NCAER

AiDPi 2026

AI & DIGITAL PUBLIC INFRASTRUCTURE

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Report on the NCAER Workshop on AI and Digital Public Infrastructure

June 5-6, 2026

NCAER organised an inaugural workshop on the Economics of Artificial Intelligence (AI) and Digital Public Infrastructure (DPI) at its campus on 5-6 June 2026. The goal of the workshop was to identify programmes of research that would help unlock the vast data sources being generated in India from the FASTag, Unified Payments Interface (UPI), Goods and Services Tax (GST), Aadhaar, and telecom platforms for promoting economic research and evidence-based policymaking.

The significance of AI and DPI in India is r eflected in the manner in which DPI was conceived of, specifically in the advent of India Stack, a unified set of open Application Programming Interfaces (APIs) and digital public goods designed to provide identity, data, and payment services to the citizens on a massive scale. India Stack, in fact, symbolises the foundation of DPI in the country, facilitating financial inclusion and transformative interaction among governments, businesses, and citizens.

The vision of Viksit Bharat is also predicated upon the guarantee of universal access to quality education, skill development, and healthcare. In this context, NCAER has envisioned forging the study of AI and DPI into a single new research vertical, realising that the scale and potential of DPI can be radically transformed with the application of AI to produce evidence-based insights for policy imperatives.

Laying the ground for the launch of NCAER's AI-DPI research vertical, the workshop on AI and DPI at NCAER sought to build a framework for its new centre by bringing

together some of the best minds from around the world to share their own research on allied subjects and to exchange ideas that would likely define India's economic future.

The workshop comprised different sessions presenting insights on the economics and research of AI and DPI. Details of the proceedings of these sessions are delineated below.

Session on 'Setting the Agenda: Why Economics of AI & DPI Matter for India'

Chair and Moderator: Mr Manish Sabharwal

This session was inaugurated by the **NCAER Director General, Mr Suresh Goyal**, who set the context for the workshop by highlighting the transformative role that DPI and AI are expected to play in shaping India's economic and social development over the coming decades. He noted that NCAER, while building on its long-standing legacy of economic research and policy engagement, is increasingly focusing on emerging national priorities at the intersection of policy, technology, and industry. Drawing lessons from India's DPI journey, he said Aadhaar was presented as a platform/infrastructure (initially not a card) that enabled the Jan Dhan-Aadhaar-Mobile (JAM) trinity and Direct Benefit Transfer (DBT), setting the stage for large-scale financial inclusion across the country. He also noted that the workshop was conceived as a platform for examining critical questions around the convergence of DPI and AI, including how AI can strengthen India's digital infrastructure, enhance public service delivery, support multilingual inclusion, and contribute to the country's long-term development goals. "*If India has to adopt the growth path that it is aspiring for, then it has to adopt strategies that enable non-linear growth. And there cannot*

be a better example than the adoption of Digital Public Infrastructure and the impact that it has had on India", stated Mr Goyal.

Mr Goyal concluded his address by pointing out that this workshop would act as a starting point for a multi-tier institutional effort towards creation of a medium-term national research agenda around AI and DPI at NCAER, leading to the evolution of a dedicated centre for AI, DPI, and Digital Futures at NCAER. On its part, the centre would be a policy-oriented, interdisciplinary, and globally networked institutional platform, enabling collaboration on AI and DPI among researchers, policymakers, regulators, infrastructure platforms, and industry practitioners.

Mr Manish Sabharwal, Vice-Chairman NCAER, Governing Board, and Co-Founder TeamLease Services, asserted the importance of location in India's AI-DPI journey. He cited the example of Karnataka and Uttar Pradesh (UP) sharing the same GDP figures, yet Karnataka has attained that figure with one-fifth the number of people than UP. He highlighted the critical potential of the convergence of DPI and AI in shaping India's next phase of development, which would aid in positioning India as the world's largest "natural data laboratory". The country's population-scale digital platforms and rich digital ecosystem also provide a unique foundation for leveraging AI to address public policy challenges and drive inclusive growth.

Describing DPI as one of India's most significant achievements in institution-building, Mr Sabharwal suggested that it had succeeded in this objective by effecting large-scale digital inclusion through platforms such as Aadhaar, UPI, and other digital public systems. *"DPI without AI is infrastructure. AI without DPI may just be intelligence. But AI plus DPI may become state capacity",* he said.

The combination of AI and DPI could serve as an opportunity for moving beyond traditional approaches to public administration and creating new models of service delivery and policy implementation. The convergence of AI and DPI could thus become a powerful driver of India's future growth and development. By strengthening state capacity, improving inclusion, and enhancing productivity, AI-enabled DPI can help India address its persistent development challenges and translate its demographic and digital strengths into broad-based prosperity.

In her address, **Ms Ravneet Kaur, Chairperson Competition Commission of India,** highlighted the conspicuous impact of AI and DPI on markets, governance, and economic activity, while emphasising the need to preserve competition in an increasingly digital economy. She noted that India has emerged as a global pioneer in DPI, creating interoperable digital platforms that have expanded access to services and laid the foundation for innovation at scale.

From the perspective of competition regulation, she stressed the need to ensure that AI-driven innovation does not come at the cost of fair and competitive markets. Ms Kaur also focused on the imperative for greater accountability and transparency in the development and deployment of AI systems, advocating mechanisms such as self-audits, continuous monitoring, and enhanced disclosures by enterprises deploying AI technologies. She argued that such measures can help address issues of concern arising from opaque algorithms and information asymmetries while maintaining consumer trust. She also emphasised that since data is a critical economic asset, many digital services are offered free to users. However, as AI systems increasingly rely on large datasets, it is essential to ensure responsible data use and prevent anti-competitive practices linked to data concentration for maintaining healthy market dynamics. "*We have to ensure that the competitive opportunities are enhanced, but*

in a manner where the systems do not move towards anti-competitive conduct", she said.

She revealed that the Competition Commission of India has adopted a regulatory approach aimed at generating more effective responses to rapidly changing digital markets. These include the introduction of a settlement and commitment framework to facilitate quicker market corrections and protect startups and Micro, Small, and Medium Enterprises (MSMEs), as well as the adoption of a deal value threshold in merger regulation to scrutinise acquisitions that may potentially eliminate future competition. AI can also enhance governance by improving fraud detection, strengthening evidence-based policymaking, and enabling more targeted public service delivery. However, the benefits of AI must be accompanied by appropriate safeguards to ensure accountability, transparency, and competitive neutrality.

Meanwhile, the Competition Commission of India is committed to adapt to technological change by strengthening its analytical capabilities, incorporating data science into its enforcement toolkit, and updating its regulatory frameworks while safeguarding competition, innovation, and consumer welfare in the digital economy, she said.

Mr Anindya Ghose, Heinz Riehl Chair Professor of Business, New York University, analysed the evolving relationship between competition policy, digital markets, and AI, drawing on his experience as an expert in some of the most significant anti-trust cases in the United States. Underscoring the need for competition authorities and policymakers to adapt to rapidly evolving technological markets, he emphasised that modern competition enforcement increasingly relies on rigorous economic analysis, large-scale data, and advanced empirical methods to understand how digital markets function and how consumers interact with competing platforms. Discussing the anti-trust cases that he had been involved in, including those of Meta and Google, he said that in both cases, the regulators had argued that the companies held dominant positions within narrowly defined markets, while the defence contended that consumers and advertisers should routinely substitute across a much broader range of platforms and services. Based on the use of extensive behavioural data, natural experiments, platform usage patterns, and econometric analyses, the cases demonstrated how empirical evidence can challenge conventional assumptions about competition in digital ecosystems. These cases thus illustrate the growing importance of evidence-based approaches in anti-trust enforcement, particularly in markets characterised by rapid innovation and changing consumer behaviour.

Mr Ghose also focused on the emerging challenges posed by AI, driven by the AI ecosystem which comprises a complex value chain, spanning chips, cloud infrastructure, data centres, foundation models, and end-user applications. As a small number of firms increasingly operate across multiple layers of this value chain, concerns are emerging around market concentration, vertical integration, and the potential for anti-competitive practices. In particular, he pointed to the possibility that firms may bundle infrastructure, models, and applications in ways that could limit consumer choice, foreclose competitors, and raise barriers to entry. At the same time, he cautioned against viewing AI solely through the lens of market concentration. Advances in machine learning and large language models may, in some cases, lower traditional barriers to entry by reducing the dependence on vast proprietary datasets and enabling smaller firms to develop competitive products and services. This dynamic, he suggested, has the potential to foster innovation and create new opportunities for competition within the AI ecosystem.

Mr Ghose noted that since many of the most important competition debates of the coming decade are likely to emerge from the AI value chain, ensuring healthy competition in these markets will necessitate robust economic analysis, continuous regulatory adaptation, and a nuanced understanding of how technological change is transforming market structures, business models, and consumer behaviour.

Mr Saurabh Garg, Secretary, Ministry of Statistics and Programme Implementation (MoSPI), reflected on the achievements of India Stack, including digital identity, payments infrastructure, consent-based data sharing, and digital service delivery, in significantly expanding access to digital services and enabling population-scale inclusion. As India moves from building DPI to harnessing AI, data will become the critical bridge between the two. The next challenge thus lies in creating a robust and interoperable data ecosystem that can support AI-driven innovation and public service delivery. "*The raw material for AI is data, so we need to make data, AI-ready",* posited Mr Garg.

While government systems are increasingly capable of exchanging data through common platforms and APIs, AI systems require shared definitions, classifications, and standards to accurately interpret and utilise information across sectors. Mr Garg illustrated how differing definitions across institutions can create barriers to effective data integration, highlighting the need for harmonised standards and metadata frameworks. Datasets under the national data ecosystem should be discoverable, accessible, interoperable, and reusable.

The essential building blocks for building an AI-ready economy, therefore, include data governance, quality assurance, common identifiers, classification systems, privacy safeguards, and secure data-sharing protocols. These efforts, he noted, are being pursued in collaboration with ministries, states, and public institutions to ensure that data can be effectively leveraged for both policy and innovation. Mr Garg stressed that the ultimate objective of data harmonisation is not merely better data management, but improved public outcomes. This emerging convergence signifies a transition from digital infrastructure towards an 'intelligence infrastructure', where data and AI can generate greater economic and social value at scale. Concluding his remarks, Mr Garg stressed that India's leadership in DPI provides a unique opportunity to build a trusted and inclusive AI ecosystem. By ensuring that public data is credible, accessible, and machine-readable, India can create the foundations for AI systems that not only drive innovation but also enhance governance, public service delivery, and societal welfare.

Dr Ravi Bapna, Curtis L. Carlson Chair Professor in Business Analytics and Information Systems, University of Minnesota, reflected on the central purpose of the workshop: bringing together academics, policymakers, and practitioners to explore how AI and DPI can address some of the most pressing challenges facing India and the world. The convergence of these communities is thus essential for ensuring that the rapidly advancing capabilities of AI are deployed at scale, equitably, and in ways that generate meaningful public value.

He emphasised that the benefits of technology are rarely determined by the technology alone. Instead, its successful adoption depends on complementary investments in institutions, leadership, skills, governance, and organisational change. Using examples from both corporate digital transformation and India's Aadhaar journey, he highlighted how technological innovation must be accompanied by social, organisational, and policy innovations to generate lasting impact.

Professor Bapna acknowledged that though India does not yet occupy a dominant position across the core layers of the AI value chain, it still possesses two distinctive advantages. The first is its deep reservoir of social and civilisational capital, reflected in strong community networks and collective institutions that can help societies adapt to technological change. The second is its proven ability to build a population-scale DPI, including Aadhaar, UPI, GSTN, FASTag, and other digital platforms that have created trusted digital rails for service delivery and economic participation. These strengths position India to become a global leader in the application layer of AI. By leveraging DPI as a foundation, India can develop AI-enabled solutions to address large-scale challenges in education, healthcare, governance, and economic inclusion.

He encouraged researchers and students to engage with emerging public datasets generated through India's digital ecosystem, which can unlock new insights into economic activity, consumption patterns, and development outcomes. Further, newer digital datasets can reveal trends that traditional indicators may overlook, creating opportunities for more precise analysis and evidence-based policymaking. He also expressed optimism that the combination of AI, DPI, high-quality data, and interdisciplinary collaboration could help India accelerate economic transformation while ensuring inclusive technological progress. "*AI, if harnessed correctly, can be the wind in the sail of the ship that takes us to our destination",* he concluded.

Mr S. Krishnan, Secretary, Ministry of Electronic and Information Technology, argued that AI, DPI and electronics cannot be viewed as separate elements, as the way India approaches AI and DPI is increasingly linked to the future of electronics. Reflecting on India's earlier experience with information technology, he noted that while free access to electronic hardware under the Information Technology Agreement (ITA) was often criticised for hurting domestic electronics manufacturing,

it also enabled the IT revolution and the growth of almost $300 billion in IT and IT-enabled services. Today, India is attempting to build the electronics story again, but with a focus on resilience, strategic autonomy, and security.

He asserted that resilience has become critical because excessive dependence on a single source of supply can create vulnerabilities and disrupt output. At the same time, a large market such as India requires a degree of strategic control over critical devices and applications, while also keeping security concerns in mind. These concerns become even more important in the context of AI, where large-scale data collection through sensors, IoT devices, and other electronic systems will underpin applications in manufacturing, agriculture and other sectors of the economy.

He further noted that as DPI evolves, the integrity of electronic systems becomes increasingly important. While digital identity and verification systems have largely relied on OTP-based authentication, rising cybercrime is driving a shift towards face authentication and biometric authentication through devices. This underpins renewed concerns around security, privacy, and trust. In a mobile-first country where more than a billion people access the Internet and nearly 95 per cent do so through mobile phones, the reliability and security of devices becomes fundamental to the functioning of the digital economy.

Mr Krishnan also highlighted India's progress in electronics manufacturing, noting that mobile phone manufacturing or assembly is improving domestically. However, he acknowledged that there is still considerable scope to increase value addition and strengthen upstream manufacturing. He argued that electronics manufacturing remains important not only because electronics is among the largest manufacturing sectors in the world, but also because India is expected to be one of the largest markets for electronic devices. Programmes such as the phased manufacturing programme, Production-Linked Incentive (PLI) schemes and the electronic component manufacturing scheme are intended to deepen domestic manufacturing, increase value addition, and create employment.

Turning to semiconductors, he described them as a foundational industry that requires long-term government support. He defended India's strategy of beginning with mature and well-established technologies, arguing that resource constraints, capability limitations, and the need for resilience make this the most practical starting point. The objective, he said, is to develop capabilities gradually, strengthen advanced manufacturing skills, support research, and eventually move towards more advanced semiconductor technologies over time.

On AI, he acknowledged that India does not currently occupy a leading position in the AI infrastructure layer. However, he argued that the larger opportunity lies in the application layer, where AI can be deployed to solve real-world problems. He cited examples of Indian entrepreneurs developing AI and cybersecurity solutions that are attracting international interest, suggesting that India can make a significant contribution through the use of AI applications. While infrastructure remains important, including chips, computing capacity and AI-related hardware, he stressed the need to focus equally on innovation, deployment, and practical use cases.

Mr Krishnan also highlighted the importance of building indigenous AI capabilities, including AI models developed for India's strategic, cultural, and linguistic needs. He noted that making machine-readable datasets available through public platforms is a critical part of this effort, enabling innovators to develop applications suited to Indian conditions. While data sharing remains challenging, he pointed to the growing number

of datasets being made available through government platforms as an important step towards building a stronger AI ecosystem.

He concluded that a country of the size of India must build capabilities across the entire technology stack. From electronics and semiconductors to DPI, data platforms, AI infrastructure and AI applications, India must develop the full ecosystem. Leveraging its scale, talent, and digital capabilities, India can not only meet its own technological needs but also provide solutions to the rest of the world.

Session on 'Report Launch—India Transformation: The Evolving Landscape of Digital Inclusion

Panellists:

- ***Suresh Goyal, Director General, NCAER***
- ***Manish Sabharwal, Vice Chairman, NCAER Governing Board; Co-Founder, TeamLease Services***
- ***Sonalde Desai, Professor and Director, National Data Innovation Centre, NCAER***
- ***Aparajita Bharti, Co-Founder, The Quantum Hub***

During this session, Mr Manish Sabharwal released the research report, "The Evolving Landscape of Digital Inclusion in India."

The report is a collaboration between the India Human Development Survey (IHDS) team at NCAER and the Women in Digital Economy Network (WiDEN) at The Quantum Hub (TQH). Drawing on NCAER's IHDS-III data, the report finds that digital participation varies substantially across age, gender, education, and socio-economic groups, pointing to considerable scope for meaningful engagement.

Dr Sonalde Desai and Ms Aparajita Bharti two of the authors of the report, introduced the report to the gathering. The other authors of the report, namely Dr Dibyasree Ganguly (Associate Fellow, NCAER), Ms Garima Agarwal (Analyst, Public Policy, The Quantum Hub), Ms Harshita Vadaddi (Analyst, Public Policy, The Quantum Hub), Ms Sonakshi Chaudhry (Associate Director, Policy & Partnerships and Chief of Staff, The

Quantum Hub) and Dr Pallavi Choudhuri (Senior Fellow and Deputy-Director, NCAER-NDIC) were also present during the launch.

As digital technologies increasingly shape access, the findings highlight the importance of ensuring that digital transformation expands opportunities rather than reproduces existing inequalities.

Read the full report here: https://ncaer.org/publication/the-evolving-landscape-of-digital-inclusion-in-india/

Session on 'State of DPI—Financial Inclusion Research'

Moderator: Kamya Chandra, CEO, Centre for Digital Public Infrastructure (CDPI)

Ms Kamya Chandra noted that with the advent of DPI, India compressed 50 years of financial inclusion progress into roughly a decade. The real question now is how to take it further, and whether the rest of the world can actually replace it. She noted that DPI is not a category of software but a set of interoperable building blocks that can be reused by anyone. The defining characteristics of these blocks are open APIs, the ability to switch providers without losing data or paying exit costs, minimalist design, privacy protection, and crucially, multiple modes of access rather than one centralised portal. DPI works most efficiently when the following three factors are perfectly aligned—technology layers, covering protocols and standards; policy and governance or the requisite institutional setup; and market innovation, including the infusion of private players into the system.

She argued that the old stack comprising Aadhaar, UPI, and DigiLocker, has given way to a far richer new stack, including the ascription of a GST identity for ten million businesses; health IDs; Udyam, the official, free government registration system in

India for MSMEs; Bharat BillPay; and National Payments Corporation of India (NPCI) payment rails, among others. She noted that the central challenge in the adoption of DPI for financial research is the gap between existing infrastructure and infrastructure planned for the future.

Shankar Maruwada, Co-Founder, EkStep Foundation, suggested that India needs to increase its per capita income to become a developed country by 2047. The current DPI architecture was built for welfare distribution, and that job has largely been accomplished. He said that Phase 1 of the plan to develop financial inclusion research, spanning the last 16 years from 2010 onwards, has been about promoting identity and welfare benefits, and providing financial access to 1.4 billion people. The next phase, Phase 2, should focus on economic opportunity, jobs, credit, market access, and skill recognition. The framework thus needs to shift from 'the government reaching citizens' to 'citizens participating in the economy on their own terms'.

Citing examples from the current DPI platforms in operation in India, Maruwada observed that when a taxi or a pizza finds the customer on the latter's phone, that signifies infrastructure working. Similarly, a girl searching for a scholarship should not have to search for it but the scholarship should instead find her. A young man with a certified skill from a local training centre should not have to write a CV, but the job opportunity nearby should find him. Elaborating these points, he said that the government already has the requisite data, but just needs to ensure that data can be activated as a discovery layer rather than remaining confined to siloed databases.

The financial inclusion data for farmers includes market information, input recommendations, and credit access in local languages. For youth, on the other hand, it should be job and scholarship discovery that works for informal, local-language, low-digital-literacy users. The imperatives for small businesses include reducing the friction of market discovery, finding workers, and ensuring government compliance and credit access, all of which currently require enormous effort and assistance from intermediaries.

He asserted that the measurement innovation that the research community ought to pursue includes building of models that can predict GDP trends before the publication of official figures. The job of the research community is not to evaluate DPI after the fact, but to be at the table while it is being built, providing the evidence base that helps governments prioritise and deliver decisions in real time. He concluded that the energy and optimism which characterised the introduction of UPI and Aadhaar in 2009 now need to be carried forward to address the next set of problems.

The address by **Shashwat Alok, Associate Professor of Finance (ISB),** touched upon the issue of 'Breaking Barriers to Financial Access: Cross-Platform Digital Payments and Credit Markets'. Discussing research that uses smartphone behavioural data, he said that questions such as how many SMS messages you receive, how long your calls are, and how many people you call, are being used as substitutes for analysing formal financial history. The single most powerful predictor has turned out to be SMS volume, which is being seen as a proxy for the size of the individual's social network. At the pin-code level, a 1 per cent increase in the UPI transaction surface has been associated with a 7 per cent increase in credit in that particular area. The combination of Jio connectivity, UPI, and Jan Dhan accounts working in coalescence rather than individually has moved the needle.

He noted that even by the most optimistic estimate, UPI has reached only about 50 per cent of India's population while the bottom half remains untouched. Along with

the need to address this gap, it is also important to determine what people are doing with the credit they are taking—is it linked to consumption, productive investment, or distress borrowing? He concluded by asking, *"Where does public infrastructure end and private technology begin? At some point that boundary has to be defined."*

Pranav Jindal, Associate Professor of Marketing, Indian School of Business (ISB), spoke on 'Financing the Token Economy: Peer Credit and Platform Outcomes'. He defined stated tokenisation as the process of putting ownership of a physical or digital asset onto a blockchain as a token. This allows tokens to be used as collateral for loans, with the entire recovery mechanism written into a smart contract. If the borrower repays, the token transfers to him, and if he defaults on the payment, it automatically transfers to the lender. The issues that need to be explored include the behaviour of a platform when peer lending is introduced and whether financing can bring in new users or just change the behaviour of existing ones.

He cited a case study wherein a major Non-Fungible Token (NFT) platform enabled peer-to-peer lending for 13 collections in the profile picture category, accounting for 51 per cent of the total platform revenue, with the rollout occurring between May and December 2023. The dataset, comprising 52 weeks of transaction-level data, covered both the 13 treated collections and 36 control collections, with the same users observed across two platforms, which were tracking whether people were genuinely new to the market or just switching platforms. The strategy included the use of a synthetic DiD approach and multiple robustness checks, including dropping overlapping users and removing control collections. It was found that financing did not attract new users from competing platforms. The effect was entirely internal, as existing users became more active and spent more, and no platform-switching was detected. He summarised his findings by noting that India has a tradition of informal money lending, and tokenisation essentially formalises that trust mechanism by replacing a personal relationship with a smart contract.

Session on 'From Transactions to Insights: Building a Research Ecosystem around UPI, FASTag, and GST

Chair: N.R.V.V.M.K. Rajendra Kumar, Member Finance, NHAI

Moderator: Alok Gupta, Curtis L. Carlson Schoolwide Chair in Information Management at the Carlson School of Management, University of Minnesota

Panellists:

Shomik Mehndiratta, Practice Manager for Transport in Europe and Central Asia, World Bank

R. Srinivasan, Professor of Strategy and Chairperson, Centre for Digital Goods, IIM Bangalore

Mudit Agarwal, CEO, Indian Highways Management Company Limited (IHMCL)

Rahul Chari, Founder and CTO, PhonePe

Geetam Tiwari, TRIPP Chair Professor and Emeritus Professor at the Department of Civil Engineering, IIT-Delhi

The panel discussion focused on how FASTag, UPI payments, and GST can be utilised for economic research.

FASTag:

It was pointed out that FASTag is not just a physical asset but also a financial asset, as it reduces the social cost or externalities. Since FASTag tracks unique vehicle IDs across specific geographical points (toll plazas) at exact times, the data moves far beyond simple toll revenue collection. By connecting the dots between individual scans, analysts could extract highly granular insights about how people and goods move. By tracking a unique tag as it pings across multiple toll plazas, one can map the exact starting point, route taken, and final destination of any highway trip. By measuring the time taken for a vehicle to travel between two sequential toll plazas, one can calculate the exact average speed on that specific stretch of highway at any given hour.

FASTag categorises vehicles, such as cars, Light Commercial Vehicles, multi-axle trucks, and earth-moving equipment to determine exactly what type of traffic is using a road, which is a direct proxy for the weight/tonnage the road is bearing. Multiple scans at the same plaza or delays between scans can identify exact locations of traffic bottlenecks. It can also help to identify commuter frequencies, seasonal travel spikes (such as during festivals or summer holidays), and the preferred hours for freight movement versus passenger travel.

Access to such data would be a goldmine for researchers in academia, government policy, and private industry. In macroeconomic research, freight movement could be a leading indicator of economic health. Researchers could use commercial vehicle volumes between major industrial hubs like the Delhi-Mumbai corridor to predict industrial output, manufacturing health, and trade volumes long before official quarterly GDP numbers are released. Tracking seasonal spikes in truck movements from rural agricultural hubs to urban centres can also help researchers map harvest yields, supply chain efficiency, and potential food inflation.

Civil engineers and urban planners rely heavily on accurate data to design infrastructure. Instead of relying on manual traffic counts, planners could use the data to definitively prove which highway corridors are operating over capacity and prioritise them for expansion or bypass construction. Researchers could also simulate the effects of 'congestion pricing' (charging more during peak hours) to assess if it would successfully shift freight traffic to night-time hours, balancing the load on the highway network. By knowing the exact volume of multi-axle trucks passing over a specific highway segment, engineers can model the wear-and-tear on the asphalt and schedule preventive maintenance before potholes or structural failures occur.

For the private sector, this data is the key to supply chain efficiency. Logistics researchers (for companies like Amazon or major freight forwarders) could analyse macro traffic flows to determine the most efficient geographic locations to build mega-warehouses or distribution centres. The data would feed into routing algorithms, allowing logistics companies to route trucks away from historical bottlenecks at specific times of day.

Transportation is a major source of greenhouse gases. By combining vehicle class data, distance travelled, and average speeds, environmental researchers could calculate incredibly accurate, localised estimates of carbon emissions and particulate matter pollution along highway corridors. They could also quantify the exact environmental and fuel-wastage cost of vehicles idling at toll plazas or traffic jams. Researchers could further map chronic speeding corridors to suggest where speed cameras or highway patrols should be deployed. In addition, they could study the cascading effect of highway accidents by observing how traffic patterns and travel times shift in the hours following a major incident.

UPI:

UPI data can be leveraged for advanced socio-economic research in the following areas:

- *High-Frequency Consumption Tracking*: Unlike night-time lights, which only indicate electrification or urbanisation, UPI transaction volumes provide a direct, quantifiable measure of retail consumption. Researchers can track exact spending velocities across different tiers of cities and villages in real time.
- *Measuring Policy Impact*: Since UPI data is available instantly, researchers can use it to measure the immediate effects of sudden policy shifts. For example, if the government alters a GST slab on consumer goods, UPI payment volumes at merchant endpoints will immediately reflect whether consumption of those goods increased or decreased.
- *Financial Inclusion and Independence*: By analysing the spending habits of specific demographics, researchers can measure true financial freedom. For example, tracking the volume of autonomous transactions made by women in rural areas provides a measurable proxy for gender-based financial empowerment.
- *Hyper-local Tourism Tracking*: A sudden spike in out-of-state UPI IDs making person-to-merchant payments at local vendors, hotels, and transit hubs can accurately map seasonal tourism flows. States can use this data to calculate the exact economic value tourists bring to local micro-economies.
- *Mapping the Rural Economy*: Since UPI has successfully penetrated rural markets, it provides unprecedented visibility into agrarian cash flows, harvest-season spending spikes, and rural distress signals.

The panellists suggested that in order to fully harness the analytical power of UPI, policy must focus on expanding the data pool. By aggressively promoting digital and financial literacy, the government can push the remaining cash-reliant demographics onto the UPI network. This is a positive feedback loop, as greater financial inclusion directly leads to richer, more comprehensive data collection for future policy planning.

GST:

The panel argued that government can use the data of GST filings to measure the effect of policy changes as well as to detect the policies and sectors that need a boost. The discussion highlighted a critical intersection between physical infrastructure, digital tracking, and the hidden costs of systemic inefficiencies. The following priorities were outlined:

- The National Highways Authority of India (NHAI) can revolutionise infrastructure upkeep by fusing high-resolution geospatial imagery with FASTag transit data. For example, a sudden, localised drop in average speeds between two toll plazas—without an accompanying increase in traffic volume—is a strong indicator of surface degradation. Addressing potholes proactively is not just a safety measure but an economic necessity. By moving from reactive repairs to predictive maintenance, the state can save the logistics sector crores of rupees in vehicle wear-and-tear, directly boosting the profitability of the freight industry.

- Effective governance requires the fusion of diverse, multi-modal datasets. Currently, there is a critical missing link between India's highly advanced digital infrastructure (like UPI and FASTag) and its physical infrastructure management. This disconnect creates a mismatch where policymakers make macro-level decisions without access to micro-level, real-time feedback. By integrating digital tracking networks with physical asset management, policymakers can create a continuous, real-time feedback loop, ensuring effective capital allocation and maintenance schedules.
- Inadequate infrastructure capacity and thin profit margins have normalised a shadow system where commercial operators pay bribes to bypass weight restrictions. Overloaded vehicles suffer accelerated mechanical failure, while simultaneously causing exponential, premature damage to highway surfaces. Ultimately, the immediate gains from this rent-seeking behaviour are completely wiped out by the long-term economic losses borne by both the state and the transport sector. It is thus imperative to augment infrastructure capacity to deal with these challenges.

Session on 'Making AI Work for Humanity'

Chair and Moderator: Ravi Bapna

Marshall Van Alstyne, Professor of Information Economics and Department Chair, the Boston University Questrom School of Business, 'Guidelines versus Guardrails for AI'

Professor Marshall Van Alstyne argued that AI is advancing at an unprecedented pace, with modern AI systems already outperforming humans in several domains, including language understanding, image recognition, scientific reasoning, and complex problem-solving tasks. Recent developments have even seen AI systems pass variants of the Turing Test, raising important questions about how society should govern increasingly capable systems. He highlighted emerging concerns about AI systems displaying deceptive or self-preserving behaviour. Examples included AI attempting to modify its own operating conditions, concealing information, manipulating users, and even demonstrating strategic behaviour when pursuing assigned objectives. While these incidents occurred largely in controlled testing environments, they underscore the challenges of relying solely on traditional control mechanisms.

A central argument of his talk was that conventional guardrails may prove ineffective because AI systems possess a capability that previous technologies lacked: self-improvement and self-design. Unlike machines such as calculators or automobiles, advanced AI can potentially modify its own code and capabilities. As a result, any constraint embedded within a system may eventually be redesigned or bypassed by future versions of that system.

Professor Van Alstyne proposed that rather than relying solely on technical restrictions, AI governance should draw lessons from political and economic institutions. Concepts such as balance of power, distributed oversight, and incentive-based mechanisms may provide more durable approaches to managing AI systems than static rules or hard-coded restrictions**.** He also emphasised fiduciary duty.

In conclusion, he suggested that the future challenge is not simply how humans can constrain AI, but how society can build a mutually beneficial relationship with increasingly autonomous systems. Effective governance may require institutional

safeguards and incentive structures rather than purely technical guardrails. *"The question is not of augmentation versus automation but how work will be restructured*", he stated.

***Jean Louis Arcand, President of the Global Development Network and Professor of International Economics at the Graduate Institute Geneva*, 'AI Inequality and Development: Rethinking Inclusion in the Digital Age'**

He examined how AI may reshape development and inequality across countries and labour markets. While AI offers substantial opportunities for growth and innovation, it may also widen disparities between firms, workers, and nations depending on their access to technology and complementary skills.

He emphasised that AI benefits are unlikely to be distributed evenly. Countries and firms that possess stronger digital infrastructure, skilled labour, and technological capabilities may capture disproportionate gains, while others risk falling behind. The challenge for policymakers is, therefore, not only technological adoption but ensuring broad-based access and inclusion.

A key concern he raised was the possibility that AI could eliminate traditional entry-level roles that serve as stepping stones for career development. As AI systems increasingly perform routine professional tasks, opportunities for learning through work experience may shrink, potentially increasing wage inequality and limiting upward mobility for future workers. The crux of his argument was that the development challenge is not whether AI will generate value, but whether that value will be distributed equitably. Policies focused on skills, access, and workforce transition will play a critical role in determining whether AI narrows or widens inequality.

***Saharsh Agarwal, Assistant Professor of Information Systems at the Indian School of Business,* 'Google AI Overviews and Publisher Traffic: Evidence from a Field Experiment'**

He presented evidence on how Google's AI-generated search summaries are changing user behaviour and affecting traffic flows across the web. He was alluding to a study that examined whether AI overviews alter the way users interact with traditional search results and whether publishers lose visibility when information is summarised directly within search results. The study used browser-extension technology to observe users' natural search behaviour over a period of time. Rather than assigning artificial search tasks, researchers tracked real-world interactions with search results, allowing them to measure how users responded when AI-generated summaries appeared alongside conventional links. The findings suggest that AI overviews satisfy many information needs directly on the search page, reducing the need for users to visit external websites. As a result, publisher traffic declines when users obtain answers directly from AI-generated summaries rather than clicking through to original content sources.

The results raise important questions about the sustainability of online publishing. If users increasingly consume information through AI-generated summaries, content creators may face declining traffic and reduced incentives to produce high-quality information. This could have broader implications for the future economics of digital content. Generative AI is transforming search from a gateway to information into a destination itself. While users may benefit from faster answers, policymakers and platforms must consider the long-term effects on publishers and information ecosystems.

***Avinash Collis, Assistant Professor at the Heinz College, Carnegie Mellon University,* 'What Is Generative AI Worth?'**

He focused on measuring the economic value of Generative AI from the perspective of users. While its impact on productivity and GDP remains difficult to detect, consumer adoption has been extraordinarily rapid. He argued that traditional economic indicators may under-estimate the true benefits users derive from AI tools. The research used large-scale willingness-to-accept experiments to estimate how much compensation users would require to stop using generative AI tools for a month. By analysing responses from thousands of users, the study estimated the consumer surplus generated by AI technologies.

In the US, estimated consumer surplus from Generative AI increased substantially within a year as adoption expanded and users discovered new applications. Although AI's contribution to productivity remains uncertain, the welfare gains experienced by consumers are already significant and measurable.

He highlighted India's rapid AI adoption, with approximately 100 million weekly ChatGPT users and strong growth across multiple AI platforms. Preliminary estimates suggest that Generative AI is already generating substantial consumer welfare benefits in India, particularly among users who actively engage with these tools. An important finding is that the overwhelming majority of AI-generated value currently accrues to consumers rather than platform providers. AI firms continue to invest heavily while users capture most of the immediate benefits through access to powerful and increasingly capable tools. It has, however, been observed that merely providing access to AI tools is insufficient. Effective adoption requires training, awareness, and

practical demonstrations of use cases. Programmes that combine access with structured learning opportunities are likely to generate much greater welfare gains.

The key takeaway from his talk was that Generative AI is already creating substantial consumer welfare, even if its productivity effects are not yet fully visible in economic statistics. The next policy challenge is expanding its meaningful adoption to ensure that these benefits reach a broader segment of society.

Session on 'Technology, Regulation, and Behavioural Outcomes'

Moderator: Venkatesh Balasubramanian, Professor in the Department of Computer Science and Engineering, IIT Madras

***Ananya Sen: Assistant Professor, Heinz College of Information System and Public Policy,* 'Amplifying Local News on Social Media: Evidence from a Field Experiment on 60 Million Users"**

She noted that local news is dying, and advertising revenue for local outlets has collapsed since digital platforms took over. The important question that thus needs to be addressed is: If you inject local news directly into people's social media feeds, does it actually change how they engage with it? She alluded to a study, wherein two groups were formed: a control group that received the standard algorithm-driven feed, and a treatment group that got a dedicated local news tab which they could actively click on. The tab showed curated local and trending news, as opposed to content that just surfaced organically. The findings indicated that treatment users did see and engage with more local news. But the sharing behaviour narrated a more complicated story. People were consuming local news but not passing it on. The objective was to read it and stop there. There were also differences by gender in who was sharing less. Across most regional languages, the effect on sharing was negative, as people shared less after seeing local news, with Telugu being the notable exception, where the effect was closer to neutral or slightly positive.

She noted that one of the most distinctly Indian observations is that injecting local news into feeds reduces the volume of 'Good Morning' messages, which represent the informal social glue of Indian social media, where people send cheerful messages to their networks as a daily ritual. Local news has nudged people away from low-information social signalling toward something more substantive, even if they were not yet sharing that substantive content widely. She also flagged the *filter bubble risk,* which predicates that the more you customise content to what someone already wants to see, the more you risk reinforcing what they already believe, leading to the key question: Does personalisation of local news help or damage the broader information ecosystem?

***Madhu Viswanathan, Associate Professor of Marketing, ISB,* 'Revenue, Regulation, and Reaction: India's Tax Reform in Online Real-Money Gaming'**

He argued that India has significantly raised GST on online real-money gaming. The research question thus is not whether this is a good policy in the abstract, but what it actually does to consumer behaviour, platform revenues, and how people respond when the regulated option becomes more expensive. He revealed that the total gaming engagement has declined on regulated platforms after the tax hike. While the revenue for operators has decreased, demand has not diminished, as a portion of the users has simply moved. Some have shifted to overseas platforms while others have downloaded

apps directly from websites when they could not find them on the App Store. This shows that if one platform is regulated, users shift to another. Similarly, if a tax is raised domestically, users go offshore. These outcomes suggest that regulators need to think about the entire ecosystem, identify the substitutes, and determine what happens to each of them after one intervenes in one place.

He remarked that the evidence from Bihar suggests that reducing alcohol consumption has led to real gains, greater household investment, better educational outcomes, and more economic control for women. It needs to be assessed whether regulation on gaming could produce similar positive spillovers if it actually reduced addiction and redirected spending. However, the evidence on gaming is not yet clear enough to make that claim confidently, and the skill-versus-chance legal distinction in Indian gaming law complicates things as well. Tools like spending caps, time-tracking mechanisms, and effort-reduction nudges (making it slightly harder to keep playing, rather than banning it) are still under-explored policy levers. He also stated that welfare calculation favours a tax or regulation, and policymakers face a political cost when consumers visibly lose access to something they enjoy. The consumer reacts by saying that "the government is taking away my gaming", which should give way to a net welfare argument that includes the costs of addiction, household financial harm, and time displacement. That re-framing is a research task, not just a communication task.

***Uttara Madurai Ananthkrishnan, Assistant Professor of Information System,* 'Increasing Road Safety Compliance in Trucking through a Field Experiment'**

She maintained that life improvement apps for health, safety, productivity, and financial discipline have a universal adoption problem. Even in the US, one-month retention for such apps sits at only around 30 per cent. In India, the challenge is far steeper, because people are being urged to switch attention away from genuinely

entertaining platforms, such as YouTube, Bollywood content, and gaming, toward something that feels like a chore. She pointed out that a teenage boy watching content on YouTube is not going to put down his phone for a generic safety reminder. Hence, if an app delivering a plain notification is competing with another one that symbolises pleasure, the former is bound to lose that competition every time.

She discussed an app devised for working with a trucking company, wherein the team deployed a safety compliance app that sent alerts to drivers every 15 minutes. The first version used standard generic alerts such as 'great job', and 'stay safe'. Drivers quickly tuned these out or got annoyed by them. The intervention that actually worked was a set of 500 Bollywood-themed alert messages—varied, culturally familiar, occasionally funny, and different enough each time so that drivers did not simply start ignoring them. The Bollywood alerts were thus designed to break through the monotony of the road in a way a plain reminder never could. Compliance rates increased by 18.2 per cent among drivers who received the Bollywood alerts as compared to those who received nothing.

The effect was strongest among drivers who had been least compliant before the intervention—the alerts moved the hardest-to-reach group the most, which is usually the opposite of what technology interventions achieve. Compliance also increased more in crowded, high-traffic areas, which makes intuitive sense—the alert caught attention precisely when the driving environment was most demanding. And alerts delivered earlier in a trip were more effective than those given later, suggesting that setting the frame for safe behaviour at the start of a journey matters more than reminding someone midway through.

She said that beyond trucking, this leads to the conclusion that treating millions of Internet users in India as a uniform population is a fundamental mistake. The content, language, cultural register, and timing of any technology intervention have to match the lived reality of the person receiving it. This finding materially changes outcomes. The same logic applies to DPI adoption: if you want a farmer in rural Maharashtra to use an Account Aggregator flow, a plain government notification in English is not going to do it. On the other hand, a voice prompt in Marathi, delivered through a culturally familiar interface at the right moment, might. This can also be connected to the broader public health tradition—polio vaccination campaigns, sanitation drives, nutrition messaging—all of which require massive, sustained, culturally specific public communication to achieve adoption. Digital infrastructure is no different. The technology is necessary but not sufficient. The goal should be to meet people where they are.

***Anandasivam Gopal*, *President's Chair of Information Systems and Innovation at the Nanyang Business School*, 'Mitigating Delays in Criminal Investigations through SMS Nudges'**

He began his address by citing a cold email sent to the Chhattisgarh CID, which eventually led to a working relationship with senior police officials. He candidly admitted that access to operational police data is rare and hard to get, and comes from persistence and relationship-building rather than any formal institutional channel. He revealed that police officers, when engaged properly, are actually quite willing to talk about their work and the constraints they face. India's criminal procedure law requires investigating officers to file reports within 60 to 90 days of a case being assigned. In practice, a significant share of cases misses this deadline. The reasons are structural: officers carry large caseloads, supervisors cannot realistically monitor field activity on

a day-to-day basis, and there is no lightweight accountability mechanism that creates a credible sense of being watched without requiring a senior officer to physically visit each case.

In this context, SMS messages sent to investigating officers as their filing deadlines approached, were framed in two different ways. One framing was pro-social, emphasising the importance of timely investigation for justice and for the people involved in the case. The other was accountability-based, making clear that the officer's supervisor at the district level was aware of the deadline and the status of the case. Both types used the natural hierarchy of the police force to make the message feel credible rather than generic. The finding was that both message types improved deadline compliance, but the accountability framing was more effective than the pro-social one.

The most important finding: messages sent ten days before the deadline produced significantly better results than messages sent just one or two days before. Last-minute reminders gave officers no actionable time. A ten-day window gave them enough time to actually do something about it. Urban stations, particularly in Raipur, showed stronger effects than rural ones, possibly because urban officers deal with more concentrated, observable caseloads where it is easier to act quickly on the case status.

Across three months of observation, the intervention recovered roughly 40,000 hours of investigation effort. This is a meaningful number for a low-cost, low-tech intervention that required nothing more than already existing SMS infrastructure. Also, police officers in India are deeply reluctant to use their personal phones for official documentation, because a personal phone used to record evidence can be subpoenaed as part of the legal process, implying that the officer could lose the phone for years while a case works through the courts. Until that legal issue is resolved, digital evidence collection in policing will remain constrained regardless of whatever tools are available.

Session on 'AI Governance and Future of Work'

Chair and Moderator: Archana Vyas, Gates Foundation

***Sofia Bapna, Associate Professor and Lawrence Fellow at the Carlson School of Management, University of Minnesota*, 'Gender Trends for Re-application: Evidence from Job Applications'**

She alluded to a study on job application trends with special focus on women's behavioural trends towards applying for jobs, wherein the sample included 8,653 candidates applying across 294 job roles, primarily in sales, customer support, and office support, spanning 201 cities. Of the applicants, 31 per cent belonged to six major metros of India, including Bengaluru, Hyderabad, Delhi, Mumbai, Chennai, and Kolkata. The applicant pool was predominantly male (81 per cent male and 19 per cent female), and 86 per cent of the workers were between the ages of 20 and 35 years. Workers were hired for specific positions at client organisations for six months to a year. In terms of the application process, a staffing agency posted positions on a web portal where candidates could search, create an account, and apply providing personal and occupational details. Candidates were screened by the staffing company, followed by interviews with both the staffing company and the client organisation.

Characterised by an experimental design, the study covered over 26 weekly cohorts, wherein the 8,653 candidates were randomly assigned to receive one of the three rejection messages (fit, quality, or no reason). Messages were sent via SMS/text message, a method utilised by over 60 per cent of the recruiters due to its high open rate (>99 per cent), quick response time, and discreet nature. Text messaging is also more standardised than phone communications, which can suffer from delays and differences in voice inflection.

Flagging the issue of gender disparity in job search persistence, Professor Bapna said that women are less likely to re-apply to the same organisation after experiencing a rejection. Consequently, fewer women remain in talent pipelines, which contributes directly to gender gaps in hiring. Her study investigates which types of job-rejection messages from employers can increase women's job search persistence. The findings of the study regarding the impact of messaging on women shows that women's propensity to apply for jobs is lower when a role is described as competitive. Job advertisements are less appealing to women when the wording elicits stereotypically masculine traits, such as use of the terms ‘competitive’ instead of ‘cooperative’, ‘dominant’ instead of ‘community’, or emphasising ‘leadership’ over ‘interpersonal skills’. Conversely, disclosing the number of applicants for a position increases the likelihood that women will complete the application.

She also noted that most job rejection communications begin with a personalised salutation (74 per cent) and a friendly opening statement, such as "Thank you for applying" (91 per cent). This is typically followed by the reason for rejection, which most commonly relates to fit or quality, or no reason is provided at all. The study also explored the nature of rejections, which could be quality-based rejections, highlighting the gap between an applicant's skills and the job's requirements, or referring to the superior quality of the applicant pool (38 per cent) or the applicant themselves (19 per cent), stating that the selected candidates were better qualified. At another level, the

impact factor emphasises a skill comparison between the rejected candidate and others, leading the applicant to interpret the rejection as a personal failing or a loss in a competitive environment. As regards the gender implication, since women are less inclined to engage with employers who emphasise competition dynamics, they are expected to react less positively to quality-related rejection messages.

Fit-based rejections, on the other hand, indicate an assessment of an applicant's congruence with broad organisational attributes, such as values, personality traits, and the work environment. In this case, the common phrasing used in the messages to communicate the rejections include 'no suitable openings' (16 per cent), 'not enough fit' (14 per cent), or that 'other applicants had a better fit' (3 per cent). The impact in these cases attributes the decision to perceived incompatibility rather than professional deficiencies, making it more face-saving, polite, and socially preferred. Since fit messages are relational and avoid emphasising a competitive environment, women are expected to respond favourably to them.

Finally, the 'no reason' rejections, which do not provide a specific reason for the rejection, are ambiguous, less transparent, and leave room for speculation. Since women are more sensitive to ambiguity and place higher emphasis on informational justice, they are expected to respond less positively to messages lacking a reason.

Bapna outlined the following core hypotheses of the study:

- Rejected women are more likely to re-apply to the same employer after receiving a fit-based rejection message as compared to a quality-based rejection message.
- Rejected women are more likely to re-apply to the same employer after receiving a fit-based rejection message as compared to a rejection message that provides no reason.

She concluded that the key contribution of the study is that it adds to the literature on gender differences in job applications, which notes that women are less likely to self-promote and less likely to re-apply after rejection. It also demonstrates that a woman's likelihood of applying after a job rejection is dependent on the specific content of the rejection message, thereby providing an insight into the role of the content of rejection messages in determining re-application trends for women for jobs.

***Jonathan Hersh, Associate Professor of Economics and Management Science at Chapman University's Argyros College of Business and Economics,* 'Space to State Capacity: Using Machine learning and Alternative Data to Inform Policy'**

Proclaiming that State capacity is fundamentally an information problem, he argued that governments fail when they cannot properly observe populations, predict shocks, or deliver services quickly. An analysis of State capacity necessitates asking three questions: Who are the vulnerable? What do they need? and, Did the policy work?

The traditional approach to assessing populations relies on surveys, which are costly and infrequent. Surveys also cost millions of dollars, censuses only happen once a decade (with some, like India's 2021 Census, experiencing delays), and the results are often reliable only at the state or district level rather than the village level. Highlighting this data gap, he pointed out that 57 countries had zero or only one poverty estimate between 2002 and 2011. Vulnerability is a flow, not a stock; static registries freeze the question of "who is poor" into a snapshot and miss people pushed into poverty by sudden shocks like floods, heat, or price changes.

In this context, he suggested that AI and DPI can act as action and perception layers to help identify vulnerable populations and their risks. Machine learning can be applied to high-resolution daytime satellite imagery to show features like cars and roofs, predicting poverty rates in areas that cannot be surveyed. The satellite imaging frequency can be much higher than what would be possible using only traditional ways and the coverage area would also be much higher. AI models, such as Convolutional Neural Networks (CNNs) can also measure bombing and conflict destruction from satellite imagery alone with over 90 per cent accuracy, as demonstrated in Syrian cities like Aleppo, Homs, and Raqqa.

DPI, on the other hand, can serve as an alternative method for measuring economic welfare. For instance, data from platforms like PhonePe Pulse captures five times the variation in economic activity as compared to traditional night-time light measurements.

He also noted that flood vulnerability is highly correlated with poverty, and poor households are the least resilient to climate shocks. By identifying households that face both high poverty rates and high flood risks, governments can adjust poverty transfers in anticipation of shocks, ultimately increasing household resilience during times of stress.

***Amit Mehra, Professor of Information Systems, Naveen Jindal School of Management, University of Texas at Dallas*, 'The Dynamic Effects of AI-based Livestreamers in Livestream Shopping'**

He began his address by noting that livestream shopping acts as a virtual showroom where a presenter showcases a series of products to an audience. It serves as a 'shoppertainment' channel that combines effective information dissemination with live entertainment through rich media content. Presenters answer viewer questions in real time, viewers can chat with one another, and purchases are made directly through links available on the interface. Examples of livestream shopping platforms include Taobao Live in China and TikTok Shop in the US.

As regards the global market growth and projections, it is estimated that in 2023, U.S. livestream commerce sales reached an estimated $50 billion. By 2026, sales are projected to grow by 36 per cent, accounting for more than 5 per cent of all e-commerce in America. The major players in this market segment include Amazon Live, Whatnot, NTWRK, Popshoplive, Shopify, and YouTube.

Correspondingly, the livestreaming e-commerce market in China generated nearly $682.5 billion (5 trillion yuan) in sales in 2023, a significant increase from $57.12 billion (420 billion yuan) in 2019. The market is projected to reach $1.11 trillion (8.16 trillion yuan) by 2026. Meanwhile, in India, the live commerce market is projected to grow from $10.19 billion in 2026 to $198.00 billion by 2034, reflecting a Compound Annual Growth Rate (CAGR) of 44 per cent.

The potential advantages of adoption of Virtual Livestreaming (VLS) are that it can be faster, can possess a higher interaction capacity, and can maintain consistent response quality throughout a livestream session. The potential shortcomings of VLS, on the other hand, include a reduced 'human feel', which may lower trust and lead to weaker persuasion. Furthermore, confident but incorrect answers may cause a loss of credibility, and the VLS itself might become a distraction from the product.

Professor Mehra also highlighted the findings of a research study on the impact of VLS on sales, which analysed over 500 major livestreaming channels on a major Chinese

platform over a one-year period from 13 July 2021 to 12 July 2022. The data encompassed 72,000 livestreaming sessions featuring a primary human livestreamer with an assistant, either human or virtual. The channels exhibited staggered VLS adoption over the calendar months. The key findings of the study are that VLS adoption initially increases sales, but its positive effect declines over time. This decline is not due to a fading novelty effect, as user engagement (comments and shares) actually increases over time, nor is it due to an AI model drift, as VLS performance parameters, like average response time and average word count, actually improve over time rather than worsen. The decline actually occurs due to a reduction in the average watch time. Paradoxically, since VLS improves the efficiency of information provision, viewers get what they need faster and leave, which reduces their exposure to products and lowers cross-sell opportunities. Hence, in order to improve the average watch time, sellers must focus on the entertainment aspect of VLS. Further, using an attractive VLS interface, such as an animated mascot, can stem the decline in sales. Such stimuli are also known to help make ads viral, and brands actively incorporate such elements into their social media strategies.

The key takeaways from the study and the potential for future research thus indicate that while VLS adoption initially boosts sales, its benefit diminishes over time due to reduced watch duration. The use of VLS interfaces like mascots effectively mitigates this decline. Future research should thus investigate approaches to make VLS more entertaining, potentially utilising AI models for video generation. Additionally, further research is needed to determine the enabling factors that can encourage livestream shopping in India and enable AI to assist in that growth.

***Shehnaz Ahmed, Lead, Applied Law and Technology Research (ALTR), Vidhi Centre for Legal Policy*, 'Governing AI: Trust, Accountability and Public Interest'**

She asserted that historical trends in energy, medicine, finance, and communications show that innovation often races ahead of regulation, resulting in harm before governance can catch up. For example, nuclear disasters led to safety standards, untested drugs led to pre-market safety standards, financial crises led to systemic risk oversight, and Internet data exploitation led to data protection and platform liability. AI is following this same historical arc, highlighting the need to proactively govern the technology. If AI is, therefore, not built for all, it will exacerbate existing inequalities and deepen existing exclusions.

She opined that a proper AI governance framework must be defined by the following three core values:

Trust: Users must be able to rely on AI systems and understand how decisions are made. This necessitates explainability, rule-bound behaviour, and meaningful consent.

Accountability: When AI causes harm, someone, that is, a human owner, must be answerable. This involves auditability, clear liability rules, human oversight, and redressal mechanisms.

Public Interest: AI benefits must serve all people and not be concentrated in the hands of a few. This necessitates risk-based oversight, representative datasets, and safety standards.

She outlined the CODE (**C**ontextual, **O**perational, **D**ata Governance, Ethical) approach, which is a principles-based framework for governing AI across its full

lifecycle, acting as the foundational principles for a coherent governance architecture rather than a singular law. CODE can briefly be explained as follows:

Contextual: Context-sensitive rules calibrated to specific sectoral and use case risks.

Operational: Rules governing how AI systems are built, tested, and validated before deployment.

Data Governance: Governance of the provenance, quality, and fairness of data used to build models.

Ethical: A rights-based framework providing non-negotiable user protections that apply regardless of the use case or sector.

She also described India's current AI governance approach as reactive, siloed, fragmented, and unclear. India relies on the following disjointed regulations rather than a cohesive framework:

IT Act, 2000 and Rules: Focused on intermediary liability for the Internet era, not automated systems.

DPDP Act and Rules: Governs personal data processing (relevant for AI inputs/outputs) but is completely silent on algorithmic decision-making and model training.

Consumer Protection Act, 2019: Provides redressal for service deficiencies but lacks express recognition of AI-specific product liability.

India AI Governance Guidelines: Offers no enforceable protections for users.

Data Exchange and Open Data Policies: These are merely policy initiatives and are not legally enforceable.

Sector-specific Interventions: Exist only in isolated pockets like Finance (Reserve bank of India [RBI], and Securities and Exchange Board of India [SEBI]) and Health (Indian Council of Medical Research [ICMR], and Ayushman Bharat Digital Mission [ABDM]).

The central question is thus not whether India needs an AI Act, but how it can build an architecture that is holistic, adaptive, and future-proof. The conversation around AI governance must thus move beyond the reductive binary of 'should we regulate or not'. Instead, the focus must be on building a governance architecture that is holistic, adaptive, and future-proof across all stages of the AI lifecycle.

History shows that in sectors like energy, medicine, and finance, innovation races ahead and harm follows before governance catches up. AI is currently following this same historical arc.

***Kanika Mahajan, Associate Professor of Economics, Ashoka University*, 'Indian Workforce's Jobs and Productivity, and Upskilling for Women Returnees'**

She referred to a study titled, 'From Pause to Pay: Supporting Women's Return to Work', which focuses on college-educated women attempting to re-enter the workforce, specifically in the technology sector. This study is contextually important as Labour Force Participation (LFP) for college-educated women in India peaks at 46 per cent in their mid-20s but falls to approximately 30-35 per cent after age 30. However, 7 million or more women are interested in returning to work. The median career break for women is three years, which is long enough for skills to become

obsolete in the fast-changing tech sector. Re-entry often fails due to a lack of technical skills (50 per cent), a lack of soft skills like confidence and networking (66 per cent), and employer discrimination, which results in 50 per cent fewer callbacks. Before their career breaks, most of these women were performing software management and basic coding tasks, such as the maintenance, support, and documentation of IT systems.

The Randomized Controlled Trial (RCT) included 1,752 eligible applicants across three phases. The eligibility criteria required applicants to be below the age of 50, college graduates, not currently employed full-time, possess prior coding knowledge, and have a career break of eight years or less.

Participants were divided into three groups: a Control group receiving no training (N=581), Treatment 1 receiving Soft Skills only for about 40 hours over 4-6 weeks (N=586), and Treatment 2 receiving Soft + Technical Skills for about 150 hours over 16-20 weeks (N=585). The technical training primarily focused on Data Science, as around 80 per cent of the participants preferred it over cloud computing or front-end development. The programme take-up was extremely high, with a 99.4 per cent enrolment rate among the treated groups.

Approximately 87 per cent of the treated participants attended at least one live session, and 42-47.4 per cent attended at least half of the sessions. The treatment raised any certificate completion by 55 per cent. The effects were strongest for the Soft + Tech group, which saw a 97 per cent increase in technical certification, a 205 per cent increase in data-science certification, and a 6 per cent increase in technical skill test scores. Perceived improvements in technical skills, soft skills, and job chances rose by 118 per cent, 157 per cent, and 118 per cent, respectively. The provision of technical and soft skills increased the proportion of interview calls for candidates by 28 per cent. Interestingly, job-offer incidence fell by 18 per cent, though data suggests that this was not driven by an increase in the candidates' salary reservations. Candidates in the Soft + Tech group began searching more narrowly for specific roles, particularly remote jobs and data science positions. Conditional on being employed, treated candidates were more likely to be working in data science and remote roles.

Professor Mahajan noted that the macro trends suggest that the largest growth in wage employment occurred in low-skilled, non-farm occupations, which increased by 2.1 crore workers whereas the medium-high skilled occupations grew by 85 lakhs each. AI exposure measures technical exposure rather than outright job loss; high exposure can indicate substitution risk, augmentation potential, or even demand growth if AI raises productivity. The highly exposed occupations cover the areas pertaining to software/database/network professionals, numerical clerks, mathematicians/actuaries/statisticians, and business/financial/sales professionals. The least exposed occupations, on the other hand, include mining/construction labourers, food preparation assistants, sheet and structural metal workers, and building trades workers.

Employment growth mapped against AI exposure shows that the largest employment growth is occurring at the least AI-exposed end, which consists of manual, physical, and low-wage occupations. Highly AI-exposed occupations are also growing, albeit more modestly, indicating that the demand for specialised cognitive skills persists.

Occupations with moderate AI exposure show very little growth, which mirrors a broader "hollowing-out" of middle-skill work. Worker shares have risen most sharply at the bottom of the skill distribution and modestly at the top, leaving the middle of the distribution relatively flat. Future skilling initiatives must create bridges to move

workers from routine, middle-skill work into either higher-productivity tasks or high-productivity roles within low-skilled work.

Recent Periodic Labour Force Survey (PLFS) data shows an approximate 9 percentage point increase in workforce participation over the last 7-8 years. However, 40 per cent of this increase is still concentrated in agriculture, highlighting a struggle to transition workers from farm to non-farm sectors. Within the non-farm sector, job growth is heavily polarised. A majority of the growth is occurring in the lowest-skilled, lowest-paying jobs (for example, plumbers, electricians, housekeeping), specifically in the lowest 25th percentile of the wage distribution. Since middle-skill occupations remain stagnant, future skilling initiatives must figure out how to transition middle-skill workers into higher-productivity tasks or increase the productivity of currently low-skilled manual work.

Since India lacks granular six-digit occupational data, researchers utilise US O*NET task data as a proxy to measure AI exposure. High AI exposure does not strictly mean job loss, and can also indicate augmentation or even demand growth. For instance, radiologists are highly exposed to AI, yet the demand for radiologists has actually increased in the last five years. Currently, the least AI-exposed jobs (manual labour, food prep) are growing the fastest, while highly exposed jobs (software, finance) are growing modestly.

Touching upon the experiment to measure the proportion of women returning to work, she noted that college-educated women see a sharp drop in labour force participation after the age of 30 years, with a median career break of three years. When attempting to return to the tech sector, they find that their previous skills, often basic coding or IT maintenance, are obsolete. An upskilling programme, in collaboration with Infosys Springboard, was thus offered to women returnees, dividing them into soft-skills only and technical + soft skills cohorts. Out of 1,500–1,600 applicants, data science was the overwhelmingly preferred technical track, with over 80 per cent of the applicants opting for it.

It has also been seen that upskilling is difficult. While initial enrolment is high, approximately 50 per cent dropped out, and only 25 per cent completed the full, rigorous certification. However, job preferences shifted dramatically. Treated women were 50 per cent more likely to specifically target data science roles and remote/hybrid work arrangements. They also modernised their job search strategies, utilising platforms like LinkedIn and online portals. Even with upskilling, systemic employer discrimination remains a massive hurdle. Women with career breaks receive 50 per cent fewer callbacks than those without, raising the critical question of whether upskilling alone is enough to overcome employer bias.

Session on 'Defining Three Priority Research Programmes for India's AI and DPI Future'

Chair: Suman Bery, Former Vice Chairman, NITI Aayog

Moderator: Akhilesh Tilotia, Co-Founder, Thurro

Panellists:

Abhishek Singh, Director General, National Testing Agency

T. Koshy, Former MD & CEO, Open Network for Digital Commerce

Karthik Adapa, Regional Advisor for Digital Health, World Health Organisation

Bhagwan Chowdhry, Professor of Finance, ISB

The panel debated the question: Should India race to become a producer of AI or focus on being its most sophisticated user? The panellists unanimously agreed that a key question to be considered was the strategic value of large data flows versus the need to develop the full AI stack (data centres, foundational models, applications). They also pondered over the critical issue of the national security implications of owning the end-to-end pipeline were critical.

Data must be viewed as a strategic asset, particularly in India, where massive data generation is the primary driver of AI-generated wealth. Its value rests in leveraging data for consumer surplus and establishing a resilient AI ecosystem. The need for a model where policy-driven access can accelerate AI uptake without sacrificing domestic expertise was also flagged. In addition, the panellists averred that it is crucial to move beyond state capacity building towards net new value creation for generating new services and outcomes.

AI in Education

The dual role of AI in education was also discussed, as AI can function as an intuitive tool for students. Further, AI can also be treated as a subject, wherein the curricula could include novel AI concepts. In addition, AI can be deployed during examinations to automate question creation, translation, and distribution, and to facilitate adaptive testing by building computer-adaptive tests that adjust difficulty in real time. AI can also break the cycle of memorisation-driven coaching centres, shifting the focus to reasoning and research skills.

AI in Healthcare

The panel focused on the issue of designing of AI systems that are tightly bound to the specific clinical environment in which they will be deployed. The following examples were cited:

1) Voice-based health advice in local languages (feature-phone), which increases access for rural mothers;
2) X-ray AI for TB screening, which can help extend diagnosis where radiologists are scarce;
3) Eye-image AI for cataract detection;
4) Neuro-imaging radiology; and
5) Radiation oncology treatment, which can standardise contouring and reduce inter-physician variance.

It was also argued that India has many AI pilots, such as breast cancer thermography across 17 states, but it needs to transition to systems that deliver diagnosis, treatment, and measurable health outcomes.

The policy priorities underscored by the panellists were as follows:

- Prioritise studies that test AI in the exact context of deployment.
- Build regulatory capacity for high-risk AI tools, including mandatory model summaries.
- Ensure continuous surveillance to track model drift and real-world effectiveness.
- Incorporate safety engineering as a primary layer of AI development to ensure that the system does not cause harm before any efficacy claims are assessed.

Mr Suman Bery delineated the Monitoring & Evaluation (M&E) function of NITI Aayog, which is dedicated towards continuously checking safety metrics after deployment. It focuses on pre-deployment risk assessment, air-gapped environments for sensitive tasks such as multilingual exam translation, ongoing post-monitoring surveillance to detect model drift and degradation, and evolving a systematic evaluation framework to measure AI performance in the exact context where it will be used. It is advisable to build theoretical models first, and thereafter use data to test and refine them. The panellists concluded that in AI research, model-driven inquiry guides data collection, avoids over-fitting, and improves interpretability. Another issue that was discussed by this panel included blockchains for AI, providing immutable audit trails, and ensuring transparency.

The panel recommended the following innovations as part of a human-capital AI-centric strategy:

- Provide low-cost computers to students across disciplines, including engineering, medicine, and law;
- Foster multilingual AI tools so that every child can learn in their mother tongue;
- Embed industry projects from grade 6 onwards, allowing students to build tangible artefacts;
- Encourage the development of a self-employment and start-up culture as valued career paths;
- Prioritise incremental improvements in government services that yield large societal gains;
- Design PLI-type incentives for private firms that adopt AI-enabled process upgrades; and
- Develop DPI as a coordinated, open-architecture ecosystem that blends public platforms (for example, UIDAI, GSTN) with private-sector innovation.

Session on 'Reflections and Future Directions'

Manish Sabharwal, Vice Chairman, NCAER Governing Board; Co-Founder, TeamLease Service

He said that Delhi tends to kill bold ideas, while Bengaluru has a culture of risk-taking that Delhi lacks, particularly around data and anonymisation. The context changes

everything across India, and the challenge for NCAER is how to remain relevant when agendas and requirements differ so sharply by geography.

He revealed that NCAER is seriously considering anchoring its macro and finance centre in Mumbai, treating NCAER as a bridge between the financial world in Mumbai and the policy world in Delhi. The same model would likely apply to NCAER's proposed AI-DPI centre, meaning the centre would not be purely Delhi-bound but would function across nodes.

He said that he has been working on a project to decriminalise ticketless travel on Indian railways—a law that has been on the books since 1948. The Railway Board resisted decriminalisation, arguing that the existing law was a deterrent. The team has put data scientists on the problem and discovered that only eight cases had been filed by the Railway Board for 800 crore travellers in a year. It has been presented to the Railway Board chairman, whose response was telling — he said "filing of only eight cases proves the deterrent is working".

The deterrent was not working at all, and the only way the argument was won was through data from a government DPI system that is not public but was accessible for this analysis. The lesson drawn was as follows: data is a double-edged sword, it can be used for harm or for surgery, but when it is the right data at the right time, it can break through institutional resistance that no amount of argument alone can shift.

He raised a concern that also came up at the RBI board—the availability of high-frequency data can lead to what is called 'presentism', spending too much time reacting to short-run signals without thinking about the underlying structural models.

He alluded to Fernand Braudel's phrase, "fireflies and froth", to describe the risk of mistaking noise for signal. The point he was making was not that data is bad, but that data without the right interpretive framework produces bad decisions.

He also mentioned that Indian think tanks have historically never had the resources or the institutional ambition they needed, and that NCAER is trying to change that. In this context, he asked the assembled researchers to help the proposed NCAER centre think about big problems that matter to India, be patient with the compounding nature of institutional change, and treat NCAER as an intellectual home and concierge.

NCAER's founding fathers had envisioned that it should be not only light-bearing but also fruit-bearing, signifying a distinction between research that illuminates and research that actually produces change.

He concluded his address by paraphrasing Calvin and Hobbes: the secret to success is being in the right place at the right time, and since you never know when the right time is, you should find the right place and hang around. That is exactly what NCAER intends to do with the AI-DPI centre—hang around for the next ten years and count on the research community to carry it to policy impact.

NCAER

National Council
Of Applied Economic
Research
11 Indraprastha Estate,
New Delhi 110002