

One-Day National Workshop on Catching-up in the Digital Economy: Identifying India's Policy Gaps and Challenges 31 January 2020

The digital technological revolution offers immense possibilities for the creation of new industries and the transformation of old industries. While India aspires to become a trillion dollar digital economy by 2025, there is only a small window of opportunity during this technological transition to reform our fragmented policy framework. Motivated by this concern, the Workshop was organised at the Institute for Studies in Industrial Development (ISID) jointly by ISID and Shiv Nadar University

with the support of:

- **Ambassador Smita Purushottam**, the Founder and Chairperson of India's first Do-tank, SITARA (Science, Indigenous Technology and Advanced Research Accelerator);
- **Prof. Rajeswari Raina**, Department for International Relations and Governance Studies, Shiv Nadar University; and
 - **Prof. M. R. Murthy**, Director, ISID

Lt. Gen. Dr. Rajesh Pant, the National Cyber Security Coordinator, National Security Council Secretariat (NSCS), was the Keynote Speaker.

The Panellists in the four sessions were the following:

- **Prof. V.K. Malhotra** (Member Secretary, ICSSR)
- **Prof. Biswajit Dhar** (Jawaharlal Nehru University)
 - **Dr. Jabin T. Jacob** (Shiv Nadar University)
- **Amb. Smita Purushottam** (Founder and Chairperson, SITARA)
- **Mr. PVG Menon** (Past President of India Electronics & Semiconductor Association (IESA), Member, India Semiconductor Manufacturing Advisory Council (SEMI USA), Chair, Working Group for Smart Manufacturing/Industry 4.0., etc.)
- **Mr. Pavithran Rajan** (Information Warfare expert and Adjunct Faculty, Punjab Engineering College)
 - **Mr. Raghuv eer BK** (CEO, Nivetti Systems)
 - **Mr. Jishnu Aravindakshan** (Product Architect, Tejas Networks)
 - **Prof. Dinesh Abrol** (Formerly, NISTADS, JNU and ISID)
 - **Prof. C.P. Chandrasekhar** (Jawaharlal Nehru University)
 - **Prof. Abhijit Das** (Head, Centre for WTO Studies)
 - **Prof. Murali Kallumm al** (Centre for WTO Studies)
 - **Dr. M. R. Anand** (Formerly, Principal Economic Advisor, DoT)
 - **Dr. Santosh Das** (ISID)
 - **Dr. Beena Saraswathy** (ISID)
 - **Dr. Satyaki Roy** (ISID)
 - **Dr. Reji K. Joseph** (ISID)
 - **Dr. Smitha Francis** (ISID; Workshop Convenor)

**Institute for Studies in Industrial Development
New Delhi**

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Executive Summary and Policy Recommendations

of the One-Day National Workshop held at ISID on 31 January 2020

**Catching-up in the Digital Economy: Identifying India's Policy
Gaps and Challenges**

(Jointly organised by ISID and the Department of International Relations and Public Governance, Shiv Nadar University, under the ongoing ICSSR Research Project at ISID on the Electronics Industry)

1. The ongoing digital transformations across the industrial, agricultural and service sectors will drive increased demand for digital products, devices and machines of all kinds. In the absence of a strategic industrial policy, the inherent nature of digital transformations involving a merging of cyber-physical systems will lead to a drastic increase India's electronics imports. Electronics already constitute India's second largest imports after petroleum products.
2. Both present and future economic value generation and innovations will become increasingly centred on codified/digitised data extraction and intelligence derived from such data. Data extraction increasingly goes beyond personal and enterprise data, and includes community data, physical data and all other kinds of public data.
3. India is the second largest generator of data in the world. Entities in the digital economy will not be able to compete unless they are able to leverage this data advantage.
4. However, India's dependence on foreign players in the digital technology spaces has allowed the foreign firms and the states controlling them to effectively garner and process the huge information flows through cyberspace. The intelligence generated from control over our national data gives a competitive advantage to the foreign nations in all spheres; not just in trade and future innovations, but also military and diplomacy.
5. Thus national sovereignty in the era of intelligentification/intelligentisation cannot exist with free cross-border data flows. Together with public cloud architectures, wider access to data enabled through data protection policies is also critical for allowing the growth of micro, small and medium enterprises (MSMEs) in the digital economy.

6. While cyberspace has become the nervous system of the digital economy, its backbone is the network connectivity and access layer provided by the telecom sector.
7. India's dependence on foreign players, especially for telecom network equipment, in all our critical civilian and military infrastructural sectors, exposes the country to cyber vulnerabilities, and therefore, national security risks.
8. **Supporting and promoting the indigenous ICT manufacturing ecosystem, and in particular, the telecom network equipment segment that constitutes the infrastructure layer of the digital economy, is therefore, critical.** This is also because:
 - i. growing ICT import dependence reduces domestic value addition, economic growth and employment in the country;
 - ii. high trade deficits pose significant macroeconomic vulnerability and undermine our economic sovereignty; and
 - iii. only by supporting our indigenous ICT enterprises and building up their technological capabilities can the country harness technologies appropriate to our security and development needs.

The ICT Manufacturing Ecosystem is crippled by the absence of Strategic Industrial Policy

1. Growing the domestic Electronic System Design and Manufacturing (ESDM) sector is vital to India's ability to catch-up in the digital economy. But a huge disconnect exists between India's capabilities in ICT hardware manufacturing, and her software and design sector, due to the lack of appropriate industrial policies while liberalizing trade and FDI.
2. A strategic industrial policy framework enables policy synchronization (in particular between trade, FDI and technology policies) to generate and maintain forward and backward domestic linkages and synergies, while simultaneously building indigenous technology capabilities. In its absence, India's signing of the WTO's Information Technology Agreement (ITA-1) in 1996 and the free trade agreements (FTAs) with East and Southeast Asian countries from the mid-2000s only served to dis-incentivise domestic production of electronic products. This is the reason that while 90% of India's electronics consumption is driven by domestic demand, the large majority of it is served by imports.
3. Despite the policies in place to enforce use of indigenous products in government such as the Preference for Make in India policy (PMI policy or Preferential Market Access/PMA policy) of the Government of India, public procurement is flawed due to the incoherent policies and lack of institutional capacities. It is often biased against indigenous companies.

4. India's procurement practices contrast sharply with those of other countries that have implemented stringent preferential market access in government procurement to indigenous companies, for security reasons and for making their economies self-sufficient in ICT technologies. These include the Buy American Act (1933), Made in China (2025), the "Buy Brazil" Policy introduced in 2011, etc.
5. There are a number of very advanced indigenous ICT companies, including in the telecom network equipment segment. However, lack of domestic market access reduces the scale for domestic product companies and have made it very difficult for them to compete with state-subsidized foreign players.
6. As a result, many strategic infrastructure and government networks are being built using only foreign technology and in most cases from a single foreign original equipment manufacturer (OEM). This is not only hampering India's industrial and economic growth, but also impacting national security.

Policy Recommendations

India's ability to effectively handle the ongoing digital transformations urgently demands an economy-wide, strategic public policy approach that integrates a national security perspective. The two critical pillars of such a strategic approach are the following:

- I. The government must support the indigenous ICT ecosystem, particularly, the telecom digital infrastructure layer, through a coherent industrial policy centred on national security.**
- II. The government must put in place the appropriate regulatory framework for data ownership and access that respects privacy and data protection.**

Recommendations made by SITARA Members and other Workshop Panellists for building the above two pillars have been grouped into short-term and long-term measures under different heads. Policies for improving domestic market access for indigenous products must be ingeniously combined with policies to support and continuously build up the indigenous innovation ecosystem in order to:

- generate sufficient domestic market for upstream and downstream companies in the ICT ecosystem and build up synergies;
- create and retain maximum value within the country for sustaining output growth and employment generation;
- minimise foreign exchange outflows; and
- ensure national security.

Policies for Improving Domestic Market Access

Short-term measures

1. Critical information infrastructure and strategic ICT must be exclusively handled by indigenous technology companies and appliances. In particular, all security-sensitive telecom networks should ONLY use PMI products (i.e. telecom networks of defence, police, railways, power, oil & gas, smart cities, banks, medical devices, etc.).
2. PMI guidelines of 100% domestic purchase for specific products must be enforced in letter and spirit, and must be strictly monitored for compliance before tender bidding. Punitive measures need to be considered for defaulting Officers.
3. The list of 50 high technology products that needs to be procured by the Indian Government/Ministry of Defence must be listed and Indian private companies who have these technologies should be registered. Procurement of Indian products must be the norm, and any deviation is to be expressly approved with explicit valid reason for deviation.
4. Private telecom operators must be incentivised to purchase Indian products. Their concessions may be linked to their commitment to buy domestic products (For e.g., a 200% credit can be provided for buying Make in India telecom equipment, which can be used as some sort of credit for AGR dues).
5. To provide level playing field to ESDM firms, capex subsidy under the Modified Special Incentive Package Scheme (M-SIPS) must be reinstated.
6. Incentives and disbursements under the National Policy on Electronics (NPE) 2.0 must be rolled out quickly.
7. The requirement of sovereign guarantees for telecom projects funded by the EXIM Bank must be removed. To maintain level playing field, foreign companies using sovereign funded/guaranteed telecom projects must not be granted market access.

Long-term measures

1. India must use 5G as an anchor to nurture an Indian ICT ecosystem.
1. Government must serve as the first customer for new R&D-intensive products and this list must be updated periodically keeping with technological changes. Government of India should evaluate senior officers in all departments based on the level of indigenous procurements they make in these listed / identified high-tech products.
2. India must formulate a Buy Indian Act for government procurement along the lines of Buy American Act, etc. so that market access is enforced even with change of government.

3. India must enact legislation on the lines of the US Lobbying Disclosure Act (LDA) and the Foreign Agents Registration Act (FARA) and reduce undue reliance on commercial agencies for policy inputs.
4. Public Service Advertising must be used to inculcate pride in domestic products.

Trade Policies

Short-term measures

1. India must utilise existing policy space to impose duties on non-ITA-1 electronics products, where we have domestic capabilities.
2. Non-tariff Measures (NTMs) like the reciprocal market access clause 10(d) of the PMI policy notified by the Department of Telecommunications (DoT) must be implemented in letter and spirit in the case of all countries which do not give fair market access to Indian companies.
3. Non-tariff Measures (NTMs) like Compulsory Registration Order (CRO), national standards, etc. in FTAs must be strengthened to prevent dumping of substandard imports through third countries that are members of region-wide FTAs. All telecom equipment used in India (including foreign equipment) must undergo mandatory testing and involve mandatory pre-market approvals.
4. In FTAs, government must remove those products from tariff liberalisation schedules, wherein domestic R&D has led to products being developed and made in India (eg. Set Top Boxes, UPS/Invertors, etc.).
5. A dedicated line-of-credit may be created for telecom exports and grant-in-aid projects, which can lead to larger business opportunities and scale benefits for indigenous firms.

Long-term measures

1. India must re-examine FTAs, especially with countries that have lax regulatory frameworks.
2. India must not allow free cross-border data flow in ANY CHAPTER or CLAUSE under any trade/investment/any other kind of negotiations with other countries, or under the WTO e-commerce negotiations.
3. India must not make any more TRIMs-plus commitments in any agreements, in the case of goods and services. This is necessary in order to retain the remaining industrial policy space related to trade, FDI, technology policies, etc.
4. There must also be no GATS-plus commitments in any agreements, including in services such as cloud computing (& other new IT service areas),

telecommunications, etc. to ensure our sovereignty in adopting policies for securing national digital infrastructure layers and other digital economy segments.

5. India must not sign any more trade/investment agreements with broad investment definition, Investor-State Dispute Settlement (ISDS), or indirect appropriation clauses.
6. RBI needs to address the issue of e-commerce payments through payment banks and commercial banks to capture growing trade in fully digitised goods. This is needed to assess India's actual import dependence and to understand revenue loss from the WTO moratorium on duties on digital trade.

Technology Policies

Short-term measures

1. The Phased Manufacturing Program (PMP) must be rejigged and extended to more products, and used to aggressively promote foundational segments like PCBs and components.
2. Government must restore tax concessions under Section 35 (2AB) of the Income Tax Act, which allowed weighted tax deduction of 200 per cent on expenditure on R&D.
3. Cost of mandatory certifications, including overseas ones, must be underwritten.
4. In-house R&D must be subsidized through grants as well as by reducing expenses. (Some states like Karnataka, Telangana and AP reimburse Patent Filing fees).
5. Outsourced R&D must be incentivized through fiscal incentives.
6. CSR funding must be allowed for independent R&D. This will also strengthen the Start-up India initiative of the Government of India.

Long-term measures

1. Focussed Incubators, which go beyond being real-estate plays, must be established. The model that Software Technology Park of India (STPI) has established with the Electropreneur Park at Delhi University, and the forthcoming Centre of Excellence (CoE) for Internet of Things (IoT) at STPI, Bangalore are useful templates to start with.
2. Plug-and-play manufacturing centres must also be established, which go beyond the bare-plot scheme currently in force with MeitY's Electronic Manufacturing Cluster (EMC) scheme.

3. A network of national Test Houses and Labs must be set up to especially help MSMEs.
4. There must be direct funding of R&D to industry, avoiding mandatory routing through academic institutions.
5. Strategic sectors like 5G, AI, Nanotechnology and Quantum computing need state funding for R&D, with identified private sector and academia partners.
6. India must create a Sovereign Patent Fund and grant-in-aid/subsidized funding/advance against govt. projects for domestic industry, funded by import cess or otherwise.
7. India must fund and set up Strategic Venture Capital firms, which then funds start-ups in critical areas that concern national security, like In Q-Tel in the US.
8. India must develop a strategy to shield Indian companies from IPR violation legal suits by MNCs (This is a planned strategy by MNCs to stymie start-ups and MSMEs globally).
5. The government must consult with Indian technologists in not just academia, but also industry to drive policy decisions around key technologies.

Data, FDI and Competition Policies

1. India must extend sovereignty to cyberspace by quicker legislation on the long pending Data Protection Bill, and the one under consideration on Non-Personal Data, with data localisation and privacy protection, and stringent punishment for wilful violations. India must stay clear of all international negotiations calling for free cross-border data.
2. Competition Commission of India's assessment of mergers and acquisitions (M&As) must include the national security lens and also accommodate the challenges from digital revolution (such as multisided markets, network effects, etc.).
3. FDI policies must be reviewed using the national security lens.

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**Catching-up in the Digital Economy: Identifying India's Policy
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*Jointly organised by ISID and Shiv Nadar University (SNU) under the ongoing
ICSSR Research Project*

Workshop Report

The deliberations began with welcome remarks and introduction of the Workshop theme by the Workshop Convenor, Dr. Smitha Francis, Consultant, ISID, who explained how India's ability to effectively handle the ongoing digital transformations urgently demands an economy-wide, strategic public policy approach that integrates a national security perspective. Dr. Francis highlighted that while electronics is already India's second largest imports after petroleum products, the inherent nature of digital transformations will further increase India's import intensity across sectors. The ongoing digital transformations across the industrial, agricultural and service sectors will drive increased demand for digital products, devices and machines of all kinds that integrate hardware and software technologies.

But there was a huge disconnect between India's electronics software and design capabilities and her ICT hardware manufacturing capabilities. This, she argued, was due to lack of appropriate industrial policies to generate domestic forward and backward linkages, while going ahead with all-out trade liberalisation. All research studies on the impact of trade liberalisation on the electronics industry have established that the ITA-1 (1996) led to high import dependence in the industry. However, India began signing FTAs with East and Southeast Asian countries from the mid-2000s with the objective to attract greater amounts of export-oriented FDI by MNCs that link to global value chains (GVCs). Research carried out at ISID has shown that due to lack of a strategic industrial policy, these FTAs involved ITA-1 plus tariff liberalisation and have only served to further disincentivise domestic production of electronic products.

So supporting and promoting the domestic ICT manufacturing ecosystem, and in particular, the telecom network equipment segment that constitutes the infrastructure layer of the digital economy, must become a national mission for India. This is critical not only because of the macroeconomic vulnerability posed by growing ICT import dependence, but also because the dependence of the country's civilian and military

infrastructure sectors on foreign players and imported devices and network equipment severely compromises our national security. These risks are exacerbated by the fact that the intelligence derived from data extracted through connected devices and equipment can become weaponised in the hands of these foreign state and non-state actors.

Further, the intrinsic cumulative nature of technology means that much of the future innovations in the services and production spaces will therefore flow from data-based intelligence these foreign players derive from India. This assumes more serious proportions given that data extraction increasingly goes beyond personal and enterprise data collected Google, or Amazon or UBER on their platforms or through connected electronic devices and equipment, and include community or collective data, physical and environmental data, and other public data, including data related to economic analyses. The dominance of foreign digital corporations (especially those using platform-based business models), whether in e-commerce, finance, transport, medical devices, or in other sectors means that these foreign corporations have de facto control over the data they collect. India faces significant challenges in formulating the required new national regulatory systems in the context of various international negotiations. All of India's ongoing bilateral, regional and multilateral negotiations on trade are seeking to incorporate policy commitments on e-commerce, cross-border data flows, etc.

It was driven by these concerns that the Workshop was put together with the support and guidance from Ambassador Smita Purushottam, the Founder and Chairperson of India's first Do-tank, the Science, Indigenous Technology and Advanced Research Accelerator, SITARA. As SITARA, Amb. Smita Purushottam has brought India's most advanced indigenous firms in the ICT sector together with academia and bureaucracy, to carry out continuous advocacy for R&D-intensive indigenization of India's hi-tech sector. The Workshop benefited enormously from the valuable inputs from the eminent ICT industry representatives and experts under SITARA's umbrella. Further, given that indigenization of India's digital infrastructure layer is the dire need of the country's security strategy in the digital era, it was of great significance that Lt. Gen. Dr. Rajesh Pant, the National Cyber Security Coordinator, NSCS, was the Keynote Speaker of the day. As the national coordinating agency, the NSCS is in charge of coordinating all activities across multiple sectors to ensure a cyber-secure and resilient India.

In his address during the Inaugural session, **Prof. Biswajit Dhar**, Centre for Economic Studies and Planning, JNU, buttressed several of the points made above while linking to the discussions during the National Symposium on Industrial Policy organised by ISID on 20 January 2020. He drew the links of the current import dependence of the Indian ICT sector to the market failures associated with the economic reforms unleashed three decades ago, with the government withdrawing totally from infrastructure, support for R&D funding, etc. and expecting the private sector to tackle all the problems. He also stressed that India's decision to sign the WTO's ITA-1 was the most disastrous for the ICT hardware sector.

He highlighted that while getting the ICT manufacturing sector growing domestically is a vital part of India's ability to catch-up in the digital economy, there are serious supply side weaknesses and infrastructure. India has to quickly move beyond knee-jerk reactions through tariff hikes to formulating a coherent strategy to tackle the growing ICT imports in imaginative ways. The lessons from the import-substitution policy years clearly show that those manufacturing industries for which the governments had clear strategies and coordinated policies are the ones which came out strong through the liberalisation years. Prof. Dhar also highlighted India's lack of a clear strategy around the second digital economy pillar related to data and the infrastructure problems facing India's digital aspirations. He wondered how India's MSMEs will benefit when our digital infrastructure and capacities are lagging behind severely. We have not formulated any clear strategies and are ambivalent about the costs and benefits, whether it is about FDI policies in e-commerce or the negotiations around data flows, including the negotiations initiated under the WTO by a select group of countries. Consequently, India comes under intense lobbying pressure about the arguments being floated about how developing country MSMEs will benefit e-commerce and free cross-border data flows. However, he was emphatic that apart from supporting indigenous ICT manufacturing through industrial policy, preventing the monopolisation of information by big-tech through data localisation policies would be critical to India's catching-up efforts in the digital economy.

Lt. Gen. Dr. Rajesh Pant, the National Cyber Security Coordinator, began his Keynote address by contextualising the criticality of the digital world in today's world. He highlighted that among the several challenges facing India amidst the Technology Cold War and the splintering/Balkanization of the Internet, digital risks have assumed the gravest proportion of all. Indeed, cybercrime has been identified as the highest man-made economic risk among the top Global Risks to the world economy identified by the World Economic Forum (the others being natural disasters, climate change and epidemics).

Lt. Gen. Dr. Pant elaborated the several policy measures that have been taken in recent times, which reflect Government's commitment to indigenisation. While India aspires to become a \$5 trillion economy by 2024, according to MeitY's official digital economy plan document, *India's Trillion-Dollar Digital Opportunity*, India would have created a digital economy of US\$800 billion - US\$ 1 trillion by 2025. It is expected by the government that the potential five-fold increase in India's economic value from digital transformations will offer a host of opportunities for domestic and international investors and create employment opportunities.

Lt. Gen. Dr. Pant was of the opinion that while India might find it difficult to catch-up in some hardware areas like semiconductor Fab, the government is serious about enabling the conditions for catch-up in new areas. But he lamented that several National Missions that have been planned have not taken off. These include, the National Supercomputing Mission, National Mission on Inter-Disciplinary Cyber-physical Systems (with DST-driven

mini-hubs across the country) to create 800 start-ups within five years; National Quantum Mission, etc. From its side, the NSCS is highly focussed on enabling and driving indigenisation wherever possible while preparing the new roadmap for national cybersecurity, with indigenous security products and a National Malware Depository in the offing.

The government was cognizant of India's huge ICT import dependence on China. Even within the domestic market, the predatory pricing by Chinese firms in government tenders was hampering indigenisation. So policies and processes and financial regulations related to L1 have to be re-formulated to overcome these major problems. The other critical problem was related to the acquisition of promising and innovative start-ups by foreign firms. So ensuring the growth of smaller start-ups as well as national champions become imperative.

He also highlighted that the Personal Data Protection (PDP) Bill and the National Cyber Security Strategy 2020 being worked on by his office make this an inflection year for cybersecurity. With the National Critical Information Infrastructure Protection Centre (NCIIPC) having been put in place, the new cyber security strategy will aim to tackle all the new threats like, ransomware, bitcoins, IoT, digital crime, etc. But departments under different ministries such as MeitY, Commerce, HRD, External Affairs have been entrusted with the different tasks and so coordination and building the synergies between all of them has become a central challenge for NSCS under the new strategy.

Dr. Jabin T. Jacob, Department of International Relations and Governance Studies at the Shiv Nadar University, the co-organiser of the Workshop, also pointed out that the lack of commercial viability of Indian products, applications and platforms and lack of other alternatives to foreign players, challenge India's sovereignty and national security. He, however, underlined that India must not consider the China/Chinese model as a role model while developing the regulatory framework and pillars of the digital economy, even when issues of scale and interests appear to be similar China. India has a commitment to individual rights and liberties which does not exist in China. So we have to develop an economic development model that does not undermine our political system and democratic values.

On the economic policy front, Chinese have mastered the art of blocking the foreign tech companies at their door and making use of them. The Communist Party state also has been having a very coordinated approach to acquire technologies abroad. Chinese investments into India thus become a challenge to sovereignty and national security because the Communist Party of China expects the Chinese companies to follow its diktats at home and abroad. The share of R&D spending by Chinese firms including by state-owned enterprises is substantially large; the latter integrally linked to the fact SOEs are also competing with private enterprises there. China has built up national champions in

different sectors, whether it is Alibaba, Sinopec, whether state-owned enterprises or otherwise, who are expected to dominate not just the domestic market, but globally as well. So if Chinese products are cheaper in India, it is because their enterprises are subsidised by the state.

Among the major challenges India faces in catching up in the digital economy are lack of ambition, implementation capabilities, serious gaps in knowledge creation and the absence of a full-spectrum approach. In terms of governance, he remarked that because India has a focus on regulations rather than ensuring competition, Indian enterprises struggle with regulations to develop skills to game the system rather than develop new capabilities. The regulatory framework around start-ups is a big challenge. Meanwhile, rather than being followers of the American and Chinese standard setters, India needs to be a standard setter. He also talked about how the speed and sequencing of reforms are important. We must not sign on to international agreements before ensuring a viable domestic ecosystem for indigenous entrepreneurs.

Dr. V. K. Malhotra, Member Secretary, Indian Council of Social Science Research (ICSSR) underlined the fact that India has different layers of society not all of which are comfortable using or have the required quality of education or infrastructure that enable India to take the kind of technological leaps. Even in the case of digital transactions, the level of preparedness is still low. At all levels, rural, peri-urban and urban areas the level of preparedness has to be increased. Even when the allocation of resources to GDP was at an abysmally low 0.85% of GDP, actual use of R&D stood at 0.7% of GDP. He also advocated more social science research into the technological, institutional and governance systems of lead countries in Asia.

Some questions were raised from the floor. **Prof. N K Goyal**, Chairman of the Telecom Equipment Manufacturers Association (TEMA) questioned Prof. Biswajit Dhar's contention that India's short-term fixes to provide support to the electronics industry in terms of customs duty hikes were not WTO-compatible. Prof. Goyal also remarked that while incentives to the electronics/telecom firms for R&D were welcome, the critical challenge facing indigenous firms were lack of market access in the domestic economy. **Prof. D. K. Nauriyal**, IIT Roorkee, wondered about the contradiction between the popular perception about India's IT prowess and the fact that Chinese firms outsmarted Indian IT firms in almost every field. **Ms. Ranja Sengupta** from Third World Network raised concerns about what even a limited trade with the US could mean for India's national interests related to data regulation, e-commerce, etc. given that the US tech lobby is pushing for free data flows.

Amb. Smita Purushottam pointed to the need for serious introspection as to why despite the several initiatives and the good intentions of the government, India's ICT imports have been increasing continuously. Electronics hardware being critical for

ensuring cyber security, she hoped that Lt. Gen. Dr. Pant as a champion for indigenisation will play the crucial directorial role critical to make India cyber secure and synergise the efforts going on under different departments to reduce Indian's dependence on foreign equipment. This should help us bring together what different models of innovation have shown - decision-making located at the very top which will enable a whole-of-government approach necessary to break the traditional, silo-based approach India has followed. Given clear evidence that foreign lobbies have penetrated Indian departments everywhere, MeitY, DoT etc. have to be made more aware of the existence of a very viable domestic sector. She underlined that close industry-government dialogue in policymaking was another important lesson to be drawn from successful innovative country experiences. Even the Chinese government works through their private enterprises like Alibaba, Tencent, etc. for their policies on AI, etc. So she requested Lt. Gen. Dr. Pant to grant another detailed interaction with domestic industry experts who can give inputs directly into policymaking and to hoped that Lt. Gen. Dr. Pant will be able to thrust the imperative for a whole-of-government approach into the government.

In his response, **Lt. Gen. Dr. Rajesh Pant** elaborated that the government has undertaken an exercise to stocktake India's capabilities in 5G and generated a 'Heat map' on existing Indian 5G capabilities. This has clearly shown that except for the operating system and chip manufacturing parts, capabilities for all the other components of 5G exist within India. The DoT has given a Rs. 240 crore project to IIT Madras which is collaborating with other organisations, to create a 5G testbed.

However, 6G has become critical from the standards point of view and getting the standard essential patents on the Indian side given that India lost out in the 5G standards game. The latter was because of the fact when the China sent hundreds of their industry representatives over the past 7-8 years to 3GPP, the industry-led standards setting body of the International Telecommunication Union (ITU), only one or two DoT officials went from the Indian side. This resulted in them getting about 35% of the standard essential patents of 5G, with others like Ericsson, Nokia, ZTE, Samsung, etc. getting the remaining patents. The government has now posted a permanent DoT representative to the ITU in Geneva.

On the decision making angle, Lt. Gen. Dr. Pant pointed out that when his office put the focus on security angle while making the case of indigenous companies in 5G, there are no doubts as to who should be left out. But inputs are also being given from the DoT, TRAI (influenced by telecom operators), DoC, etc. However, given that currently the National Security Agency (NSA)'s views carry weight at the highest decision making level, he hoped that decisions in national interest will be taken.

In this context, he also requested Amb. Smita Purushottam to pass on specific inputs about how MeitY was undermining indigenisation efforts. Knowing the MeitY Secretary's

interest in indigenisation, Lt. Gen. Dr. Pant offered to meet the former with the Ambassador to sort out whatever issues were retarding domestic electronics industry's growth.

On the question of India's relationship with the US, he emphasised that the US is our strategic partner and the present government has been able to take the partnership to a higher level especially in the cyber security field.

At this point, **Mr. Pavithran Rajan**, an information warfare expert and Adjunct Faculty, Punjab Engineering College, underlined the fact that there was no security in 5G without the operating system (OS) and the chips. He also clarified that while the indigenous players already have all the other 5G capabilities, it is indeed in the OS and chips that they need government support. Further, in the context of India-US strategic partnership, Mr. Rajan found it unacceptable that India was dependent on another sovereign country to obtain intelligence for her cyber security. **Mr. Raghuvver BK**, CEO of Nivetti Systems also emphasised that India has the capabilities in operating systems, and reiterated that OS is extremely critical from a cybersecurity perspective.

Amb. Smita Purushottam, along with the industry representatives from SITARA have sought a meeting with Lt. Gen. Dr. Rajesh Pant to be able to demonstrate the OS and other 5G capabilities of the home-grown companies.

In his response on India's Strategic Partnership with the US, **Prof. Biswajit Dhar** stressed that the strategic interest of the US was only the large Indian market, including the attraction of data through the digital markets, especially e-commerce. Based on his experience with trade negotiations over the years, he underlined that the US has a government which is completely industry-driven and completely influenced by the huge Washington lobby working with the Congress that provides the mandate in all negotiations. And it is with this mandate that the negotiators come and ask partner country governments to do certain things. Given this client state nature of the US, India needs to be very wary of the level to which US commercial interests are driving the 'Strategic Partnership' with the US. He also pointed out that with respect to the trade deal which the US completed with China, China has agreed to everything that the US wanted; unlike India which agrees to nothing at international negotiations to come back home to undertake all the policy changes that were asked of it, China does not implement what they agree in international deals. A second major point of departure between India and China is in the way China utilised its large domestic market advantage to negotiate technology transfer from foreign companies who wanted to set up plants there. By contrast, India has been having a very open FDI policy. As years of research at ISID by Prof. Chalapati Rao and himself had shown, the liberal FDI policy has not helped India either in technological development, or in terms of addition to net investments. He

cautioned that the Indian government's recent plan to increase investments from China would be disastrous- from economic and strategic perspectives.

Amb. Smita Purushottam argued that as long as India is clear of its national interests, we can take strong stands even against the US and draw the lines where necessary. She argued that the problem comes when we ourselves do not have clear definition of our national interest. She drew attention to the example of the ban on Chinese telecom equipment that all ministries including the MEA had agreed upon. But the Ministry of Commerce came out with an objection related to WTO obligations, despite the fact that India could use the security exception in the WTO clauses. SITARA has found out that the MoC is working with a consulting company with conflicts of interest, as that company handles anti-dumping cases for China.

Dr. Geeta Gowri from the Competition Commission of India (CCI) pointed to the need for the telecom standards body TSDSI (Telecommunications Standards Development Society,)’s capabilities need to be strengthened in a very significant manner. In this context, being a member of the TSDSI and involved in the standardisation of 5G from the start, **Mr. Jishnu Aravindakshan**, Product Architect of Tejas Networks, sought to explain that because TSDSI had to allow telecom vendor community not based out of India to be a part of India's negotiations at 3GPP (the standards organisation, which develops protocols for mobile telephony) they had completely blocked any attempts by Indian companies for nearly two and a half years. Although Indian companies had the ambition, they were not able to take on the foreign cartel working through the Indian system. By the time the indigenous companies reached the ITU, it was the last meeting. It was only Russia that supported India at 3GPP. Mr. Aravindakshan also pointed out that there do not need to be large differences in standards for standardisation to make a difference. The critical thing is to have some small differentiation that becomes part of a national strategy, which is then applicable to every vendor selling in India so that an ecosystem will develop.

But as pointed out by both Prof. Biswajit Dhar and Dr. Francis, our industrial policy for the electronics industry has been implemented over the past decades without any such strategic vision. Despite full-fledged trade liberalisation subsequently and successive governments' efforts to woo FDI into the electronics industry to enable technological upgradation, in general the Indian ICT hardware manufacturing industry is known to lag behind its Asian peers because of a lack of strategic industrial policy for the sector.

While Lt. Gen. Dr. Rajesh Pant had to leave, the Workshop moved into the Second Panel consisting of ICT industry representatives, chaired by **Amb. Smita Purushottam**. While elaborating SITARA's objective in promoting R&D-intensive indigenisation in the country, Amb. Purushottam commended ISID's long-standing tradition in supporting the cause of indigenisation through evidence-based research, which has helped to establish

how India's lack of a national strategy has led to incoherent trade, FDI and other industrial policies and contributed to undermining the country's indigenous manufacturing sector. She underlined the critical role being played by the ICT sector not only because it integrally intertwined with economic prowess in the digital era, but more importantly, it is at the core of the military doctrines of major countries like China. While such is the reality of the information warfare era, the way India has handed over her information networks to foreign players including Chinese firms, is unacceptable. The Chinese have won several tenders in India because of our lack of coherent policies and institutional capacities. What needs to be recognised by the policymaking and academic communities is that there are a number of very advanced indigenous ICT companies, including those with 5G capabilities, some of which were represented at the Workshop. However, because of the lack of domestic market access arising from the various policy failures under discussion, the products of such advanced indigenous companies are getting routed through MNCs under their brand names, which the country then imports at high premiums. The lack of market access even in government procurement contracts, she pointed out, reflected another huge failure of the Indian policy framework for the ICT ecosystem. Underbidding by Chinese companies in India's tenders goes up to 70% of the projected value of the tender. She warned that with these kind of adverse factors ranged against India's surviving indigenous ICT firms, if the government does not act fast, they will face extinction, and lead to India's national security being at the mercy of foreign sovereign powers.

From the panel, the question of what ails the policy environment for India's ICT manufacturing ecosystem was discussed in detail by **Mr. PVG Menon**, Past President of India Electronics & Semiconductor Association (IESA), Member, India Semiconductor Manufacturing Advisory Council (SEMI USA), Chair, Working Group for Smart Manufacturing/Industry 4.0., etc. He began by pointing out that 90% of India's electronics consumption was driven by domestic demand, unlike in the case of China where 70% is driven by exports. This means that when there is a drop in GDP growth rate, electronics consumption declines. The electronics system design and manufacturing (ESDM) sector consists of four major components: the electronics hardware products; design (VLSI, embedded software and PCBs); components and semiconductors; and exports. With the continuous decline GDP growth rates, despite the downward revision in IESA's projection for India's ESDM sector to USD 228 billion by 2020, presently the ESDM sector stood at roughly USD 200-210 billion in 2019-20, out of which about half (USD 110 billion) is products. Out of the latter, about USD 70 billion was domestic production according to MeitY. Mr. Menon suspected that this could be an overestimate because of the fact that MeitY does not make a distinction between assembly and manufacturing (the latter as defined by the National Manufacturing Policy in 2011) in this extremely import-intensive industry. What the Finance ministry does not acknowledge is that ESDM is a horizontal enabler contributing to economy-wide productivity improvement similar to software and

telecom; not a vertical sector. It accounts for about 7% of India's GDP and is one of the fastest growing segments with a CAGR of 26%. It employs about 7 lakh people with more than 50% of the electronics manufacturing workforce being women. Further, the multiplier impact of electronics manufacturing between secondary and tertiary is roughly 1:10 compared to 1:7 for the software industry. Roughly 90% of the global semiconductor industry having their footprints in India, . Despite having a huge domestic market for electronics products (400 million mobile phone, 15 million TVs and 10 million computers sold in 2019; 15-20 million 2 Wheeler auto instrument clusters, etc.), Make in India opportunities have been bypassed either by intent or by mistake.

Mr. Menon also discussed how apart from ITA-1, the multiple FTAs have also been a challenge for the electronics industry. While it is possible to have for companies that come from countries having extremely well integrated supply chains (like China and Taiwan) to sell at lower prices when compared to the typical industry average, the problem has been that Chinese firms bid for tenders at average selling prices that are equal to their total material cost. The latter is not possible with significant state subsidies of some form. Mr. Menon pointed out that the problem is that FTAs enable such state-subsidised products to come in duty-free while domestic firms face structural disabilities of 25-30 percent to manufacture high volume electronics in India are unable to compete with them. This, at the same time, when coupled with inverted duty structure in some cases, the multiple FTAs and cumbersome government procurement processes make it difficult to aggregate demand for domestic products. The lack of domestic market access in turn reduces the scale for domestic product companies and have made it very difficult for them to compete with state-subsidized foreign players. According to Mr. Menon, some of the other challenges faced by the sector are weak implementation of MeitY's incentive policies and regulatory flip-flops that prevent large investors to commit big ticket investments. Mr. Menon made several recommendations related to building up the Indian ESDM ecosystem, for strengthening indigenous R&D, for promoting telecom exports from India, and on how to tweak FTAs. These are listed under the Workshop Recommendations.

Mr. Pavithran Rajan, the information warfare expert and Adjunct Faculty, Punjab Engineering College, elaborated on how cyberspace has become the nervous system of all our critical civilian and military infrastructural sectors. The latter encompasses both public and private institutions in the sectors of agriculture, food, water, public health, emergency services, government, defence industrial base, ICT, energy, transportation, banking and finance, postal services, shipping, etc. This is precisely why the US budget for cyber security is larger than their nuclear weapons budget and the Chinese have declared their intentions to concentrate on cyberspace and information warfare. Both the physical infrastructure layer consisting of the telecom network access equipment and products, and the information layers of cyberspace have become venues for weaponization. It is known the US National Security Agency's PRISM intelligence

gathering through its tech companies has been going on since 2007. On the other side, China's new security law asserting the nation's sovereignty over cyberspace and calling for network technology to be "controllable" has been in place since 2015. Clearly, India's heavy dependence on products and solutions by foreign countries makes her extremely vulnerable to adversarial state-sponsored attacks. Only indigenous ICT technologies can secure India against these threats to sovereignty and security. It was emphasised by Mr. Rajan that India's dependence on foreign players in the digital technology spaces have allowed the foreign firms and the state controlling them to effectively garner and process the huge information flows through cyberspace.

Clearly, the intelligence generated from control over our national data gives a competitive advantage to the foreign nations in all spheres; not just in trade and future innovations, but also military and diplomacy. Therefore, the regulatory framework in relation to data ownership and access to personal and non-personal data together with data privacy has critical implications. Thus it was emphasised by Mr. Pavithran Rajan that national sovereignty in the era of intelligentification/intelligentisation cannot exist with free cross-border data flows.

In this context, Mr. Rajan called upon the country to see through the foreign tech lobbying around free flow of data by linking it to freedom of expression and ideas. For example, he pointed out how privacy is the most used word in US lobbying reports submitted by Amazon, Apple, Google, Facebook and Microsoft during 2005-18. According to him, the clear delineation made between freedom of speech, ideas and personal data is a strategic deception.

During the industry panel, **Mr. Raghuvver BK**, CEO Nivetti Systems and **Mr. Jishnu Aravindakshan**, Product Architect, Tejas Networks highlighted several of their indigenously designed and manufactured, highly advanced and secure telecom network equipment products of their companies, Nivetti Systems and Tejas Networks, respectively. They repeatedly pointed out that despite having such products, indigenous firms like theirs were facing severe difficulties in accessing domestic market, despite the Preference for Make in India policy (Preferential Market Access/PMA/PMI policy) of the Government of India on public procurement. These policies were flawed because of the lack of institutional capacities and lack of awareness. As a result, many departments look at mechanisms to bypass all the policies, and sometimes were even explicitly discriminated against indigenous companies.

Mr. Raghuvver also highlighted how artificial entry barriers are created by foreign MNCs. This is not only impacting security of the country, but is hampering Industrial and economic growth also. If the Indian government continues to engage only with foreign private companies for consulting new age technologies, the obvious result of this would be that the advice would be based on what helps them sell more to India. Currently, it

makes India highly vulnerable that there are many critical infrastructure and important government networks that are built using only foreign technology and in most cases from a single OEM.

Mr. Jishnu Aravindakshan showed how India's government procurement practices contrasts sharply with those of other countries that have implemented stringent PMA for security reasons and for making their economies self-sufficient in ICT technologies. For instance,

- USA: Buy American Act (1933) offers purchase price preference of up to 50% to domestic suppliers in government procurements;
- China: Made in China (2025) sets aggressive localization targets. 70%-80% of 3G/4G equipment tenders (by value) in China were awarded to local firms – Huawei, ZTE and Datang; Government procurements undergo strict China Compulsory Certification (CCC) and additional security considerations.
- Brazil: Preferential treatment to Brazilian firms such as Asga, Datacom, Padtec. Also, "Buy Brazil" introduced in 2011 (Decreto 7546/11) gives 25% price preference to domestic firms in all government procurements.

The Third Panel was chaired by **Prof. Dinesh Abrol**, formerly of NISTADS, JNU and ISID. **Prof. C. P. Chandrasekhar**, formerly of Jawaharlal Nehru University, who spoke in this Panel, discussed about the relationship between finance and IT sector over a period of time. He brought in the neo-Schumpeterian framework of Carlota Perez and talked about how the frenzy phase of the digital technologies was being driven by financialisation. For neo-Schumpeterian economists that there was a close link between financial development and innovation in different phases of the cycle. For Schumpeter himself, the definition of innovation was broad, it included new markets, commodities and so on. These innovations, in turn, had to be funded by banks in order to spurt innovations and thus, in turn influence economic growth. Carlota Perez had talked about the age of Information Technology from 1971 within the techno-economic paradigm framework she developed. According to her, with the advent of every new technological revolution, one had a new techno-economic paradigm, which involved large financial investments to support innovation and growth. This, in turn, sets off a boom, which sets off a speculative frenzy as technologies begin to mature. But even when the possibilities of diffusion of innovations shrink, the financial investment continues in a speculative frenzy, resulting in a bust. Finance then looks for a new avenues of investment and this would result in a new Kondratieff wave.

As Prof. Chandrasekhar pointed out, the period starting from the 1950s can be regarded as the beginning of the period of IT techno-economic paradigm, which lasted for 50-60 odd years. But despite the IT crashes of the late 1990s and early 2000s, finance has not really moved out of the sector. Finance has continued to put its bets on many IT firms,

resulting in buoyancy in financial markets even when real growth is low. So what is the significant transformation within this sector that makes finance choose it as a site of investment? According to him, what fundamentally transformed the industry is the separation that was created between the hardware world and the software world beginning in 1981, when IBM and Microsoft worked together to create an Operating System. So software soon not only became service providers to different sectors, but they also manifested as tangible products (like Microsoft Office, Lotus). This division created a new whole industry. What we see now is its proliferation in a different form in the platform/aggregator firms.

Prof. Abhijit Das, Head of the Centre for WTO Studies, in his address in the Third Panel elaborated the dynamics of the ongoing e-commerce negotiations under the WTO. These negotiations were initiated in 2018 by some 70 odd countries that includes EU, Japan and Canada, without the consent of the entire WTO membership. India and South Africa are not currently party to these negotiations. At the heart, the negotiations are about three issues: cross border data flows, server localization and access to source code. Any new digital product has three components: the technology, the business model and the data. The technology that underpins a digital product is not difficult to replicate even while respecting the IPR. Similarly, even the business model can be replicated. For the digital product to be commercially successful, it has to operate on a huge mass of data. Those who have the data will have the consumers. To illustrate this point, Prof. Das took the example of new search engines which had emerged in the EU around 7-8 years ago. These were technologically superior to Google and were considered stiff competition. However, they were wiped out because they did not have access to the kind of data that Google had. In this virtuous cycle, new entities will not be able to compete unless they are able to leverage the data advantage. The emergence of Alibaba and Tencent in China are an example. The Chinese state made sure that the data generated in China remained within China. That is what enabled the digital products produced in China to compete with Silicon Valley.

It is in response to the emergence of possible competitors that the big US tech firms came up with 'Digital 2 Dozen' agenda, wherein they want to prevent countries from retaining the flexibility to put restrictions on cross border data flows. But Prof. Das emphatically argued that if India does not put restrictions on the outflow of data generated within its frontiers, it will not be able to leverage digital economy opportunities. The crux of the WTO e-commerce negotiations is to compel countries to give up their rights on putting restrictions on the cross border flow of their data. It is tantamount to saying that if one has iron ore in their country, then one must compulsory allow iron ore to be exported. However, outflow of data will be allowed for free and no revenue will be generated in return for the relaxation of this restriction unlike in the aforementioned iron ore example. This is the reason why India has stayed out of the negotiating table and this in turn has

been a cause of worry for Japan and US. The fear is based on the possibility that India may restrict cross border data flows and hence pose competition for its tech firms.

Prof. Das lamented that there is almost next to zero understanding in India, even among policy makers, of the risks that one runs by joining the negotiating table. The E-commerce policy which proposed India putting restriction on its data flows received criticism from big tech firms in Silicon Valley. If India joins the WTO negotiating table and accept the cross border data flow agenda, it will heavily compromise the ability of domestic firms to create indigenous digital products by leveraging the access to the data within its frontiers. A question that one must pose to understand the importance of this argument is: what is the monetized value of the data generated by Americans? In a couple of years, the monetary value of its data will exceed the GDP of its agriculture. India is the second largest generator of data in the world and thus, India's monetized value of data in a decade could reach such mountainous proportions.

Prof. Murali Kallummal of the Centre for WTO Studies, brought a new issue into the discussion on digital economy by elaborating on how the WTO moratorium on tariffs on trade in e-commerce products is leading to loss of revenue for developing countries like India. This is because trade in 29 digitizable products identified by the WTO such as books, maps, music, etc. has been increasing. Using WITS Comtrade data for separating out trade trends in all merchandise goods and these digitizable goods, he showed that while global imports of all products were going up, imports of such digitizable goods were seen to be decreasing in usual trade data. Given that the increase in actual trade in digitizable products is not observable in the traditional trade data captured through Customs ports, he called for a re-assessment of India's import flows based on renewed/strengthened data gathering of trade in digitalized goods. India's trade deficit is likely to see an increase once imports of digitalised goods are also taken into account.

The presentations in the Fourth Panel chaired by **Dr. M. R. Anand** (Formerly, Principal Economic Advisor, DoT) again discussed the growing importance of data. **Dr. Reji K. Joseph**, ISID argued that the fact that AI is facilitating the development of new technologies and products, including in the health sector, is the reason why large digital technology firms like Google and Microsoft are getting into joint ventures in the medical technologies and devices and drug development spaces. Dr. Joseph pointed out how Google and Microsoft are working with Sanofi and Novartis respectively to develop new AI-based medical devices. Medical devices are becoming the centre of disease management, from data generation, disease identification and disease management. This interface with data and intelligence gathering means that by allowing foreign companies and foreign equipment, India's health care delivery systems are also becoming dangerously vulnerable to external manipulation. Clearly, personal health data of the more than half a billion connected population in India becomes a huge draw of intelligence for foreign firms. Apart from data protection issues and its interface with

innovation, according to Dr. Joseph, another major regulatory challenge was with respect to patenting of innovations arising from machines.

Data and digital intelligence-related concerns were also brought out in the deliberations on e-commerce and financial sectors. In the case of platform-based businesses and the anti-competitive practices adopted by them, it was explained by **Dr. Beena Saraswathy**, ISID, how access to Big data is a critical asset for market competitiveness. This needs to be assessed when dealing with foreign acquisitions. While assessing the impact of deals involving foreign mergers and takeovers, it is also important for competition authorities to assess the presence of multi-sided markets and network effects related to digital intelligence in detail. This was not the case with the Flipkart-Walmart deal. She discussed how a lack of holistic market assessments by the Competition Commission of India has/will lead to loss of domestically grown start-ups through foreign takeovers.

We can link this to the implications of the withdrawal of the state from long-term funding of productive investments and the changing nature of financial intermediation for India's high-tech innovation ecosystem. Increasing financialization has led to large amounts of funds flowing into start-ups from foreign venture capital funds, PE funds etc. Very often, this is leading to the foreign acquisition of strategically important high-technology start-ups/firms, which is problematic from the point of view of national security. Losing national champions will also have long run adverse effect on the economy. Increasing consolidation by foreign digital corporations across sectors with major tendencies for abuse of digital intelligence-based market power will impact innovation, growth of small and medium enterprises (SMEs), and availability of decent employment opportunities within the country.

At another level, digital technology-enabled innovation in financial services has led to the emergence of a set of companies providing financial services directly to consumers through online platforms. **Dr. Santosh Das**, ISID discussed the key activities of such fintech companies, which involve: payments / insurance; asset/wealth management; crowdfunding – raising capital for firm/industry; virtual currency - digital money, crypto currency, etc. He argued that as credit risk from borrower to creditor passes through under regulated and under controlled channels, these technologies have led to new risks to financial stability through their tendency of decentralisation, which less transparent to the regulators. To be able to act fast for ensuring financial stability and limiting systemic risk to the financial system, real time regulatory monitoring and identification of real time distribution of risks are critical for regulators to act fast. So Dr. Santosh Das also emphasised that data localisation and data protection laws are critical for ensuring the security of the financial infrastructure layer of the nation. At the same time, data privacy and security are also critical, because profiling of consumers through use of algorithms based on personal information available online can be potentially discriminatory with finance being denied to a group of people with certain disadvantages.

Dr. Satyaki Roy brought the discussion on employment implications of the new technologies to the deliberations. He recalled Keynes' contribution in 1930 paper, wherein Keynes had predicted technological unemployment with rising per capita income. It is generally held that AI and IOT is going to make large number of jobs redundant in the coming 20 years. ILO estimates of job loss is indeed scary at least for developing countries where most of the jobs are repetitive in nature. Another scenario being pointed out is that with increase in the use of robots as they become cheaper, developing countries' advantage in having cheap labour will no longer be there. This would imply that the advantage in relocating production to developing countries will also decline. But Dr. Roy pointed out that such predictions are based on the assumption that entire jobs would be displaced. He contested this static analysis by pointing out that such predictions were also made earlier in the context of first and second industrial revolution; but tasks, rather than entire jobs, are replaced by machines. The net result is difficult to estimate. Moreover, if we endogenize technology, the scenario would be much more dynamic where new tasks and complementary activities may create new employment. But this possibility depends upon the growth of aggregate productivity, which depends on diffusion of technologies. In most of the advanced countries, aggregate productivity growth has declined in the context of new generation technologies. Unlike in the first and second industrial revolutions, when labour was shifted out of agriculture into non-agricultural activities, technology was labour-intensive and skill difference was not too large, the critical input in the present phase is knowledge. So it is not easy to absorb employ the people displaced by new technologies because knowledge diffusion is likely to take much more time than in the earlier industrial revolutions. Unlike other inputs whose stock declines with use, while knowledge being a non-rival commodity and it grows with sharing and learning in a collaborative environment. However, according to Dr. Roy, establishment of property rights and value distribution based on productivity are slowing down the diffusion process.

Policy Recommendations

India's ability to effectively handle the ongoing digital transformations urgently demands an economy-wide, strategic public policy approach that integrates a national security perspective. The two critical pillars of such a strategic approach are the following:

- III. The government must support the indigenous ICT ecosystem, particularly, the telecom digital infrastructure layer, through a coherent industrial policy centred on national security.**
- IV. The government must put in place the appropriate regulatory framework for data ownership and access that respects privacy and data protection.**

Recommendations made by SITARA Members and other Workshop Panellists for building the above two pillars have been grouped into short-term and long-term measures under different heads. Policies for improving domestic market access for indigenous products must be ingeniously combined with policies to support and continuously build up the indigenous innovation ecosystem in order to:

- generate sufficient domestic market for upstream and downstream companies in the ICT ecosystem and build up synergies;
- create and retain maximum value within the country for sustaining output growth and employment generation;
- minimise foreign exchange outflows; and
- ensure national security.

Overarching recommendations are based on those made by Ambassador Smita Purushottam (SITARA Founder and Chairperson) for a whole-of-economy approach to public policy from a national security perspective, and similar recommendations by Prof. Biswajit Dhar (Jawaharlal Nehru University), Dr. Jabin T. Jacob (Shiv Nadar University), Mr. Pavithran Rajan (Information Warfare expert and Adjunct Faculty, Punjab Engineering College), and the Workshop Convenor, Dr. Smitha Francis (Consultant, ISID). Among the ICT sector-specific recommendations, Mr. PVG Menon made the recommendations on ESDM ecosystem, R&D and FTAs; Mr. Raghuveer BK (CEO, Nivetti Systems) and Mr. Jishnu Aravindakshan (Product Architect, Tejas Networks) made the recommendations on the telecom sector and government procurement practices. Dr. Smitha Francis contributed to the recommendations on FTAs as well as the need to promote ICT hardware-software synergies domestically. Among the policies for the data

infrastructure layer, while Prof. Abhijit Das (Head, Centre for WTO Studies) made the recommendations on e-commerce and cross-border data flows, those related to institutional changes were made by Mr. Pavithran Rajan. Other economic policy recommendations are based on those by Prof. Murali Kallummal, Dr. Santosh Das, Dr. Beena Saraswathy, Dr. Satyaki Roy and Dr. Reji K. Joseph. The recommendations also draw from the research work carried out at ISID on electronics industry, FTAs, etc. in addition the work on FDI carried out by Prof. Chalapati Rao and Prof. Biswajit Dhar.

Policies for Improving Domestic Market Access

Short-term measures

8. Critical information infrastructure and strategic ICT must be exclusively handled by indigenous technology companies and appliances. In particular, all security-sensitive telecom networks should ONLY use PMI products (i.e. telecom networks of defence, police, railways, power, oil & gas, smart cities, banks, medical devices, etc.).
9. PMI guidelines of 100% domestic purchase for specific products must be enforced in letter and spirit, and must be strictly monitored for compliance before tender bidding. Punitive measures need to be considered for defaulting Officers.
10. The list of 50 high technology products that needs to be procured by the Indian Government/Ministry of Defence must be listed and Indian private companies who have these technologies registered. Procurement of Indian products must be the norm, and any deviation is to be expressly approved with explicit valid reason for deviation.
11. Private telecom operators must be incentivised to purchase Indian products. Their concessions may be linked to their commitment to buy domestic products (For e.g., a 200% credit can be provided for buying Make in India telecom equipment, which can be used as some sort of credit for AGR dues).
12. To provide level playing field to ESDM firms, capex subsidy under the Modified Special Incentive Package Scheme (M-SIPS) must be reinstated.
13. Incentives and disbursements under the National Policy on Electronics (NPE) 2.0 must be rolled out quickly.
14. The requirement of sovereign guarantees for telecom projects funded by the EXIM Bank must be removed. To maintain level playing field, foreign companies using sovereign funded/guaranteed telecom projects must not be granted market access.

Long-term measures

6. India must use 5G as an anchor to nurture an Indian ICT ecosystem.

2. Government must serve as the first customer for new R&D-intensive products and this list must be updated periodically keeping with technological changes. Government of India should evaluate senior officers in all departments based on the level of indigenous procurements they make in these listed / identified high-tech products.
7. India must formulate a Buy Indian Act for government procurement along the lines of Buy American Act, etc. so that market access is enforced even with change of government.
8. India must enact legislation on the lines of the US Lobbying Disclosure Act (LDA) and the Foreign Agents Registration Act (FARA) and reduce undue reliance on commercial agencies for policy inputs.
9. Public Service Advertising must be used to inculcate pride in domestic products.

Trade Policies

Short-term measures

6. India must utilise existing policy space to impose duties on non-ITA-1 electronics products, where we have domestic capabilities.
7. Non-tariff Measures (NTMs) like the reciprocal market access clause 10(d) of the PMI policy notified by the Department of Telecommunications (DoT) must be implemented in letter and spirit in the case of all countries which do not give fair market access to Indian companies.
8. Non-tariff Measures (NTMs) like Compulsory Registration Order (CRO), national standards, etc. in FTAs must be strengthened to prevent dumping of substandard imports through third countries that are members of region-wide FTAs. All telecom equipment used in India (including foreign equipment) must undergo mandatory testing and involve mandatory pre-market approvals.
9. In FTAs, government must remove those products from tariff liberalisation schedules, wherein domestic R&D has led to products being developed and made in India (eg. Set Top Boxes, UPS/Invertors, etc.).
10. A dedicated line-of-credit may be created for telecom exports and grant-in-aid projects, which can lead to larger business opportunities and scale benefits for indigenous firms.

Long-term measures

7. India must re-examine FTAs, especially with countries that have lax regulatory frameworks.

8. India must not allow free cross-border data flow in ANY CHAPTER or CLAUSE under any trade/investment/any other kind of negotiations with other countries, or under the WTO e-commerce negotiations.
9. India must not make any more TRIMs-plus commitments in any agreements, in the case of goods and services. This is necessary in order to retain the remaining industrial policy space related to trade, FDI, technology policies, etc.
10. There must also be no GATS-plus commitments in any agreements, including in services such as cloud computing (& other new IT service areas), telecommunications, etc. to ensure our sovereignty in adopting policies for securing national digital infrastructure layers and other digital economy segments.
11. India must not sign any more trade/investment agreements with broad investment definition, Investor-State Dispute Settlement (ISDS), or indirect appropriation clauses.
12. RBI needs to address the issue of e-commerce payments through payment banks and commercial banks to capture growing trade in fully digitised goods. This is needed to assess India's actual import dependence and to understand revenue loss from the WTO moratorium on duties on digital trade.

Technology Policies

Short-term measures

7. The Phased Manufacturing Program (PMP) must be rejigged and extended to more products, and used to aggressively promote foundational segments like PCBs and components.
8. Government must restore tax concessions under Section 35 (2AB) of the Income Tax Act, which allowed weighted tax deduction of 200 per cent on expenditure on R&D.
9. Cost of mandatory certifications, including overseas ones, must be underwritten.
10. In-house R&D must be subsidized through grants as well as by reducing expenses. (Some states like Karnataka, Telangana and AP reimburse Patent Filing fees).
11. Outsourced R&D must be incentivized through fiscal incentives.
12. CSR funding must be allowed for independent R&D. This will also strengthen the Start-up India initiative of the Government of India.

Long-term measures

9. Focussed Incubators, which go beyond being real-estate plays, must be established. The model that Software Technology Park of India (STPI) has established with the Electropreneur Park at Delhi University, and the forthcoming Centre of Excellence (CoE) for Internet of Things (IoT) at STPI, Bangalore are useful templates to start with.
10. Plug-and-play manufacturing centres must also be established, which go beyond the bare-plot scheme currently in force with MeitY's Electronic Manufacturing Cluster (EMC) scheme.
11. A network of national Test Houses and Labs must be set up to especially help MSMEs.
12. There must be direct funding of R&D to industry, avoiding mandatory routing through academic institutions.
13. Strategic sectors like 5G, AI, Nanotechnology and Quantum computing need state funding for R&D, with identified private sector and academia partners.
14. India must create a Sovereign Patent Fund and grant-in-aid/subsidized funding/advance against govt. projects for domestic industry, funded by import cess or otherwise.
15. India must fund and set up Strategic Venture Capital firms, which then funds start-ups in critical areas that concern national security, like In Q-Tel in the US.
16. India must develop a strategy to shield Indian companies from IPR violation legal suits by MNCs (This is a planned strategy by MNCs to stymie start-ups and MSMEs globally).
10. The government must consult with Indian technologists in not just academia, but also industry to drive policy decisions around key technologies.

Data, FDI and Competition Policies

4. India must extend sovereignty to cyberspace by quicker legislation on the long pending Data Protection Bill, and the one under consideration on Non-Personal Data, with data localisation and privacy protection, and stringent punishment for wilful violations.
5. Competition Commission of India's assessment of mergers and acquisitions (M&As) must include the national security lens and also accommodate the challenges from digital revolution (such as multisided markets, network effects, etc.).
6. FDI policies must be reviewed using the national security lens.

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