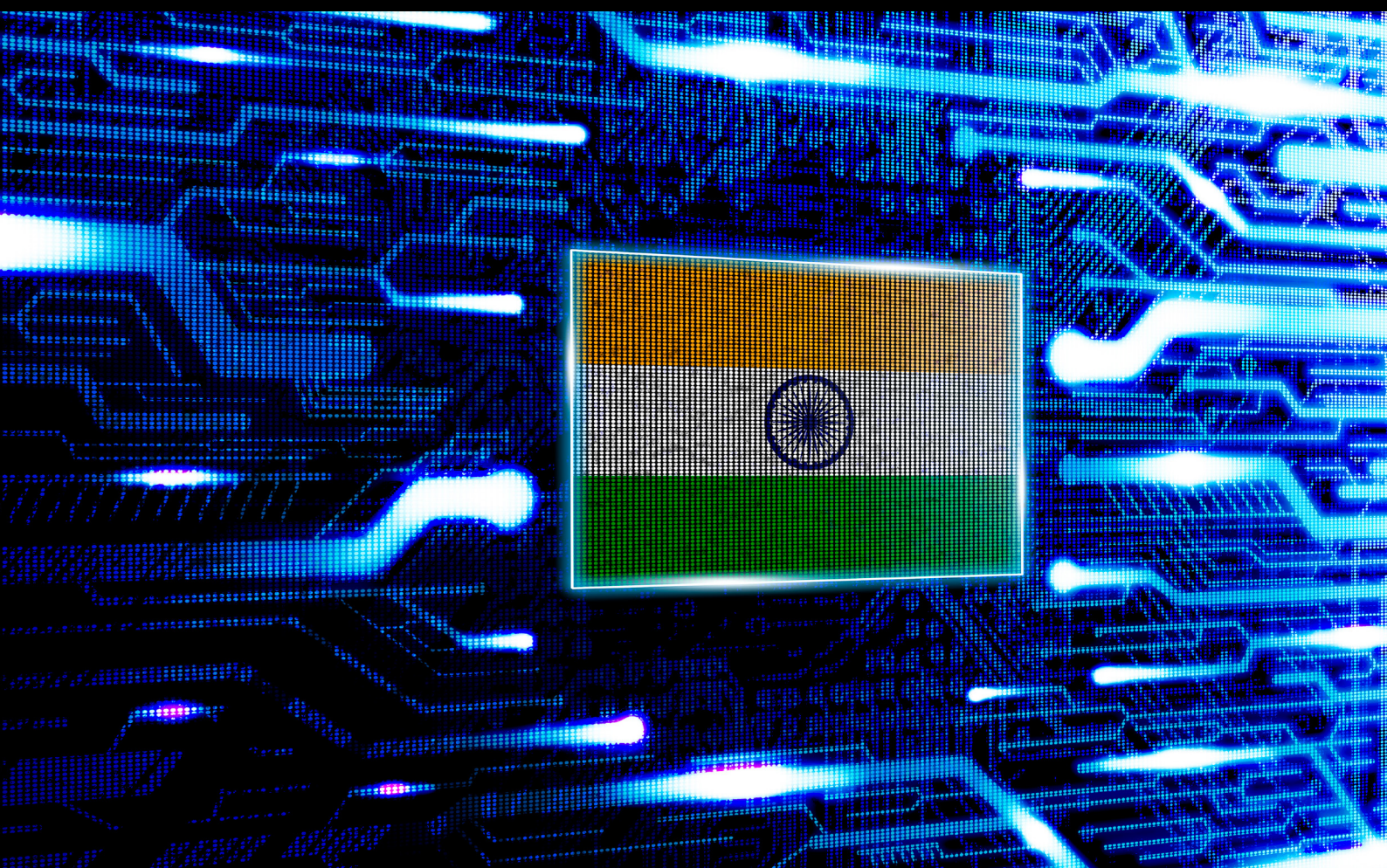# Critical technologies and the Indo-Pacific

A new India–Australia partnership

Aakriti Bachhawat, Danielle Cave, Jocelinn Kang,
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A shifting technology landscape and Covid-19

Most countries are technology-takers rather than technology-makers, and historically most have taken a passive approach to the technologies they deploy, including in critical national infrastructure. However, that's changing quickly. Whereas commercial imperatives once ruled supreme, states are now increasingly concerned with the implications of technology for governance, civil liberties, geopolitics, data protection and privacy, national security, ethics and trust. Cost is still a primary factor, of course, but these other drivers are increasingly framing national strategies and influencing policymaking.

Major decisions about critical infrastructure—for example, which telecommunications vendors nation-states are (and are not) prepared to partner with in 5G—now take into consideration where those vendors come from, their supply chains and the international behaviour of the vendor's home government. Bodies that fund research and development (R&D) into emerging technologies must now assess the dual and multi-use nature of those technologies. Research to improve smart city and traffic technologies, for example, can be used by foreign actors in ways different from those originally intended, including its exploitation for military gain, intelligence advantage or to enable human rights abuses.[1]

Covid-19 has accelerated strategic competition between states, particularly the US and China. Much of that competition centres on technology and data: Who owns and controls it? How is it being used? What rules, norms and standards are different states abiding by? This competition is quickly spilling over into international forums, including standards-setting bodies, and it's throwing up new challenges to global technology companies. It's also leading to new partnerships and presenting opportunities to deepen existing partnerships, as countries find more commonalities in the multitude of technological challenges they face. More opportunities are arising—and arising quickly—for practical cooperation to help deal with these challenges. One such partnership is the India-Australia relationship.

While the Covid-19 pandemic has damaged economies and disrupted our way of life, it has also highlighted our dependence on technology and the extent to which we'll rely on the next wave of technologies to drive future prosperity. The pandemic has also placed supply-chain security and reliability front and centre for the world's decision-makers and is leading to a push to find alternative sources of digital technologies and critical inputs, such as rare-earth minerals. It's here, for example, where Australia and India may find complementary interests, particularly in fields such as advanced and high-tech manufacturing.[2] While India is keen to burnish its credentials as an alternative hub for manufacturing, Australian industries could benefit through better access to India's large supply of cost-effective labour and technical talent. The recent agreement to cooperate on rare-earth minerals reflects the growing synergies in the relationship: Australia is a key supplier of those minerals, and India needs a reliable supply of rare earths to fuel its 'Make in India' program.[3] Both countries are dealing with an increasingly assertive Chinese state, which is forcing a public debate and rethink in both Australia and India on the risks associated with their current dependence on the Chinese market.

As Covid-19 continues to drag on economies, societies and global interconnectedness, the Indian and Australian governments will have to work harder to keep up the positive momentum that can currently be seen in the bilateral relationship. Both governments have shown an appetite to expand the breadth

of bilateral cooperation and to continue investing in strategic technology sectors.[4] At this year's June 2020 virtual summit between prime ministers Narendra Modi and Scott Morrison, for example, the agreement signed on cyber and critical technologies stands out as an area of cooperation where the two countries have clear synergies and are prepared to invest.

This report recommends that, as the bilateral relationship continues to grow, both governments invest in the construction of a new India–Australia partnership on technology. The foundation for such a partnership already exists, and it could stimulate regional momentum in a range of key critical and emerging technology areas. In this report, we outline what that partnership could look like. We examine the current state of the India–Australia relationship; provide an overview of current technology cooperation and where challenges and roadblocks lie; analyse each state's competitive advantages in selected technology areas; and highlight where there are opportunities for further collaboration. The report contains 14 policy recommendations that will help build this new partnership.

India–Australia cooperation surges ahead

India and Australia signed the following agreements in June 2020:

- Joint Statement on a Comprehensive Strategic Partnership between Republic of India and Australia
- Joint Declaration on a Shared Vision for Maritime Cooperation in the Indo-Pacific
- Framework Arrangement on Cyber and Cyber-Enabled Critical Technologies Cooperation
- Memorandum of Understanding (MoU) on Cooperation in the field of Mining and Processing of Critical and Strategic Minerals
- Arrangement Concerning Mutual Logistics Support
- Implementing Arrangement concerning Cooperation in Defence Science and Technology to the MoU on Defence Cooperation
- MoU on Cooperation in the field of Public Administration and Governance Reforms
- MoU on Cooperation in Vocational Education and Training
- MoU on Water Resources Management.

Source: 'Joint Statement on a Comprehensive Strategic Partnership between Republic of India and Australia', Department of Foreign Affairs and Trade, 4 June 2020, online.

The current India–Australia relationship: evolution and expansion

The Australia–India relationship is rapidly becoming one of the most important pillars of the Indo-Pacific. The relationship has travelled real distance over the past few years—politically, economically and militarily. Covid-19 provides an opportunity for both sides to build a solid bilateral relationship in its own right, rather than within the context of the larger, and increasingly tense, US–China relationship.[5]

Converging geopolitical perceptions

Today, it's increasingly clear that neither Canberra or New Delhi believes—as they may have a few years ago—that China will rise peacefully and that their relationships with Beijing will be primarily based on 'win–win' cooperation. In contrast, recent actions taken by Australia and India in response to the Chinese Communist Party's assertiveness in the wake of Covid-19 have reinforced mutual perceptions of each other's reliability.

Moreover, the intensifying geopolitical competition between the US and China over the past few years has coincided with the emergence of a more isolationist and transactional US administration, which has altered the foreign policy calculations of middle and rising powers in the region. Canberra and New Delhi remain wary of Washington's ability to maintain a rules-based order in the Indo-Pacific on its own.

But, of course, there are challenges in the relationship. Rising illiberalism in India, particularly with regard to the treatment of minority communities and developments such as increases in internet shutdowns,[6] sit uncomfortably with Canberra as the government works hard to forge a closer relationship; it also contrasts with the strong international voice India has as a leading and diverse democracy. On the other hand, the memory of Australia abandoning the Quadrilateral Security Dialogue (the Quad: Australia, Japan, India, the US) in 2008 due to the Chinese Government's sensitivities explains the bureaucratic inertia and reticence informing New Delhi's attitudes vis-a-vis Canberra even today.[7]

Nonetheless, India's long-held suspicions of Australia's over-reliance on China's economy are giving way to an acknowledgement of Canberra's assertion of its national interests in the face of Beijing's diplomatic and economic coercion.[8] Significantly, Canberra has also voiced its support for New Delhi in the ongoing Sino-Indian clash in Ladakh, which is a considerable shift in its diplomatic position vis-a-vis China–India relations and is likely to further consolidate ties.[9]

Economic, diplomatic and defence ties

On trade, although Australia failed to convince India to join the Regional Comprehensive Economic Partnership in 2019, there's some indication that New Delhi might be open to a freer bilateral trade arrangement with Canberra.[10] However, it's important for Australia not to fixate on a free trade agreement as the hallmark of success, given that it's likely that, as with other nations, India's protectionist tendencies will be heightened in the aftermath of Covid-19. Already, the pandemic has

produced a significant decline in Australian exports to India in June 2020.[11] Still, it's important to take note of the progress made in recent years: Australian exports to India doubled from $11 billion in 2013 to $22 billion in 2018,[12] and India was Australia's fifth largest export market and eighth largest trading partner overall in 2018–19.[13]

In June 2020, prime ministers Morrison and Modi held a virtual summit during which they elevated bilateral ties to a comprehensive strategic partnership.[14] This included a mutual logistics support agreement, which will facilitate much deeper military cooperation than in the past.[15] In 2019, AUSINDEX (the biennial military exercise between Australia and India) included antisubmarine exercises, demonstrating increasing mutual trust and interoperability.[16] India also made a debut in Operation Pitch Black (Australia's multinational air combat exercise) in July 2018.[17] There's speculation that India is very close to inviting Australia to the 2020 Malabar naval exercises in the Bay of Bengal, which is likely to further strengthen the Quad and, more importantly, remove a symbolic obstacle to deeper Australia–India relations.[18] Canberra and New Delhi have also elevated their diplomatic engagement by instituting a new biennial defence and foreign ministers' '2+2' meeting arrangement during the Modi–Morrison summit.[19] Also, the Indian Ministry of External Affairs has recently created a new 'Oceania' division, centred on Australia, which speaks to the growing strength of the relationship.[20]

Australia–India relations have continued to blossom minilaterally through the elevation of the Quad meetings to the ministerial level in October 2019.[21] The Quad has been active as a consultative forum during the pandemic, which indicates the important role it can play in facilitating regional cooperation on non-traditional security issues.[22] Other minilateral channels of cooperation include the India–Australia–Indonesia partnership in the Indian Ocean[23] and the India–Australia–Japan trilateral.[24]

In a post-Covid world, trust will be the main currency in the international system.[25] Countries will look foremost to invest in partnerships with nations they can rely upon to act consistently with their commitments, whether on trade, infrastructure, defence, supply chains, cyberspace or technology. In an environment in which trust is more important than ever, India–Australia ties have an increasingly bright future.

Technology cooperation and leveraging competitive advantages

India is increasingly emerging as a global technology hub. Its digital economy is slated to reach US$1 trillion by 2025.[26] It's a leading source of information technology (IT) and IT-enabled services. Indian companies from those sectors are estimated to have set up more than 1,000 global delivery centres in 80 countries.[27] New investments in space and satellite technologies, smart cities and vibrant cybersecurity and start-up sectors are positioning India's economy to take advantage of our digital world.

Australia has comparative global strengths in the fields of research, education and training. The current government has continued to show an appetite for continued investment in the defence and strategic technology sectors.[28] Across government, the public service is increasingly investing in technology policy expertise, and, while still settling, policymaking in that area is slowly becoming more strategic and long term. Australia's first-mover role in making sensitive critical technology policy decisions ahead of the rest of the world, such as banning 'high-risk' vendors from its 5G network back in 2018, has led to governments around the world turning to Australia for policy insight and also advice. However, despite some of those strengths and positive trends, the Australian Government has struggled to take advantage of some of its own decision making and translate this into a forward-looking and stable regulatory framework that encourages private sector investment, fosters innovation and minimises risk.

Technology cooperation and collaboration between India and Australia remain in a nascent phase, but there's enormous potential that could be leveraged by both states if they're willing to make small, targeted investments and put in the bureaucratic effort required. Each country's foreign affairs ministry is well placed to lead on setting this strategic vision and coordinating this bureaucratic effort via the relevant country and thematic areas, and of course, through each high commission. But each ministry will only make headway if they can bring other government departments and the business community on board to support this effort, particularly those organisations working across the telecommunications, internet, cyber-security, critical infrastructure and technology fields. In addition to important business engagement through avenues such as business councils and trade missions, universities and think tanks will be key components in elevating this partnership and stimulating further technology cooperation.

While technology cooperation between India and Australia is currently underdone, there are signs of positive momentum. Among the nine agreements signed during the Modi–Morrison summit, the Framework Arrangement on Cyber and Cyber-Enabled Critical Technologies Cooperation[29] stands out as an area of cooperation where both states see opportunity and are keen to see practical progress. Unlike previous agreements on cyber and technology issues, this newest one has funding attached for R&D (A$12.7 million). Other announcements from the summit included a pledge to integrate supply chains between local small and medium enterprises and start-ups, as well as agreements on greater cooperation in defence science and technology.[30]

The following five case studies outline some of the challenges to deeper cooperation while also highlighting the many opportunities in different technology areas. Each case study also contains specific recommendations for policymakers in India and Australia, which are summarised at the end of the report.

5G technologies

5G technologies will underpin both India's and Australia's ambitions for future digital functionality and capability. For India, those ambitions are characterised by autonomy, the economic uplift of all sections of its population and its aspiration to become a global 5G manufacturing hub.[31] Australia's 5G vision, meanwhile, emphasises the global competitiveness of its digital economy and the exponential improvement in users' experience of online services.[32]

Domestically, the Indian Government emphasises self-sufficiency—epitomised in initiatives such as Make in India and *Aatmanirbhar Bharat* ('self-sufficient India'). India's 5G policies have a dual aim of rapid deployment and the development of a domestic 5G industrial base, including semiconductor labs and assembly and testing facilities. The Australian Government's 5G strategy focuses on creating an enabling regulatory environment that clears the way for private-sector telecom players to rapidly test and deploy 5G networks. According to the Department of Infrastructure, Transport, Regional Development and Communications' *5G—Enabling the future economy* report, 5G will help keep Australia's high-value manufacturing sector competitive, improve transportation and traffic management, and support a diverse, rich digital economy.

There are also international dimensions to 5G, and both India and Australia take seriously the security and geopolitical implications of the technology.

The Australian Government effectively banned 'high-risk' vendors—Huawei and ZTE—from Australia's 5G networks in 2018, due to concerns about risks created by the Chinese state's power over such entities.[33] The Government of India—due in part to Chinese incursions in the Indian territory of Galwan, starting in May 2020—has barred state-owned telecommunications companies from using Chinese vendors, and will 'review the participation of all Chinese equipment makers in 5G trials'.[34]

These positions come with their own drawbacks. Australian telcos are sourcing from Nokia and Ericsson in what's 'effectively a duopoly and a broader 5G 'ecosystem' will take a combination of effective government policy and regulatory action and time to create'.[35] Indian telcos face a similar vendor environment, should the government put a similar framework to Australia's in place. Homegrown 5G solutions have been floated in both countries and, in India, Reliance Jio will be entering 5G trials using its own technology.[36]

Active participation in standards-setting forums such as the International Telecommunication Union is a priority for both countries. Australian officials continue to refocus resources towards those bodies and, while India's participation in such forums so far has been described as 'low key', policy documents indicate that the government wants to move from being a rule-taker to being a rule-maker.[37]

Given the growing number of states in the Indo-Pacific, and globally, that are restricting the participation of high-risk vendors such as Huawei in 5G infrastructure and networks, there's growing potential for a regional partnership in this area. A D10 'club of democracies' on 5G has been floated by Downing Street but, at present, the proposal lacks detail and direction. There's space in the Indo-Pacific to build capacity between states that are concerned about supply-chain security, network security and data protection. Such a group could, for example, provide a platform for collaboration with like-minded countries to ensure that 5G standards-setting is inclusive and to enable knowledge sharing on the creation of enabling policy ecosystems for the rapid deployment of 5G networks, including on cybersecurity.

A growing concern around 5G in Australia and India is the proliferation of online disinformation and social media manipulation. Limited accessible information paired with the peddling of disinformation by state and non-state actors (such as influencers, nationalist trolls and conspiracy theorists) are parts of the problem.[38] Conspiracy theories relating to the health effects of 5G are rife online. Despite evidence to the contrary, 5G disinformation has become so widespread as to become a barrier to 5G deployment, and some countries have already seen cases of the destruction of 5G cell towers by locals.[39]

Public- and private-sector players in India and Australia can share best practices with each other and the region to, in the case of 5G, create accessible, evidence-based public information campaigns regarding 5G and work with social media platforms to disseminate accurate information and flag coordinated disinformation campaigns.[40]

Artificial intelligence

Currently, India and Australia are at a similar stage in their development of artificial intelligence (AI): they have enthusiastic AI sectors but lack formal policies to support growth and encourage innovation.

Both countries recognise AI as a technology of strategic importance and have worked on national AI strategies.[41] Those strategies have identified areas in which AI technologies could have the most impact in solving local problems and expressed a desire to commercialise and export those solutions. They both wish to engage in responsible AI and have identified challenges and a need for guidance on obtaining high-quality data ethically, including guidance on data protection. Several collaborative and complementary partnership opportunities can be explored between Australia and India that could address those common challenges and enhance the domestic capabilities of each country. Common sectors in focus are agriculture, health care, education and smart cities.

India and Australia are currently working on their regulatory frameworks to enhance data privacy protections. India began drafting its Personal Data Protection Bill in 2017, and a modified version is currently making its way through parliament.[42] Australia's consumer and privacy regulatory bodies have been engaged in work to strengthen consumer access and control of their own data[43] and to assess the scope of, as well as future proof, the *Privacy Act*.[44] Robust data protection policies and standards that engender trust and help to create enhanced data ecosystems would lead to an ability to access greater amounts of high-quality data while also facilitating smoother cross-border data-sharing arrangements. This in turn would open up more opportunities for collaboration and the trading of data assets.

Australia and India have been working towards inclusive and responsible AI. An unregulated AI environment presents social, safety and security risks. There's been significant movement this year by both countries to increase participation in global AI standards setting and international AI policy representation,[45] which was previously quite low. Notably, both countries are part of the recently established France–Canada-led Global Partnership on Artificial Intelligence (GPAI), which aims to ensure that AI is 'used responsibly, respecting human rights and democratic values'.[46]

Australian and Indian investment in education would reap significant benefits and help grow the two countries' local AI ecosystems. Developing general AI literacy will lead to more demand to implement AI solutions and to develop the engineers and researchers who will work to bridge the skills gap.

Without greater investment in education and work opportunities, there's a risk that local talent will continue to seek opportunities abroad. A study on global AI talent flows showed that the majority of students who finish their study in Australia and India seek postgraduate opportunities overseas, primarily in the US.[47] A portion of Indian graduates have chosen to leave India for opportunities in Australia.

India's plans to develop smart cities under Make in India (an initiative to bolster India's manufacturing industry) can open up a broad range of mutually beneficial opportunities for both nations.[48] Collaborative R&D into AI applications in smart cities works towards supporting India's manufacturing sector as well as the high-tech industry that surrounds smart cities. Growth in end-user industries such as power and infrastructure also means opportunities for the mining sectors of both nations, including demand for Australia's critical minerals, which are used in the manufacture of products such as solar panels and rechargeable batteries.[49]

Quantum technologies

Quantum technologies (including quantum computing, communications and other quantum-enabled technologies) have the potential to reshape future economies, global cooperation and strategic competition.[50]

In Australia—a quantum technology pioneer—the potential economic and policy implications of more investment in quantum technologies have received growing attention during 2020.[51] Australia's strengths in quantum technologies lie in R&D and in quantum computing.[52] A 2020 report released by Australia's lead science agency, CSIRO, states that quantum computing presents the largest long-term opportunity for the country, with the potential to create 10,000 jobs and A$2.5 billion in annual revenue by 2040, while spurring breakthroughs in drug development, industrial processes and machine learning.[53]

2020 has also brought traction for India on quantum technologies. The government has committed US$1.12 billion over five years as part of a new national quantum mission—a considerable investment, when compared with past public investments.[54] Implemented by India's Department of Science and Technology, the new funding will 'ensure both public and private sectors will benefit' and will also help stimulate a pipeline to support research and related applications.[55] The new mission will be tasked with overseeing the development of quantum technologies for communications, computing, materials development and cryptography.[56]

Earlier this year, the Secretary of the Department of Science and Technology told the media that India's quantum research is 'solid on the theoretical side, but we need to build infrastructure and experimental facilities, we need to build our capacity.'[57] This highlights a gap for India that Australia can help fill with its expertise in quantum research, training and capacity building. A number of small low-cost investments would help to boost India's quantum technology capacity, including PhD scholarships, research fellowships between Australian and Indian universities and secondments between relevant government science and technology departments.

India brings a lot to the table that would enhance Australia's position as a quantum technology pioneer. It's home to an enormous pool of science, technology, engineering and mathematics talent. It also has a stronger record than Australia in technology commercialisation. It's also worth noting that

India's network of business leaders occupying key senior positions in global internet and technology companies is unmatched outside of the US.[58] Given India's vibrant technology sector, there may be opportunities for quantum-focused public–private partnerships between government and industry. It would make sense for such projects to be based in India, where there's both a greater technology talent pool and a larger market to test and scale-up technology products and solutions. Australia, and a small number of other regional countries such as Japan, could play a key role in supporting the development of such partnerships and, potentially, contributing to and sharing the development of intellectual property.

Space technologies

The increasing relevance of space in multiple domains (including economics, meteorology, navigation and the military) provides ripe ground for further collaboration on opportunities and challenges. Although India and Australia have very different space programs (India's is longstanding and established, while Australia's is just beginning), there are still avenues for fruitful cooperation.

India and Australia have growing and energetic private space sectors, some parts of which have niche capabilities and technologies. This provides opportunities for the governments to bring the two sectors together to leverage the entire spectrum of space technology capabilities and encourage the growth of innovative new space enterprises. Both countries have growing intelligence, surveillance and reconnaissance (ISR) requirements, for example, especially in the maritime domain. Cooperation in space-based ISR would have multiple benefits for both countries, both by harnessing the best available technology and by pooling costs and analytical capabilities.

Given the growing use of space and the increase in the number and types of actors in space, there is a need to monitor the space environment in order to avoid possible accidents and collisions. India and Australia have limited situational awareness capabilities to track spacecraft and how space assets are used to understand the maritime domain. As both countries seek to expand and invest in space situational awareness capabilities, partnerships between the two and other like-minded countries in the Indo-Pacific, including Japan and Indonesia, make sense. Space assets for developing effective maritime domain awareness are also important, given the growing maritime security threats in the Indo-Pacific.

There are also additional challenges in space, especially in the space security domain, that call for enhanced global governance measures. The threat of anti-satellite weapons and the growing threat of cyber and electronic warfare in space are cases in point. Existing measures, such as the Outer Space Treaty of 1967, have gaps in addressing these more contemporary issues. For instance, the Outer Space Treaty bans the placement of weapons of mass destruction in space, but makes no mention of conventional weapons. The crowded and congested nature of near-Earth space also raises the risk of radio frequency interference. Major space powers need to take a concerted approach in developing new mechanisms to govern activities in outer space, but the sharp division and disagreement among the major space players has impeded progress in developing an effective space regime. There's a critical role for countries such as India and Australia in combining their efforts to bridge the gaps between different proposals that seek to ensure the use of space in a safe, secure and sustainable manner. India and Australia could team up with other middle powers and like-minded governments to devise technology-driven solutions to address these challenges.

In an environmentally challenged region that weathers severe natural disasters, there's a need for a large number of remote sensing satellites. India has an impressive number of remote sensing or earth observation satellites using state-of-the-art cameras that are capable of providing images of the Earth in multiple resolutions, bands and swathes, and has offered those services to regional and global customers. The Indian civil space agency—the Indian Space Research Organisation (ISRO)—is collaborating with several space agencies, including those of the US and France, on developing those satellites. This type of international satellite engagement is an ideal area for closer collaboration in the India–Australia context.[59]

The existing International Space Station, which has hosted astronauts from many countries, will be wound up in a few years. After that, the only space station will be the one that China is now establishing. There are currently no plans for any other international space stations. India and Australia should proactively engage in any planning for one that occurs over the next decade.

Cooperation on critical minerals and rare earths

Australia and India signed an MoU to cooperate on critical minerals in June 2020, alongside the comprehensive strategic partnership signed by prime ministers Morrison and Modi (see box on page 4).[60] Although rare-earths cooperation doesn't strictly classify as technology cooperation *per se*, it does merit a mention in this context, as critical minerals and rare earths form the backbone of the technology industry and are essential components of batteries, computers, smartphones, hard drives, lasers and other devices.[61] They're used in various high-tech industries and sectors, ranging from renewable energy, automobiles and agriculture to defence and aerospace, among others. Most importantly, the use of these elements in defence manufacturing makes them fundamental to national security.[62]

Cooperation on critical minerals

The MoU signed by India and Australia entails cooperation on information-sharing, research linkages between institutions and supply-chain resilience.[63] Australia has identified the potential to be the top supplier of cobalt and zircon to India. Canberra has also identified antimony, lithium, rare earths and tantalum as other minerals that it could offer to New Delhi.[64] India has, in turn, identified lithium,[65] cobalt, nickel and rare earths[66] as crucial for its electric automobile and manufacturing industries.[67]

Information sharing

India and Australia have agreed to share information about each other's mineral resources, demand and production capacities in order to facilitate cooperation. Australia is well placed to share its geological research and offer mining equipment and expertise across the full spectrum of India's requirements in that sector, as outlined in India's National Mineral Policy 2019: mineral conservation and development; scientific methods of mining; machinery and beneficiation equipment; human resource and infrastructure development.[68] Australia has considerable expertise in high-tech engineering, resource extraction and processing, and renewables.[69] According to the Australian Government's Critical Minerals Facilitation Office, a joint working group has been created to manage the exchange of information.

Research linkages

The Australian Government has allocated $4.5 million towards R&D programs focused on critical minerals to CSIRO, the Australian Nuclear Science and Technology Organisation and Geoscience Australia.[70] While the Indian Government has an R&D program worth roughly $4.4 million (2016–17 budget) for major minerals, it doesn't yet have a dedicated program for critical minerals.[71]

The Australian Government encourages private investment into R&D initiatives on critical minerals through the provision of tax offsets for eligible research programs worth more than $20,000.[72] Several Australian universities are building research programs to investigate critical minerals. The University of Adelaide, for example, is establishing its new Critical Minerals Research Centre to build expertise in 'end to end' critical-minerals mining research and training.[73]

Supply-chain resilience

China accounts for 80% of the world's rare earth production and exercises an almost total monopoly over many stages of downstream processing and manufacturing.[74] In comparison, Australia, which is the second largest supplier of these minerals, is responsible for only 11% of the world's production.[75] In the past few years, and particularly since the onset of trade tensions between the US and China,[76] countries have woken up to the need to diversify rare-earths supply chains.[77] India's vulnerability through its dependence on China for critical minerals has increased in the wake of the Line of Actual Control stand-off with the People's Liberation Army in recent months.

Producers of critical minerals can face several challenges, including funding and price volatility, sustainability risks and manufacturing limits, all of which mean that no state can be self-sufficient in this sector[78] and that new international trade and investment relationships are vital for continued global technological development.[79] India and Australia, along with Japan, are in discussions to build a new supply-chain resilience initiative,[80] which is likely to include critical minerals. Apart from India, Australia has formed critical-minerals supply-chain partnerships with the US,[81] South Korea, Japan and Canada.[82]

India is a net importer of processed rare earths, despite holding one-fifth of the world's reserves, because those minerals are largely untapped by the country's state-owned mining companies.[83] New Delhi needs to invest and build expertise across all stages of mining, including geoscience, exploration, development, production and reclamation.[84] India's emphasis on building an *Aatma Nirbhar Bharat* through the Make in India initiative means that critical minerals are a top priority for the government and will become even more important after Covid-19. As Australia looks to shore up its own manufacturing sector, there are particular synergies to be explored in the field of downstream processing and advanced manufacturing to bolster India's Make in India 2.0 initiative.[85]

Mining in India is a largely state-owned and state-run activity.[86] Opening up the mining sector to private investment, both domestic and foreign, will enable the efficient and profit-oriented pursuit of critical minerals, which would make the sector modern and cost-effective and also bring in much-needed revenue for the Indian Government. There's great potential for Indian businesses to invest in Australia's mining sector to reap the benefits of the country's competitive advantages,

including its technical, capital-allocation and risk-management abilities; political and economic predictability; regulatory and legal certainty; and environmental and labour standards.[87]

According to the Australian Government's Critical Minerals Strategy 2019, critical minerals such as cobalt, tungsten, zirconium and others with 'high geological potential' remain relatively underinvested in[88] and could prove ripe for collaboration between Australian and Indian companies. One such venture is the recently announced partnership between ASX-listed Neometals and Indian refinery Manikaran Power to set up a lithium refinery in India.[89]

Furthermore, countries in the Indian Ocean region, including India and Australia, have vast mineral resources, including rare-earth elements, contained in the sands along their coastlines.[90] Producing rare earths from those sands is comparatively easier, more cost-effective and more competitive vis-a-vis Chinese rare earths, even without state subsidies.[91] There's also an opportunity for Australia–India collaboration in third countries in the Indian Ocean region, such as Indonesia, Thailand, Tanzania, Madagascar and South Africa, which are known to have rare-earth deposits in their sands. There are also 'waste-tailing' opportunities from old mining projects.[92]

Fintech and opportunities for an Indo-Pacific stack

The adoption of digital payments has risen exponentially in India and Australia over the past decade. In India, that growth has run parallel to rapid mobile device penetration, aided by initiatives such as the Aadhaar (a 12-digit unique biometric identity number) and the Unified Payments Interface (a payment system that facilitates instant inter-bank transactions through mobile phones), as well as the unintended push factor created by demonetisation in 2016. In 2019, the fintech adoption rate in the country stood at 87%, and the value of digital payments is expected to grow 20% annually until 2023, constituting 2.2% of the global digital payments market.[93] Paytm, India's largest digital payments app, received $1.7 billion in investment in 2019, making it the largest fintech deal of its kind in the Asia–Pacific and the sixth largest in the world.[94]

Australia took a major policy step on 1 July 2020 with the launch of 'open banking' under the Consumer Data Right Act. The new policy is intended to enable the safe transfer of banking data to accredited third parties.[95] Australia recorded a 58% adoption rate for fintech in 2019, up from just 15% in 2015.[96]

Application programming interfaces (APIs), which enable applications to communicate with each other, are the key to fintech development in both countries. IndiaStack, for instance, is a set of indigenously developed APIs and is behind ambitious projects such as Aadhaar and the Unified Payments Interface. Australia's api.gov.au gives 'technology developers, researchers and other parties access to a range of government APIs'.

There has been interest in the Indo-Pacific countries on full stack capabilities, particularly for digital IDs that facilitate secure mobile banking. For example, Manila sent an exploratory team to the Unique Identification Authority of India, which is the custodian of Aadhaar, and has since piloted its own national biometric ID.[97]

Partners in technology: India and Australia in the Indo-Pacific

India and Australia are located in an increasingly geopolitically turbulent region. While the Indo-Pacific is one of the most economically vibrant regions, it's increasingly witnessing more than its fair share of mistrust, rivalry and insecurity. This is a consequence of the changing balance of power in the region and the spectacular rise of an increasingly assertive China. This political problem is exacerbated by technological factors, including the uneven availability and potential misuse of technology, which could also have implications for strategic stability in the region.

There are two interrelated issues here. The first is cooperation in the development of technologies (such as advanced computing, 5G and AI) so that authoritarian states don't dominate them and use them as a source of power over others. The second is the issue of governance of certain areas of technology and its implementation so that such technologies don't damage or restrict the rights and development opportunities of all states. For example, space is an arena that requires urgent efforts to develop fresh norms and rules, without which we're facing the possibility of all states losing the ability to explore this important domain for national development without threat from others.

China's rise and regional strategic uncertainties have compelled like-minded states such as Australia and India to come together to help shape a more stable, secure and prosperous Indo-Pacific. Cooperation in these areas can develop rapidly in a bilateral context, but there are also possibilities of expansion to other like-minded and capable countries in the region, such as Japan, Indonesia, South Korea, Singapore and others.

Multilateral institutions are proving to be inept at handling the security issues in this fast-moving field, especially in tightening existing rules and regulations and in developing new ones. The impasse in the multilateral process also provides key Indo-Pacific powers such as Australia and India and other partners an opportunity to take the lead in starting conversations for the development of norms of responsible behaviour, standards and guidelines as well as transparency and confidence building measures.

While legal measures, such as the Outer Space Treaty, may be ideal instruments to manage some policy areas, the highly contested nature of major-power relations today means that they're unlikely to yield any positive results for technology policy in the near term. There could be Track 1, Track 1.5 and Track 2 dialogues discussing areas of technology policy cooperation. This report offers recommendations and ideas to kick-start conversations in trilateral, quadrilateral and minilateral settings.

Along with the development of norms and regulations, Australia, India and like-minded countries need to work together to uphold and ensure accountability and transparency in multilateral agencies so that those agencies aren't hijacked by any single power. The World Health Organisation's experience during the initial stages of the Covid-19 pandemic is a useful reminder of the kind of challenge co-option presents.

Australia and India have different technological strengths. Nevertheless, the political and strategic utility of a Quad or Quad-plus (adding New Zealand, South Korea and Vietnam) to form technology coalitions to deal with a number of issues, including global supply chains, is significant. Vietnam is already using opportunities in this domain by tapping into business entities shifting out of China. Japan has further incentivised business enterprises to move out of China. While these are mostly individual efforts, there could be more coordinated and concerted efforts in protecting critical technology industries that are part of global supply chains with a heavy dependence on entities within China's jurisdiction.

Equally important is ensuring that no power is able to gain coercive capacities due to its technological advantage. This is particularly true in the Indo-Pacific region, which is witnessing both the use of technology to penetrate societies and the use of technology by some states for political and strategic ends, including the use of political pressure to determine technological choices that could have potentially strategic long-term consequences for the entire region. One example is 5G telecommunication technology that China has been pressuring other countries to accept, which would potentially give China such a capacity. This becomes particularly problematic when it isn't a function of legitimate market competition and technological prowess but the result of clear Chinese government intent to use technology as a source of its strategic and economic power.

Nevertheless, combating such efforts isn't easy, especially for smaller developing countries that might not be able to bear the cost of such competition. An Indo-Pacific Technology Fund (IPTF), with India and Australia as initial investors, could potentially help to deal with some of those challenges. The IPTF could help reduce vulnerabilities by supporting the development of critical emerging technologies while also helping states develop and upskill their own in-house technological capacities. It can also fund training to help smaller partners enhance their own capabilities to meet future technological challenges. The IPTF could first be developed as an Australia–India public–private partnership (modelled along the lines of the US–India Clean Energy Initiative, for example). The two governments could start with modest contributions of USD$75 million each (which could be drawn from development assistance budgets), while also seeking collective private sector investment of USD$100 million. In exploring the establishment of such a fund, India and Australia should meet early with likely key stakeholders, including governments in the region, key civil society groups and potential private-sector partners to seek feedback and help shape this initiative.

Policy recommendations

We make the following 14 policy recommendations. The first four are general recommendations and are followed by sector-specific recommendations.

General

India and Australia should establish an Indo-Pacific Technology Fund (IPTF). As discussed above, this fund could start with investments by the Indian and Australian governments and by industry. In the short-term, it could grow to include other partners, such as Japan, and eventually make space for other countries to participate if they are interested, such as Taiwan, Singapore, South Korea and Southeast Asian states.

India and Australia should prioritise coordination and collaboration in standards-setting bodies. The elevation of these issues as a bilateral priority could take place at a new annual Track 1.5 dialogue in 2021 that focuses on critical and emerging technologies and brings together government officials, industry, think tanks and academics. One focus of the dialogue should be on developing norms for technology use that could also provide broader lessons for the Indo-Pacific region. This could be hosted by think tanks and supported by the Indian and Australian foreign affairs ministries and security and science and technology departments.

The Australian Government should launch the Prime Minister's Indo-Pacific Technology Scholarships in 2021. The scholarships should be awarded to researchers in universities and think tanks in India to undertake PhDs, research and think-tank fellowships in Australia. The scholarship program could start in India and gradually expand to include other countries. Quantum, AI and space technologies could be key priority areas for the program. The scholarships would be prestigious and should be awarded in consultation with Australia's Chief Scientist and the Indian Prime Minister's Principal Scientific Adviser.

The Indian and Australian governments should consider secondments, which could begin in 2021, between their science and technology departments, policy departments and government research institutions. They should also continuously look for opportunities to bolster their embassies with additional staff who have expertise in science and technology. The two governments could consider setting up offices of the CSIRO in India as well as expanding the presence of Australia's Department of Industry, Science, Energy and Resources in India. Similarly, India should consider posting ISRO and other scientific liaison officers in the Indian High Commission in Canberra and Indian embassies in the Indo-Pacific.

- **Recommendation 1:** Launch an Indo-Pacific Technology Fund to help facilitate greater technological linkages across the Indo-Pacific region by supporting technology development, capacity-building and training amongst smaller partner states.

- **Recommendation 2:** Launch a new India–Australia Track 1.5 dialogue in 2021 on critical and emerging technologies and make technology norms and standards one of the key focuses of this dialogue.

- **Recommendation 3:** Establish the Prime Minister's Indo-Pacific Technology Scholarships to commence issuing scholarships in 2021, with India as the initial focus of these new scholarships.

- **Recommendation 4:** Explore India–Australia secondment opportunities among key government departments, as well as opportunities for a greater CSIRO and Department of Industry presence in India and a corresponding Indian scientific presence in Australia.

5G

Australia and India should work together with other partners in the Indo-Pacific to promote 5G capacity-building in the Indo-Pacific. Promoting knowledge sharing on 5G would help build norms and a common understanding of supply-chain security, network security, data protection and 5G standards-setting and could also tackle issues such as 5G disinformation.

- **Recommendation 5:** Work together to promote 5G capacity-building activities in the Indo-Pacific through both established and new capacity-building activities.

Artificial intelligence

India and Australia should look for opportunities to more actively promote policy discussions in the Indo-Pacific, and lessons learned, about AI, data policy standardisation, data protection legislation, cross-border data sharing and data ethics issues. Both governments should continue to strive to ensure that they're adequately represented in international AI policymaking (for example, through the many UN and standards bodies that are increasingly engaging with AI and incorporating it into their work).[98]

The two countries should also explore opportunities for public–private R&D projects on AI and smart city development. This could help support both countries' R&D and high-technology manufacturing sectors.

- **Recommendation 6:** In order to more actively promote regional policy discussions about AI, India and Australia should co-lead an Indo-Pacific chapter of the Global Partnership on Artificial Intelligence.
- **Recommendation 7:** India and Australia should seek opportunities to engage in joint R&D projects that look at AI and smart city development. One option would be for each government's tertiary research funding bodies to co-fund a centre of excellence on AI and smart city development involving one university partner each in India and Australia.

Quantum technologies

India and Australia should look for opportunities to partner and pool resources on quantum projects, including quantum computing. For example, government science institutions could partner on a pilot quantum computing project. There may be regional public–private opportunities that could be established or better leveraged.

- **Recommendation 8:** Explore India–Australia partnership, research and resource pooling opportunities in quantum computing.

Space technologies

Australia and India should establish a new Track 1.5 dialogue on space security governance, driven by their space agencies and supported by their high commissions. This dialogue would be the ideal place to explore many of the following recommendations.

ISRO's Space Situational Awareness Directorate, the Australian Space Agency, defence and relevant border agencies need to initiate exploratory discussions on space situational awareness and maritime domain awareness. This assumes critical importance, given the geopolitical contention in the Indo-Pacific, including in the maritime space. The Track 1.5 dialogue suggested in Recommendation 2 could help facilitate this discussion.

Along the same lines, India and Australia can also initiate broader ISR collaboration, integrating ISR data, and expanding the data-sharing partnership to others in the Indo-Pacific. This could be undertaken by the two countries' relevant agencies and also in the Track 1.5 process.

India and Australia should collaborate on building better redundancy measures, including through encryption measures on data transmitted to and from satellites. This is an ideal area for industry to pitch in, and industry-to-industry collaboration could ease the burden on governments.

Given that the Indo-Pacific region is very prone to frequent natural disasters, India and Australia should work together on developing a constellation of remote sensing satellites, including for use in the Indo-Pacific context. ISRO, CSIRO and the Australian Space Agency could initiate discussions to explore this potential collaboration. This would assist in rapid humanitarian assistance and disaster relief responses from partner states.

The International Space Station will be decommissioned by 2030, so India and Australia should proactively engage in any planning for a replacement that occurs over the next decade. This will not only provide a boost to the human adventure in space but also provide further momentum for both India's and Australia's space programs (including the commercial space sector) and help to ensure that Indo-Pacific space actors are able to feed into and shape future major space developments.

- **Recommendation 9:** India and Australia should establish a Track 1.5 dialogue on space in 2021. The dialogue could help to sharpen focus in a number of areas, including space security governance, space situational awareness and maritime domain awareness, and explore opportunities for public–private collaboration on building better redundancy measures. It would become the key annual vehicle through which space, science and foreign affairs agencies, industry and civil society come together.

- **Recommendation 10:** India and Australia should work together to explore how ISR data can be integrated and how such data sharing initiatives can be expanded to include other partners in the Indo-Pacifc.

- **Recommendation 11:** India and Australia, through their space and science agencies, should collaborate on developing a constellation of remote sensing satellites, including for use in the Indo-Pacific.

- **Recommendation 12:** Both countries should proactively engage in any discussions and planning on future international space stations and ensure that space agencies in the Indo-Pacific have the opportunity to feed into future major space developments.

Critical minerals and rare earths

Australia and India should consider a freer trading arrangement for critical minerals to offset the risks of unreliable supply chains, allow for smooth collaboration between their private sectors and facilitate two-way investments in both countries.[99] India should consider instituting an equivalent of Australia's Critical Minerals Facilitation Office to focus exclusively on critical-mineral cooperation with like-minded countries. This has the potential to be a game-changer for India's Make in India initiative.

- **Recommendation 13:** Australia and India should consider a freer and more open trading and investment arrangement for critical minerals.

- **Recommendation 14:** India should consider establishing an equivalent of Australia's Critical Minerals Facilitation Office to focus exclusively on critical-mineral cooperation with like-minded countries. India should also formulate a national critical-minerals strategy to develop a coherent plan of action for its future critical-mineral needs.

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Acronyms and abbreviations

AI   artificial intelligence

API   application programming interface

ASEAN   Association of Southeast Asian Nations

CSIRO   Commonwealth Scientific and Industrial Research Organisation

IPTF   Indo-Pacific Technology Fund

ISR   intelligence, surveillance and reconnaissance

ISRO   Indian Space Research Organisation

IT   information technology

MoU   memorandum of understanding

Quad   Quadrilateral Security Dialogue

R&D   research and development

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Clean pipes: Should ISPs provide a more secure internet?

Introduction

One of the largest online challenges facing Australia is to provide effective cybersecurity to the majority of internet users who don't have the skills or resources to defend themselves. This paper explores the concept of 'Clean Pipes', which is the idea that internet service providers (ISPs) could provide security services to their customers to deliver a level of default security. The Australian Government looks to be implementing a version of Clean Pipes on 30 June 2020 the Prime Minister announced a funding commitment to 'prevent malicious cyber activity from ever reaching millions of Australians across the country by blocking known malicious websites and computer viruses at speed.' This paper examines arguments for Clean Pipes and possible implementation roadblocks.

Background

Australia's 2016 Cyber Security Strategy recognised the opportunities and risks that come with cyberspace and committed to 'enabling growth, innovation and prosperity for all Australians through strong cyber security.'

Despite that strategy, however, the online security environment has continued to deteriorate.

There have already been several significant and newsworthy attacks so far this year:

- Toll Group was affected by ransomware in both February and May.
- BlueScope Steel's operations were affected by ransomware in May.
- MyBudget, a money management company, had outages caused by ransomware in May.
- Lion Australia, a beverage giant, was crippled by ransomware in June.

However, most attacks aren't publicly reported, so these incidents are undoubtedly just the tip of the iceberg. A 2018 estimate that included broader direct costs calculated the potential loss to the Australian economy at $29 billion per year.
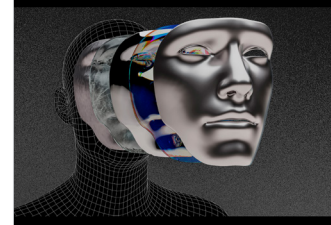
During the Covid-19 crisis, there's also been significant domestic and international concern about the vulnerability of critical infrastructure such as hospitals and the health sector to cyberattacks. Interpol warned that cybercriminals were targeting critical healthcare institutions with ransomware, and the Cyber Peace Institute issued a call for all governments to 'work together now to stop cyberattacks on the healthcare sector'. This also rose to the highest levels of international diplomacy—the Department of Foreign Affairs and the Australian Cyber Security Centre (ACSC) issued a joint statement on 'unacceptable malicious cyber activity', and US Secretary of State Mike Pompeo warned of consequences for malicious cyber activity affecting hospitals and healthcare systems.

This high-level diplomatic concern emphasises not only that cybersecurity is critically important, but that our current approaches to protecting Australia have failed to adequately protect all of our critical infrastructure.

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Covid-19 Disinformation

and social media manipulation

Elise Thomas, Albert Zhang and Emilia Currey

Pro-Russian vaccine politics drives new disinformation narratives

Introduction

On 17 July, a press release was posted to the websites of the Luhansk People's Republic, the pro-Russian self-declared state in Luhansk, Eastern Ukraine. The press release related to a supposed US Covid-19 vaccine trial that had been conducted on Ukrainian volunteers, including soldiers, in Kharkiv (which is controlled by the Ukrainian Government). According to the press release, of the 15 patients who received the trial vaccine, five were killed, including four Ukrainian soldiers. The press release was published the day after Russia announced plans to mass-produce its own vaccine in a matter of weeks.

The Ukrainian vaccine trial never happened. However, this disinformation narrative—which has clear political, anti-American and anti-Ukrainian Government undertones—has achieved widespread dissemination in multiple languages and across multiple communities, including into a prominent Australian anti-vaccination Facebook group (Figure 1). It has been effectively laundered from a fringe propaganda site associated with a separatist government, backed by pro-Russian militia, into the international information ecosystem, despite a multitude of attempts by legitimate media in multiple languages, including English, Spanish, Italian, Romanian and Czech, to fact-check it.

Figure 1: Tweets repeating the disinformation narrative

The success of this completely fictional narrative reflects a broader shift across the disinformation space. As the world's focus moves from the initial response to the coronavirus crisis towards the race to a vaccine, with all of the complex geopolitical interests that entails, political disinformation is also moving on from the origins of the virus to the vaccine race.

This report uses the US–Ukrainian vaccine narrative as a case study to examine how political disinformation about Covid-19 vaccines is being laundered into the international information ecosystem.

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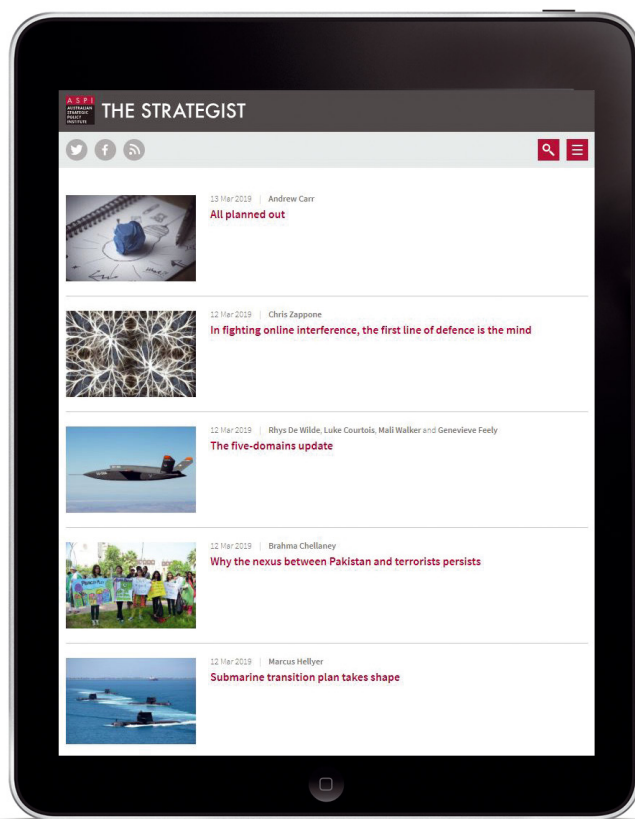
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