to solve issues related to cross-border remittances. For example, for smaller values, we could think of interoperable business layers, but for larger values, it should go through the current existing intermediary network.

The Next Decade of India Stack

1. Small businesses can be benefited in two ways through the India Stack. One, by creating a national registry of startups that is available, perhaps through APIs, to people who are looking to invest in India. Two, by creating an aggregator model that allows companies to buy and sell carbon credits to create net-zero carbon marketplaces.

2. There can be three models to facilitate internationalization of the India Stack:
   i. Autonomous model: Under this model, a third organization, for example, the Bill and Melinda Gates Foundation, Omidyar Network, NORAD, or USAID, talks to one of the Indian companies to build DPGs.
   ii. India can do it by itself: India can approach a country in, say, Africa and offer to build the entire system from the ground up for that country. However, chances of this model being accepted are limited.
   iii. Create a global standard: India can help foster a global standard in which we involve other participants as well, from both developing and developed countries.

3. Rather than relying on multilateral institutions such as the World Bank or the International Monetary Fund to set and execute standards, India should create a technology standard organization and call it a Centre of Excellence (CoE). In addition to bringing together government officers, it should bring together experts like lawyers, technologists, and innovators—people who have some awareness and understanding of the standard setting. Although this organization would still be an India-centered CoE, it will create a sense of participation, trust, and belonging among all stakeholders.

Digital Public Infrastructure (DPI): Building Collaborative Partnerships and Alliances

1. To build an effective DPI, the government should establish strong policy frameworks and robust policy guardrails, and the private sector should be in charge of innovation.

2. While India has the human capital and resources to build its own DPI, other countries may not have the same resources. Accordingly, they will have to adopt other solutions and contextualize them to their own needs. However, such solutions often come with vendor lock-ins and reduced “digital sovereignty.” As this area is one of the G20 priorities, India should showcase the India Stack as a framework for sovereignty and encourage other countries to build sovereign DPI.

3. India could be a great player to support DPI development in other countries, with its industry supporting local vendors in the implementing nations. For this, India could either adopt a low-risk approach or a high-risk method. The former entails setting up or proposing a standing partnership that focuses on DPI that is designed, deployed, governed for people, and the latter involves initiating a global dialogue around the safeguards that should be put in place to develop DPI.
Cyber-resilience: Security of the Internet Infrastructure

1. Both governments and the private sector should focus on four pillars of cybersecurity. First, the protection of critical information infrastructure; second, the implementation of cyber norms; third, threat intel sharing and incident reporting; and fourth, strengthening international cooperation on cybersecurity capacity-building to include skill development exercises.

2. In addition to protecting software platforms, it is important to focus on physical internet infrastructures, which could also be potential targets during conflicts or can be impacted by natural disasters. It is imperative to have backup data centers and explore options to store data on the cloud in multiple geographical locations. This can help prevent the possibility of losing data from physical attacks, while still retaining technological control over it.

3. Political awareness must be raised to ensure that more resources are dedicated to building cyber capacities so that cybersecurity is connected to the development agenda. A workshop on cyber capacity-building during India’s G20 presidency could be a good starting point.

What's New IN-SPACe?

1. While the Indian space ecosystem has undergone a change over the last decade or so, areas that require improvement, especially for small businesses, include the involvement of the government (or ISRO, in this case) as an anchor customer, simplification of procedures for seeking grants, and an increase in the amount of grants or funding available. Funding is a critical constraint. Identifying incentives (such as the Production Liked Incentive or PLI scheme) and clarity over India’s FDI policy on investment in the space sector are imperative.

2. A robust space policy framework is key to clarifying the contours of what is permissible in the sector and to support the reforms underway. Moreover, it is imperative to involve legal and policy experts in drafting the policy framework, particularly in view of the international law and treaties as well as the issues involved, such as space debris, anti-satellite weapons, and testing. Thus far, the drafting process has largely been led by the scientific community.

3. Given the geopolitical aspects of space, India is right to evolve an independent strategy. However, strategic partnerships with other countries or their space agencies like NASA and ESA being part of coalitions and leveraging new geopolitical constructs such as the Quadrilateral Dialogue could help India leapfrog in this sector and provide access to funding and markets for its space industry.

Startup 20: An Agenda for G20

1. Create a fund of funds (FoF) to ensure access to risk capital to support innovation and entrepreneurship. One model could be a FoF by international organizations like the World Bank, which, instead of offering long-term loans, could set up a country-wise FoF to coinvest alongside local funds in innovation ecosystems. Another could be a five-billion-dollar G20 FoF in countries outside the U.S. and the EU, with professional management and investments sourced from billionaires or international funding agencies like the International Finance Corporation or the European Development Bank, in addition to World Bank.

2. Given the diversity of innovation models in G20 countries, innovation ecosystems around the world should be connected to share experiences and best practices. Mechanisms to connect entrepreneurs to global investors and markets around key sectors or priorities should also be established.
3. It is imperative to address the question of how to include more women entrepreneurs, particularly in terms of access to capital through the creation of an exclusive fund for them. This could be addressed by the separate G20 vertical that exists on gender.

Technology and Trade: Opportunities and Challenges

1. Apart from data flows, a range of issues pertinent to digital trade, such as recognition of electronic contracts, electronic authentication, and concerns related to MSMEs, should be discussed.
2. The hope for India’s G20 presidency would be to introduce a developing country or region’s perspective and concerns (such as the digital divide), especially discussions that can be utilized by non-G20 members too, for the creation of a cooperative mechanism.
3. An important focus area for G20 could be the empowerment of MSMEs, particularly the role technology and tech infrastructure can play in integrating them into global trade. The specific challenges here include a lack of common taxonomies or definitions (for example, the meaning of “organic”) and limited awareness and fear of compliance requirements.

Bridgital USP: Building Unique Semiconductor Partnerships

1. India needs to have short-, medium-, and long-term goals, given the time frames involved in establishing a robust semiconductor ecosystem. Plugging into the global supply-chain ecosystem, cultivating talent, and focusing on trailing or analog nodes in the short term would help India progress to more complex activities and build the necessary ecosystem over time. Further, rather than inviting companies to set up shop in India, the approach could be to identify how the government can support the companies’ ambitions.
2. On partnership between the Taiwan Semiconductor Manufacturing Company and India, a suggestion was to clarify India’s strategy—identify the sector or segment or niche in which it has a competitive advantage (perhaps design, given the existing talent) and work with existing leaders to strengthen this.
3. From an Indo-U.S. perspective in particular, the focus should be on enhancing India’s engagement with the U.S. R&D base. There is also scope for joint R&D on the military and security side, which is minimal at present. Challenges to cooperation include the security protocols in both countries, but the advantage is that in addition to alignment between India and the U.S. on the challenges in the Indo-Pacific region from an industry or economic perspective, there is now a security rationale. So, industry and foreign policymakers must come together to realize the potential for cooperation.

Responsible AI: A Strategic Imperative

1. There is a need to move quickly to build the tools to govern AI, given the speed at which AI models are being open sourced, built, and deployed, and the trial and error, and negotiation for consistent rules that are likely to be involved on the policy side. In other words, building interpretable AI models, from both technical and policy perspectives, is going to be critical over the next few years.
2. From a policy and regulatory perspective, a multidisciplinary approach and collaboration between technologists, policymakers, lawyers, and others are required. Regulation should be contextualized or use-case specific rather than a blanket approach because the risks differ based on them. From a corporate point of view, a risk-based assessment is necessary to not
stifle innovation. Policy sandboxes are useful to test out pilots, and learnings from the same can then be incorporated into policy strategy documents.

3. In terms of what the role of various stakeholders could be, the domestic focus should be on standards and how these commitments are being met. Dialogue between technologists across borders as well as with different geopolitical centers of power on safety and the direction of developments are also important. A transparency on where actors have not lived up to their expectations will also be crucial.

G20 Troika: Indonesia, India, and Brazil

1. In addition to public funds, an infusion of blended finance and private capital in developing countries is needed for global financial resilience. For this, multilateral development banks established in the post-World War II era, such as the World Bank and IMF, must undergo significant reforms and their role must shift from direct lenders to enablers and facilitators of credit flows.

2. Investment destinations must focus on capacity-building, should develop a pipeline of investible projects, and ensure policy certainty to attract and retain private and institutional investments.

3. G20 countries should deal with agriculture in a manner that effectively contributes to the SDGs such as food security, enhanced efficiency, and productivity, and reduces trade distortions in agri-food systems. Therefore, the agenda for food security should also be context-based.

Lessons from the War in Ukraine

1. It is important to build a distributed sensing network along the continental border that ranges from a cheap Intelligence, Surveillance, Reconnaissance (ISR) system to more sophisticated drone networks, to have a battlefield command system that can work well with dispersed forces.

2. Instead of a top-down approach to impose export control mechanism, companies and individuals should self-regulate. For this, countries should invest in confidence-building measures, which are not binding, but are building blocks to increase transparency between and within countries. This will help build some baseline norms and understanding of what is accessible and of steps that should be taken in case unintended uses of technologies arise.

3. Prioritization of defense indigenization is key. It is important to focus funds in areas where India has a comparative advantage. It is also imperative to think carefully about critical technology procurement in terms of identifying opportunities to work with partners and in areas where the tech should be bought off the shelf.

Save the Data: Localization as Democratization?

1. India needs to gradually grow into a data protection regime, because without an enforceable law, it is still at a nascent stage of data protection. While India builds its internal mechanism, it must be ensured that the law doesn’t violate the principles of subordinate legislation and rulemaking.

2. Businesses must be provided with certainty about where the data will be allowed to flow well in advance, for proper compliance with the law. Further, it is important that data must be
allowed to flow for the time being, and restrictions on international data transfers must be
carefully considered in a transparent and clear way.
3. The right to protect data must be balanced against the right of the state to access data for law
enforcement and national security purposes.

Promoting Sustainability: Transitioning to a Net-Zero Economy

1. Climate finance must be massively scaled up to properly serve mitigation and adaptation
actions to address climate change. Further, financially underserved sectors, including
industry, forest, and agriculture, must be given a bigger share of climate capital.
2. Blended finance with private philanthropic participation may improve climate financing as
public funding and traditional development assistance are inadequate for climate actions.
Further, multilateral development banks could be reformed from lending banks to leverage
banks—for instance, instead of lending $200 billion, they could raise $2 trillion using the
$200 billion. As G20 countries are major shareholders of multilateral development banks,
they can change governance and practices in the development banks for better climate
financing.
3. Carbon markets for emissions trading, proposed first by the Kyoto Protocol in 1992, must be
prioritized and enabled. Proposed reforms to India’s Energy Conservation Act to enable
carbon markets will be welcome. A strong regulator must be established to facilitate carbon
market transactions.

Architecture for Biosafety and Biosecurity

1. It is important to adopt clear definitions and create awareness to develop a common
understanding regarding the difference between biosafety and biosecurity. Biosecurity, as
defined by the panel, is the set of tools and systems that are put in place to prevent the
deliberate misuse of biotechnology to cause harm or develop bioweapons. Biosafety, on the
other hand, is the set of systems and tools to prevent laboratory accidents.
2. A cost-benefit analysis should be done at the beginning of each research experiment to
evaluate potential unexpected outcomes from editing or engineering pathogens. Furthermore,
from planning, project implementation, and project execution in research labs or commercial
facilities to publishing and sharing of the findings and commercialization of technology, a
cost-benefit analysis should be conducted at all stages. In addition to considering the cost of
the experiment, the governing authorities should also consider the cost in case of an accident
or misuse of the experiment.
3. The science and security communities, along with members from academia, the private
sector, funding agencies, and international organizations, should exchange information with
each other to create governance frameworks that balance the benefits and the risks of
biotechnology research.
Open-network Technologies: A Driver of Financial Inclusion

1. Many large banks, both in India and abroad, do not have significant operations in rural areas. So, it is important to ensure that small and rural financial institutions are given equal access to open-network or open-source technologies to make it cheaper and safer for them to serve the first mile to participate in the payments network.

2. It is important to not create dichotomies where one can either work on a tech-driven approach or a people-driven approach. There needs to be an approach where technology removes the hurdles people face.

3. Open-source technologies involve multiple stakeholders or vendors in the entire chain of the tech solution, but the accountability should lie with the hub aggregator, for example, NPCI in India, which operates the tech. The sharing of liability with the software providers should be left to the hub aggregators.
# Global Technology Summit

## AGENDA

**Day 1: November 29, 2022**  
**Sub-theme: India’s Digital Way: The Road to G20**

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<td><strong>Rudra Chaudhuri</strong>, Director, Carnegie India</td>
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<td>09:15</td>
<td>Inaugural Address</td>
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<td><strong>S. Jaishankar</strong>, External Affairs Minister of India</td>
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<td>09:30</td>
<td>Inaugural Conversation: ‘Geo-digital’ and its Effects</td>
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<td><strong>S. Jaishankar</strong>, External Affairs Minister of India and <strong>C. Raja Mohan</strong>, Senior Fellow, Asia Society Policy Institute</td>
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<td><strong>Melinda French Gates</strong>, Co-chair and Trustee, Bill and Melinda Gates Foundation</td>
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<td><strong>Amitabh Kant</strong>, India’s G20 Sherpa</td>
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<td>Panel: India’s Digital Way: The Road to G20 and Beyond</td>
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<td><strong>Ashley J. Tellis</strong>, Tata Chair for Strategic Affairs and Senior Fellow, Carnegie Endowment for International Peace</td>
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<td><strong>Sunil Bharti Mittal</strong>, Founder &amp; Chairman, Bharti Enterprises</td>
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<td><strong>Amitabh Kant</strong>, India’s G20 Sherpa</td>
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<td><strong>Nivruti Rai</strong>, Country Head, Intel India &amp; Vice President, Intel Foundry Services, Intel Corporation</td>
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<td><strong>Sachin Chaturvedi</strong>, Director General, Research and Information System for Developing Countries</td>
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<td><strong>Nandan Nilekani</strong>, Co-founder and Chairman, Infosys Technologies Limited Founding Chairman, Unique Identification Authority of India</td>
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<td>Panel: Digital Identities: Foundational Architectures for a Digital Society</td>
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<td><strong>Vyjayanti T Desai</strong>, Practice Manager, Identification for Development &amp; Digitizing Government to Persons Payment, The World Bank</td>
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<td><strong>Assane Gueye</strong>, Assistant Teaching Professor, Carnegie Mellon University Africa &amp; Co-Director, Cylab-Africa</td>
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<td><strong>Carsten Maple</strong>, Turing Fellow, The Alan Turing Institute</td>
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<td><strong>Dushni Weerakoon</strong>, Executive Director, Institute of Policy Studies of Sri Lanka</td>
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<td><strong>CV Madhukar</strong>, Chief Executive Officer, Co-Develop</td>
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<td><strong>R.S. Sharma</strong>, Chief Executive Officer, National Health Authority</td>
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<td>Panel: Digital Health Solutions: Road to Sustainable Healthcare Delivery</td>
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<td><strong>R.S. Sharma</strong>, Chief Executive Officer, National Health Authority</td>
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<td><strong>Evan Feigenbaum</strong>, Vice President for Studies, Carnegie Endowment for International Peace (CEIP)</td>
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<td><strong>Sopnendu Mohanty</strong>, Chief Fintech Officer, Monetary Authority of Singapore</td>
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<td><strong>Priyadarshini D.,</strong>, Associate Fellow, Technology &amp; Society Program, Carnegie India</td>
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<td><strong>Amandeep Singh Gill</strong>, United Nations Secretary-General’s Envoy on Technology</td>
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<td>13:15</td>
<td>Panel: Digital Public Infrastructure: Building Collaborative Partnerships &amp; Alliances</td>
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<td><strong>Kathleen McGowan</strong>, Senior Director, Policy &amp; Advocacy, Digital Impact Alliance, United Nations Foundation</td>
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<td><strong>Chetan Krishnaswamy</strong>, Vice President, Public Policy, Amazon India</td>
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<td><strong>Aubra Anthony</strong>, Senior Fellow, Technology and International Affairs Program, CEIP</td>
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<td>14:00</td>
<td>Ministerial Address</td>
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<td><strong>Michelle Donelan</strong>, U.K.’s Secretary of State for Digital, Culture, Media, and Sport (virtual)</td>
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**Address**  
**Harshvardhan Shringla**, G20 Chief Coordinator, Government of India

**Conversation: Initiative on Critical and Emerging Technologies between India and the United States**  
**Taran Chhabra**, Special Assistant to President and Senior Director, Technology and National Security Council, The White House  
**Rudra Chaudhuri**, Director, Carnegie India

**Panel: A Connected World: Aligning Principles for Cross-border Payments**  
**Ritesh Shukla**, Chief Executive Officer, NPCI International Payments Limited  
**Sopnendu Mohanty**, Chief Fintech Officer, Monetary Authority of Singapore  
**Sherab Jamtsho**, Director, Royal Monetary Authority of Bhutan  
**Juliet Wangui Maina**, Senior Manager, Regulatory and Public Policy, m-PESA (virtual)  
**Priyadarshini D.,** Associate Fellow, Technology & Society Program, Carnegie India

**Curtain Raiser: Data Empowerment and Protection Architecture (DEPA)**  
**Rahul Matthew, Partner, Trilegal**

**Panel: The Next Decade of India Stack**  
**Javed Ashraf**, Ambassador of India to the Republic of France and Principality of Monaco  
**Abhishek Singh**, President & Chief Executive Officer, National eGovernance Division, Ministry of Electronics and Information Technology, Government of India  
**Rahul Matthew, Partner, Trilegal**  
**Sanket Atal, Managing Director, Salesforce India Operation, Site Lead - Technology, Marketing, Product, Salesforce**  
**Sarayu Natarajan, Founder, Aapti Institute**

**Panel: The World We Live In**  
**Keyzom Ngodup Massally**, Head of Digital Programmes, Chief Digital Office, United Nations Development Programme  
**Ashok Malik**, Partner & Chair (India), The Asia Group  
**Colin Reed**, Global Intelligence Manager, Salesforce  
**Samir Saran**, President, Observer Research Foundation

**Video Message**  
**Amandeep Singh Gill**, United Nations Secretary-General’s Envoy on Technology

**Panel: Digital Public Infrastructure: Building Collaborative Partnerships & Alliances**  
**Kathleen McGowan**, Senior Director, Policy & Advocacy, Digital Impact Alliance, United Nations Foundation  
**Chetan Krishnaswamy**, Vice President, Public Policy, Amazon India  
**Aubra Anthony**, Senior Fellow, Technology and International Affairs Program, CEIP

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Panel: Cyber-resilience: Security of the Internet Infrastructure
Noelle van der waag-Cowling, Cyber Program Lead, Security Institute for Governance and Leadership, Stellenbosch University
Manjeet Singh, Joint Secretary (Cyber), National Security Council Secretariat
David van Duren, Director, Global Forum on Cyber Expertise (virtual)
Asutosh Chadha, Director and Country Head, Public Policy and Government Affairs, Microsoft India
Nanjira Sambuli, Fellow, Technology and International Affairs Program (TIA), CEIP

Closing Remarks

Closed-door Discussion: Semiconductors: The Connecting Corridor Between Policy and Investments

Day 2: November 30, 2022
Sub-theme: Navigating Partnerships and Alliances for the Future

Closed-door Discussion: Central Bank Digital Currencies: The Future of Global Financial System

Keynote Address: Contours of Building an EU-India Trade and Technology Council
Margrethe Vestager, Executive Vice-President, European Commission for a Europe Fit for the Digital Age and Co-chair, Trade and Technology Council (virtual)

Panel: Technology & Trade: Opportunities and Challenges
Bhupen Wakankar, Director, Global Trade, Amazon India
Anita Prakash, Senior Policy Adviser for International Economic Cooperation, Economic Research Institute for ASEAN and East Asia (virtual)
Christophe Kiener, EU Chief Negotiator for Trade
Sarah Fallon, Regional Director, India and Middle East, Science and Innovation Network, British High Commission
Evon Feigenbaum, Vice president for Studies, CEIP

Panel: Creating Public Infrastructure for an Open Digital Economy: The Indian Experience
Sumit Seth, Joint Secretary (PP&R), Ministry of External Affairs, Government of India
Rahul Handa, Senior Vice President, Strategic Initiatives, Open Network for Digital Commerce
Sharad Sharma, Co-founder, iSPIRT
Rohini Srinivaths, National Technology Officer, India
Suyash Rai, Deputy Director & Fellow, Carnegie India

Conversation: National Quantum Mission
Ajay Kumar Sood, Principal Scientific Adviser to the Government of India
Michael Nelson, Senior Fellow, TIA, CEIP

Talk: Building Unique Collaborations for Innovation
Nivrut Rai, Country Head, Intel India & Vice President, Intel Foundry Services, Intel Corporation

Panel: Bridgital USP: Building Unique Semiconductor Partnerships
Anantha S, Director, Government Affairs and Public Policy, India, Intel Corporation
Chris Miller, Associate Professor, The Fletcher School, Tufts University (virtual)
Jason Hsu, Senior Fellow, Ash Center for Democratic Governance and Innovation, Harvard Kennedy School
Sagar Sharma, Chief of Staff, India Semiconductor Mission
Vrinda Kapoor, Co-founder, 3rditech

Talk: Responsible AI: We Have the Principles, We Need the Tools
Matt Sheehan, Fellow, Asia Program, CEIP

Panel: Responsible AI: A Strategic Imperative
Mariano-Florentino Cuellar, President, Carnegie Endowment for International Peace (virtual)
Samantha Hoffman, Senior Analyst, International Cyber Policy Centre, Australian Strategic Policy Institute
Rohit Satish, Program Lead, Art Park
Sarah E. Kemp, Vice president, International Government Affairs, Intel Corporation (virtual)
Matt Sheehan, Fellow, Asia Program, CEIP

Book Discussion: After Tiananmen: The Rise of China
Vijay Gokhale, Non-resident Senior Fellow, Carnegie India
Samantha Hoffman, Senior Analyst, International Cyber Policy Centre, Australian Strategic Policy Institute
Srinath Raghavan, Non-resident Senior Fellow, Carnegie India
Evan Feigenbaum, Vice president for Studies, CEIP
Ashley J. Tellis, Tata Chair for Strategic Affairs and Senior Fellow, CEIP

Conversation: HealthCare.AI: Disrupting Healthcare for Bharat
Prashant Tandon, Co-founder & Chief Executive Officer, Tata 1MG
Kashyap Chanchani, Managing Partner, The Rainmaker Group

Conversation: Healthcare.AI: Disrupting Healthcare for Bharat
Basant Garg, Additional Chief Executive Officer, National Health Authority

Talk: Ayushman Bharat Digital Mission (ABDM)
Rohitha Ravathsa, National Technology Officer, India
Sagar Sharma, Co-founder, 3rditech
| Closing Remarks |
| Closed-door Discussion: Meet ABDM |
| Closed-door Discussion: Principles for Digital Health Architectures |
| Day 3: December 1, 2022  |
| Sub-theme: Fragmentation and Its Effects |
| Closed-door Discussion: Safeguarding Modern Science and Biotechnology Innovation: India’s Road to G20 |
| Opening Remarks |
| Conversation: G20 Troika: Indonesia, India, and Brazil |
|  | Amitabh Kant, India’s G20 Sherpa (virtual) |
|  | Sarquis José Buainain Sarquis, Brazil’s G20 Sherpa (virtual) |
|  | Rudra Chaudhuri, Director, Carnegie India (virtual) |
| Ministerial Address |
| James Cleverly, Secretary of State for Foreign, Commonwealth and Development Affairs of the United Kingdom (virtual) |
| Ministerial Address |
| Josephine Teo, Minister for Communications and Information, Ministry of Communications and Information, Singapore (virtual) |
| Panel: Save the Data: Localization as Democratization? |
| Melinda Claybaugh, Privacy Policy Director, Legislation, Meta |
| Ralf Sauer, Deputy Head, DG Justice and Consumer’s Unit for International Data Flows and Protection, European Commission |
| Audrey Plonk, Head of Division, Digital Economy Policy, The Organization of Economic Cooperation and Development (OECD) (virtual) |
| Rahul Matthan, Partner, Trilegal |
| Anirudh Burman, Associate Research Director and Fellow, Carnegie India |
| Ministerial Address |
| Sanae Takaichi, Minister of Economic Security of Japan (virtual) |
| Panel: Lessons from the War in Ukraine |
| Raj Shukla, Member, Union Public Service Commission |
| Joshua T. White, Non-resident Fellow, Foreign Policy, Brookings |
| Lauren Kahn, Research Fellow, Council on Foreign Relations (virtual) |
| Ashley J. Tellis, Tata Chair for Strategic Affairs and Senior Fellow, Carnegie Endowment for International Peace |
| Indrani Bagchi, Chief Executive Officer, Ananta Aspen Centre |
| Panel: Promoting Sustainability: Transitioning to a Net-Zero Economy |
| Sassoon Grigorian, Vice President, Government Affairs & Public Policy, APAC & Japan, Salesforce |
| Ashutosh Chadha, Director & Country Head, Public Policy & Govt. Affairs, Microsoft India |
| Neeraj Sinha, Senior Adviser (S&T), NITI Aayog |
| Sandeep Chakravorty, Joint Secretary (EW), Ministry of External Affairs, Government of India |
| Varad Pande, Partner, Omidyar Network India |
| Sharmila Barathan, President, Govt. Affairs & Policy, General Electric, South Asia |
| Anirudh Suri, Non-resident Scholar, Carnegie India |
| Conversation: Building Technologies for a Sustainable Global Food Chain |
| Tarunjeet Singh Bhamra, Founder & CEO, Agnext |
| Kunal Bhardwaj, Partner, The Rainmaker Group |
| Panel: Local Content: Instrument of India’s Soft Power |
| Gaurav Gandhi, Vice President, Prime Video |
| Nanjira Sambuli, Fellow, TIA, CEIP |
| Amritpal Singh Bindra, Founder, Still & Still Media Collective |
| Rangita Prithish Nandy, Creative Director, Prithish Nandy Communications |
| Vikram Chandra, Founder, Editorji Technologies |
| Panel: Architecture for Biosafety and Biosecurity |
| Jaime Yassis, Vice President, NTI Bio |
| Mrinmayee Bhushan, Founder-director, Mindfarm Novatech Private Limited |
| Piers Millett, Executive Director, IBBI (virtual) |
| Shruti Sharma, Senior Research Analyst & Senior Convenor, Global Technology Summit, Carnegie India |
| Ministerial Address |
| Rajkumar Ranjan Singh, Minister of State for External Affairs and Education, Govt. of India |
| Keynote Address: Customer at the Center of Innovation |
| Rajesh Bansal, CEO, Reserve Bank Innovation Hub |
| Panel: Open-Network Technologies: A Driver of Financial Inclusion |
| Steven Haley, Director, Market Development & Partnerships, Mojaloop Foundation |
| Kamya Chandra, Practitioner Economist, Digital Development (virtual) |
| Nanjira Sambuli, Fellow, TIA, CEIP |
| Siddharth Tiwari, Former Chief Representative for Asia and the Pacific, Bank for International Settlements (virtual) |
| MG Vaidyan, Senior Advisor, Financial Inclusion, Tata Trusts |
| Priyadarshini D, Associate Fellow, Technology & Society Program, Carnegie India |
| Ministerial Address: |
| Isa Ali Ibrahim Pantani, Minister of Communications & Digital Economy, Nigeria |
| Address |
| Oddmund Hoel, State Secretary, Norwegian Ministry of Education & Research |
| Conversation: Personalized Cancer Care (virtual) |
| Siddhartha Mukherjee, Assistant Professor of Medicine, Columbia University & Pulitzer Prize-Winning Author |
| Kiran Mazumdar-Shaw, Executive Chairperson, Biocon & Biocon Biologics |
| Closed-door Discussion: Improving Access to Welfare Through DPGs |
| Closed-door Discussion: Unpacking the Digital Personal Data Protection Bill, 2022 |
Book Launch: Grasping Greatness: Making India a Leading Power

Welcome Remarks
Rudra Chaudhuri, Director, Carnegie India

Introduction to the Book
Ashley J. Tellis, Tata Chair for Strategic Affairs and Senior Fellow, Carnegie Endowment for International Peace

Conversation
S. Jaishankar, External Affairs Minister of India
Ashley J. Tellis, Tata Chair for Strategic Affairs and Senior Fellow, Carnegie Endowment for International Peace

Panel Discussion
Ila Patnaik, Chief Economist, Aditya Birla Group
Bibek Debroy, Chairman, Economic Advisory Council to the Prime Minister of India (EAC-PM)
Arjun Subramaniam, President’s Chair of Excellence, National Defence College
C. Raja Mohan, Senior Fellow, Asia Society Policy Institute

Closing Remarks