TECHNOLOGY AND ANALYTICS *for* LAW & JUSTICE

DAKSH CENTRE OF EXCELLENCE
FOR LAW AND TECHNOLOGY, IIT DELHI

TECHNOLOGY AND ANALYTICS *for* LAW & JUSTICE

Edited by

Nomesh Bhojkumar Bolia
Surya Prakash B S

Foreword by

Justice Rajiv Shakdher, Delhi High Court

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Foreword

The collaboration between DAKSH and IIT Delhi could not have come at a better time. A sectoral approach towards data analytics is perhaps the best way forward as otherwise, one ends up missing the wood from the trees. Although the Indian Judiciary has been able to create, if you like, a data mine, thanks to the National Judicial Data Grid (NIDG), configured under the aegis of the Supreme Court e-Committee, what it needs now is to carry out a robust and continuous analysis of the data.

Amongst other end goals, the envisaged exercise should lead to finding solutions and answers to the following, seemingly, intractable issues:

i. Ways and means to address problems encountered due to the complexification of cases. We should be able to deconstruct the cases, in a manner that core and ancillary issues are separated. Inextricably linked to this is the identification of the relevant material on record, which is co-relatable to the issues at hand.

ii. To arrive at the optimum caseload per judge in each jurisdiction. Suggest the best mix taking into account the strength of each judge.

iii. Methodology to be employed to reduce the timeframe between the stage when an action is instituted and its final disposal.

iv. Last, but not least, to evolve a tool to secure the fruits of a hard-won decree from a recalcitrant judgment debtor; even while protecting the rights of a genuinely insolvent person/entity.

At the heart of the judicial data analysis should be an endeavour to enhance the capacity of all stakeholders keeping in mind "purpose limitation". Analysis should be such that it tells us what data need not be collected and the data that could be weeded out.

DAKSH and IIT Delhi will be rendering a yeoman service to the judiciary if they can successfully execute its ongoing projects and those which are lined up bearing in mind the interest of the judiciary.

I wish both, DAKSH and IIT Delhi every success in the execution of the project(s) in the days ahead.

Rajiv Shakdher
Judge
Delhi High Court

"An excellent overview of developments in the field of technology and analytics that is useful for legal practitioners and with an implementation pathway for institutions."

Hon'ble Mr Justice Muhamed Mustaque A
High Court of Kerala

"A first-of-its-kind book that goes deep at the intersection of two fast-developing fields. A must-read for all who care about transforming our Law & Justice space through collaboration between academia, practitioners and the institutions of the state."

Prof V Ramgopal Rao, PhD
Vice Chancellor, BITS Pilani

"Few problems in India are more important than the judicial branch, and one of the most important elements of the solution space is the application of modern technology. This book is a valuable building block in this emerging field - everyone interested in the Indian legal system should read it."

Dr. Ajay Shah
Senior Policy Expert and co-author of 'In Service of the Republic'.

Preface

There is no longer any aspect of human life that is left untouched by technology and analytics. These two forces have fundamentally altered the human experience, and how we relate to each other and with the world at large. What this means for the law and justice system, which has to ultimately uphold human values, is still being understood in all its complexity. It impacts all of our lives, whether we are conscious of it or not. The framing of laws, complying with them, enforcement, adjudication of disputes, and the law created by judicial pronouncements - these are as much informed and impacted by the values of the society as they are by the exchange of information. Technology and analytics are essentially about information - how they are created, stored, categorised, exchanged, accessed, understood and incorporated in transactions. Like other domains, the boundaries of these fields are expanding at a rate faster than ever before by building on previous knowledge and breaking new ground.

The term 'technology' is now widely understood and needs no explanation. In this volume, it has been used in this general sense of applied science, and instruments, particularly digital in nature, for practical ends. 'Analytics' has been used in this volume as the process of converting raw data into actionable insights through statistical models and analyses.

At the DAKSH Centre of Excellence (CoE) in Law and Technology at IIT Delhi, when we started work at the intersection of law and justice and technology and analytics, we were confronted with the question of where we are at, what is the state of play, especially in the Indian context. We launched this book project to engage with these questions:

- What has been the trajectory of the evolution of technology adoption in India's law and justice systems?
- How do communities perceive this and what are their needs and expectations?

- What questions are innovators in the space working on? What needs to be solved to take the ecosystem to the next level?
- How can institutions embed these innovations into practices?

The volume has been divided into four sections: Access, Assistance, Analytics, and Institutionalisation. The chapters cover the entire gamut of topics: mapping the landscape, identifying the digital divide in accessing digital justice, leveraging community as a force to spark innovation, how lawmakers and administrators have been using technology, how contracts can become 'smarter', latest developments in forensics technologies and how they can be incorporated into the criminal justice processes, technology for national security, data analytics and operations research for efficiency and effectiveness of courts, financing of innovations in this space, and institutional capacity for operationalising innovations.

The project benefited from an online author's roundtable conducted in December 2021 with feedback from discussants.

The two domains will be intertwined even more tightly in the years ahead. With the launch of Phase 3 of the e-Courts project that envisages building Digital Public Infrastructure and Digital Public Goods for courts, citizens can look forward to experiencing 'justice as a service'. However, it is important to be aware that these will not be inevitable developments. It will require conscious steps to be taken by leaders and policymakers at all levels to develop a framework for innovation and transformation, the capacity to engage with researchers and market players and institutionalise them.

We hope the book will be of interest to a wide audience including researchers, policymakers, government agencies, tech companies, law firms, legal practitioners, academics, and students requiring a head-start in the world of transforming law and justice systems. Needless to say, the views expressed in the chapters reflect the perspectives of the authors and not of DAKSH, IIT Delhi or the CoE.

The editors would like to thank the authors for their patience and for continuing to engage with the editorial process that included rigorous fact and plagiarism checking as per rigorous academic standards and copy editing. We are thankful to the editorial team consisting of Leah Verghese of DAKSH and Deepak Gautam of the CoE, as well as the CoE team including Soham Ghosh, Maansi Gupta, Surabhi Bhatia and Krishna Shah for their input and hard work. We are also thankful to Aditi and her team for their support through the editing process, and of course, Bhupendra Yadav and the team at OakBridge. We are thankful to the several awesome PhD and other students/colleagues at IIT Delhi/DAKSH who have played an important role in supporting our research, not necessarily directly related to the volume but helping set up a track for all relevant work. On a personal note, we would like to thank our colleagues at IIT Delhi, DAKSH and, very importantly, our families for being extremely supportive in this endeavour, while we were often found burning the midnight oil at the expense of several other pressing responsibilities.

The insightful foreword from Hon'ble Mr Justice Rajeev Shakdher has been invaluable to this volume. Finally, we are thankful to the Infosys Foundation for their generous support and the administration team at IIT Delhi for their support all along.

Nomesh B Bolia, Professor and Coordinator of the CoE, IIT Delhi
Surya Prakash BS, Programme Director, DAKSH Society

Editorial Team:
Leah Verghese, DAKSH Society
Deepak Gautam, IIT Delhi

Editors and Contributors

Dr Nomesh Bolia is a professor at IIT Delhi and the founding Director of its Public Systems Lab. His research and innovation interests are in Operations Research and its applications to Public Systems, Public Policy and Governance. Prof Bolia is the recipient of several national-international awards and grants such as the Indo-US Science and Technology Forum's Public Health Fellowship, DAAD (German) Research Stays, Volvo Research & Educational Foundations (VREF) Study Visitation and Teaching Excellence Award at IIT Delhi. He has published several papers in international journals of repute, consulted many companies in the public/private sector in India and mentored start-ups in the broad domain of Operations Research. He is also the founding coordinator of the DAKSH Centre of Excellence for Law & Technology. His vision and commitment to the area of Industrial Engineering and Operations Research have been recognised by the Government of India that nominated him as a member of the Board of Governors of the National Institute of Industrial Engineering (later IIM Mumbai), India's premier institute in this area, and for other responsibilities such as member of the Academic Advisory Committee of the National Assessment and Accreditation Council of India, Visitor's Nominee to various IITs and on several other committees.

Surya Prakash BS is Programme Director at DAKSH a civil society organisation working on transforming India's law and justice system. He has been working closely with courts, tribunals, governments, researchers, and academic institutions over the last 7 years in this field. He has published, and guided teams in carrying out original research that has contributed to understanding ground realities and

envisioned systemic changes. His areas of interest are empirical legal research, complex social systems, technology, and analytics. He is a chartered accountant and law graduate who has worked in the corporate sector prior to this role.

Abhijeet Srivastava is a corporate lawyer with a passion for artificial intelligence and law. He graduated from the School of Law at UPES Dehradun with honours, earning a gold medal and recognition as the best law student at his university. Apart from his legal career, he focuses on developing strategies for integrating artificial intelligence into legal operations.

Aishani Rai is a Senior Research Associate at Aapti Institute, with a background in law. Her work at Aapti revolves around mapping harms stemming from technology and understanding the governance of tech platforms. Her prior work involved developing frameworks of governance for emerging innovations such as artificial intelligence, as well as for social media platforms in mitigating online harms. Additionally, she has worked on understanding the legal landscape and socio-economic value of safety tech in India. Aishani seeks to explore the confluence of technology with laws and work towards bolstering legal frameworks, protecting citizens from harms stemming from tech deployment.

Aniket Deroy is a PhD Student at IIT Kharagpur, India. He did his B.E. from IIEST Shibpur and MTech from IIT Kharagpur. He founded a startup called Alivo, a Social networking platform focused on Health and Fitness. Currently, he has multiple publications in various good conferences and Journals. He is closely involved in extracurricular activities like various forms of Indian Dance, Recitation, Painting, sports, etc.

Anshu Singh is working as a Teaching cum Research Associate in Forensic Accounting & Financial Investigations at the School of Forensics, Risk Management & National Security, Rashtriya Raksha University, Lavad, Gujarat since 2021. She is pursuing her PhD in Forensic Science. She holds an MPhil degree in Forensic Science (2021) and a Master's degree

(2020) in Forensic Science with a specialisation in Questioned Documents, Fingerprints and Forensic Photography from Rashtriya Raksha University. She is also working as an Associate Principal Investigator in the Project and making her contribution to the field of Forensic Accounting & Financial Investigations. She has contributed to the field by publishing various research papers and delivering lectures for Law enforcement officers, Police officers, Practitioners, etc. in India and Abroad.

Anushka Jain is a lawyer and policy researcher interested in disruptive technologies such as artificial intelligence. She works as a Research Associate at Digital Futures Lab. Previously, she worked with Internet Freedom Foundation, a digital rights organisation based in New Delhi, where she led their work on technological surveillance and specifically, their project on facial recognition technology. She has done extensive advocacy on issues such as privacy, data protection, the right to information, and surveillance.

Ashish Kulkarni is an economist based out of Pune. He teaches courses in economics and statistics and writes a daily blog called econforeverybody.com. He has worked in the past with Genpact, and Fidelity Investments as an analyst, and with Suzlon as an economist. He has also worked with the Gokhale Institute of Politics and Economics as an Assistant Professor.

Ava Haider is a Senior Associate at Aapti Institute, where she brings a background in social science and academia to questions of digital rights and inclusion. Her ongoing work at Aapti includes the financial sustainability of digital public infrastructure (DPI), leveraging open-source communities for civic development, the paths to self-regulation of digital platforms, and how trust manifests in digital ecosystems, particularly for women. She is interested in understanding how questions of online trust and safety intersect with the diversity of digital voices and trends, and how DPI can be leveraged for inclusion and impact in the Global South. Ava graduated from Ashoka University with a BA and postgraduate diploma in Political Science.

Bhargavi Zaveri-Shah is a doctoral researcher at the National University of Singapore. Her research interests are the working of central banks and courts in developing countries. In her previous role, she led a team of legal researchers at a Mumbai-based interdisciplinary think tank. She has worked with the Government of India on several projects, including one on estimating the workload of the National Company Law Tribunal. She has previously held research positions at the National Institute of Public Finance and Policy and the Harvard Law School, and currently leads a project at XKDR Forum on developing a litigant-centric performance measurement system for Indian courts.

BK Agarwal, a civil engineering post-graduate from IIT Delhi, has worked for 36 years in the Indian Administrative Service before retiring as Secretary of the Government of India. He is an expert in Land Administration and has authored a book Land Registration: Global Practices and Lessons for India. He is an Advisor to the National Monitoring Committee on Rehabilitation and Resettlement, Department of Land Resources, Government of India. He is also a member of the working group constituted by the Government of India for framing geospatial data standards for land parcels.

Diya Uday leads the research work on land markets at XKDR Forum. Her interests are in the areas of regulatory governance, state capacity and access to finance. She has worked on projects for the World Bank, the National Council for Applied Economic Research; the Indira Gandhi Institute of Development Research, the Department of Economic Affairs at the Ministry of Finance and the National Bank for Agriculture and Rural Development. She has been a visiting faculty at the Tata Institute of Social Science in Mumbai and has previously been an associate at leading law firms in India including Cyril Amarchand Mangaldas.

Douglas Daniel D'sa is an avid researcher currently taking an acute interest in the intersection between 'Emerging Technologies & the Transnational nature of financial crime and the effect this unequivocally has on International Relations'. Douglas currently works in the financial sector, channelling these interests by focusing on anti-money laundering and counter-terrorism financing.

Prior to this, he was engaged as a Research Associate at the National Resource Center on Human Trafficking (NRCHT) at the Rashtriya Raksha University, Lavad, Gujarat, and also served as a research intern with the Chennai Centre for China Studies (C3S). He pursued his post-graduation in MSc. International Crimes, Conflict and Criminology from the Vrije Universiteit Amsterdam.

Dr Arun Kumar is an Indian clinical psychologist who has served as an Assistant Professor at Rashtriya Raksha University. He has conducted research, conducted in-depth analyses, and conducted technical interviews using technologies like LVA, Brain Fingerprinting, cognitive, and Polygraph. Dr Kumar has also contributed to content moderation at Google's YouTube and NIMS Hospital in Hyderabad. His expertise extends beyond clinical realms, guiding individuals towards resilience-building and coping mechanisms. He has worked on brain mapping and fingerprinting in cases like the Trivandrum Woman Missing Case and contributed to true-crime documentaries like Netflix's "Indian Predator: The Beast of Bangalore" and "Indian Predator: The Butcher of Delhi." His journey exemplifies a rare blend of clinical proficiency, research contribution, and real-world impact.

Dr Ashutosh Modi is an Assistant Professor at the CSE Department, IIT Kanpur. His expertise lies in ML, NLP, and RL, and his research focuses on Legal-AI, Affective Computing, Text-based RL agents for common sense understanding, and NLP for Sign Languages. Before joining IIT Kanpur, he worked at Disney Research Los Angeles and Zurich. Dr. Modi did his PhD from Saarland University, Germany. At IIT Kanpur, he leads the Exploration Lab and his lab has been publishing at top international conferences/journals and was awarded the best student paper award at ACII 2021. Dr. Modi was awarded the Google Research India Faculty Award in 2022. He actively engages with the industry, and research community, and serves on the program committees of several top NLP and ML conferences and journals.

Dr J R Gaur is a former Director and Chief Mentor at the School of Forensics, Risk Management & National Security. Currently is Emeritus Resource Faculty of the School of Forensics, Risk Management & National Security (SFRMNS) at Rashtriya Raksha University. He has enormously contributed to Forensic Analysis, Forensic Education, Police, prosecution and judicial

officer training in the country and abroad and solved highly ticklish crime cases in India including homicides, suicides, accidents, terrorist activities, plane crashes, train derailments, industrial explosions, shoot-outs, wildlife killings, smuggling, assaults, dowry deaths and economic offences serving as director State Forensic Science Laboratory, Himachal Pradesh. Dr Gaur has been given letters of appreciation by his seniors in the State and Central Governments for his excellent and meritorious performance in Forensic works.

Dr Kripabandhu Ghosh is an Assistant Professor at the Department of Computational and Data Sciences, IISER Kolkata, West Bengal, India. He completed his Ph.D. from Indian Statistical Institute, Kolkata on "Information Retrieval in the Legal Domain". He has been working on AI-Law topics for the last 13 years. His papers have received awards at the two most recognised international conferences in AI and Law – Best Paper award at JURIX 2019 and Best Student Paper award at ICAIL 2021. He has also published papers in reputed AI-law journals such as AI and Law, Springer (the most reputed AI-law journal), IPM and prestigious conferences such as SIGIR, CIKM, ACL, ECIR, etc. In addition, he has organised several AI-Law events, including a workshop with an international conference (ACM CIKM), shared tasks such as AILA, and international symposiums like SAIL' 23 that hosted talks by reputed researchers in the domain. He has recently been inducted to the Editorial Board of the AI and Law journal, Springer (the most reputed AI-law journal).

Dr Saptarshi Ghosh is currently an Associate Professor with the Department of Computer Science and Engineering, IIT Kharagpur and the head of a Max Planck Partner Group at IIT Kharagpur. He received his PhD from IIT Kharagpur, India, in 2013. He was a Humboldt Postdoctoral Fellow with the Max Planck Institute for Software Systems, Saarbrucken, Germany. His research interests include Social network analysis, Legal analytics, and Algorithmic bias and fairness.

Gaurav Pathak is an Assistant Professor at Jindal Global Law School, OP Jindal Global University. He is an EULISP Scholar specialising in Information Technology and Intellectual Property law. Before entering academia, he was a dispute resolution attorney and was part of landmark litigations involving technology law before the Supreme Court of India and the High Court of Delhi. He has published

in several academic journals and has been part of many television discussions on cyberspace and governance.

Harsh V Pant is Vice President – Studies and Foreign Policy at Observer Research Foundation, New Delhi. He is a Professor of International Relations at King's College London. He is also the Director (Honorary) of the Delhi School of Transnational Affairs at Delhi University.

Joseph Pookkatt heads the Firms Commercial Law practice with over 28 years of legal, strategic, commercial and management experience. Joseph graduated from the National Law School of India University (Bangalore) and the College of Law, York, UK. He is a recipient of several scholarships and prestigious global fellowships including the Chevening Scholarship in Corporate Law (UK-1996); the European Series (EU-1997) and the Rheinhard Mohn Fellowship among others. In the year 2005, he was selected by the US Department of State as India's representative for the International Visitor Leadership Program 2005 for studies on the US Legal System. Joseph has also completed executive education programs in prestigious institutions like IIM, Ahmedabad and Harvard Law School. Mr Pookkatt has practised and studied law in the key jurisdictions of the United Kingdom, the United States and India.

Kartik Bommakanti is a Senior Fellow with the Strategic Studies Programme. Kartik specialises in space military issues and his research is primarily centred on the Indo-Pacific region. He also works on emerging technologies as well as nuclear, conventional and sub-conventional coercion, particularly in the context of the Indian subcontinent and the role of great powers in the subcontinent's strategic dynamics.

Keerthana Medarametla is a Senior Curator at Agami, a non-profit cataysing ideas that serve justice. She is a lawyer by education, a researcher at heart, and is passionate about nurturing communities/opportunities that work better for society, particularly the law and justice system. Before Agami, she was a Senior Research Fellow at CLPG, NLU Delhi. She completed her BALLB from NLU Delhi and LLM from Harvard Law School.

Krishna Shah is an advocate currently practising in the Gujarat High Court. She has been in the litigation field for 5 years and has worked on civil and commercial matters across various forums and courts. She has also taken courses on LegalTech in Germany and is keen on participating in the development of LegalTech in India.

L Badri Narayanan advises in the areas of corporate, tax and investment matters. He is qualified to practice as a lawyer in India and New York. He advises on various issues involving consortiums and joint ventures such as contract manufacturing scenarios, valuation, secondment, royalties, and license fee arrangements. He has advised and assisted various leading Indian and multinational corporations with transactions pertaining to joint ventures, acquisitions and restructurings. His broad experience also includes having represented parties before various fora in tax and commercial disputes. He practised law in the United States before moving to India.

Mohit Yadav is the Founder of legal tech company Altinfo, which serves leading Indian law and audit firms. He is frequently quoted in major Indian newspapers for his expertise in corporate law and business. He has published on intellectual property in academic journals, worked with the University Grants Commission on online law courses, and maintains an active interest in IP law.

Murali Neelakantan is a dual qualified (English solicitor and Indian advocate). He has been an equity partner in leading international law firms in London. After his return to India in 2008 as a partner at Khaitan & Co, he was global general counsel at Cipla and then Executive Director and global general counsel at Glenmark. He has taught at WBNUJS and NLSIU and lectured at other educational institutions. He was one of the editors of "An Ideas of a Law School; Ideas from the Law School" (2019), a collection of essays on the legal profession and legal education.

Naksatra Kumar Bailung is a research-oriented mathematics graduate student pursuing another Master in Data Science. Envisioning AI having a crucial part in everyone's future, he uses his mathematical and data scientist skills to develop models that can solve real-world problems and create innovative solutions. Having a dual degree in (BS-MS) in Mathematics, Naksatra's work has consisted primarily of an academic nature. Competent in Python, R, C++, Linux, Statistics, Data Science and Machine Learning. Having experience in 3D modelling, basic web development and cryptography, he learns new skills in his free time. As a lifelong learning and research enthusiast, he scours through recent research papers in the field of Computer Vision and Natural Language Processing and enjoys working on Kaggle datasets.

Nikhil Narendran is a Partner at Trilegal. He is a subject matter expert in technology, media and telecom communication. He focuses on the interplay of technology, human lives, and commerce.

Prachee Mishra is currently the Head of Research at PRS Legislative Research. PRS provides non-partisan research support to legislators across parties in India. At PRS she has published research focussed on the infrastructure sectors including railways, transport and land-related matters. Previously, she has researched various urban planning issues with the New York City - Department of Transportation, the Lincoln Institute of Land Policy at Cambridge, US, and the NYU Wagner School of Public Service. Before that, Prachee worked in Mumbai as an architect. She holds a Master's degree in Urban Planning from New York University, US and a Bachelor's degree in Architecture from NIT Bhopal.

Prachi Kathane is currently working as an Assistant Professor (Forensic Science) and Assistant Director of the School of Forensics, Risk Management & National Security, Rashtriya Raksha University, Lavad, Gujarat since 2020. She is pursuing her PhD in Forensic Science. She holds a Master's degree (2019) in Forensic Science (with a specialisation in Questioned Documents and

Fingerprints) and a Bachelor's degree (2017) in Forensic Science from the Government Institute of Forensic Science, Nagpur. She is a Gold Medalist and the University's First Rank Holder of Masters in Forensic Science. She qualified the CBSE-UGC-NET (Forensic Science) in July 2018. She has also qualified Forensic Psychology Aptitude and Caliber Testing (FPACT) Examination, conducted by LNJN National Institute of Criminology and Forensic Science, New Delhi, 2019.

Prof Santosh K Misra is an Adjunct Professor in the Decision Science and Information Systems discipline at IIM Nagpur. He has over 28 years of experience in both the private and public sectors. He has a B Tech in EE from IIT Kanpur and has MS in VLSI Design and Digital Signal Processing from the University of Minnesota, USA. He has worked in AT&T Bell Labs in the Wireless and Multimedia Division and served in some of the senior most positions in the Governments of Tamil Nadu and Chhattisgarh. He has served as Secretary to Government, Commissioner of e-Governance, Commissioner of Transport and District Collector. He has successfully conceptualised and led large-scale IT transformation projects in government and is recognised as a global thought leader in emerging technologies. He has rich work experience in key sectors of Technology, e-governance, Mobility and Transport, Tourism, and Infrastructure. He has contributed to several key digital initiatives of the Government of India and State Governments.

Prof Sumeet Gupta is a Professor of Information Systems at IIM Raipur. He received a PhD (Information Systems) as well as an MBA from the National University of Singapore and a BE (Mining) from GEC Raipur. He has a total of 20 years of work experience in Industry, Teaching and Research, during which he worked with L&T India, The Logistics Institute-Asia Pacific, Singapore and SSGI Bhilai before joining IIM Raipur. He participated in the Global Colloquium at Harvard Business School in 2015. He has been accredited by AIMA as an Accredited Management Teacher and was awarded the Prof Manubhai M Shah Memorial Award by the Indian Commerce Association for the year 2017. He was also awarded the President Graduate Fellowship at the National University of Singapore. He has published more than 100 papers in top-ranked International Journals (DSS, Omega, P&M, I&M, IJIM, EJOR, etc.) and more than 30 papers in International Conferences (ICIS, ECIS, PACIS, AMCIS, AOM, POMS, etc.). His research interests include Electronic Governance, E-Commerce, and Business Analytics. He has conducted several consultancy projects with both Private and Government bodies in India and abroad and has conducted many training programs.

Rashika Narain is a weaver at Agami, a non-profit working to advance ideas that improve systems of law and justice in India. She also practices environmental law before the National Green Tribunal and the Supreme Court and is deeply passionate about improving the experience of a citizen interacting with formal dispute resolution systems. She earned her BA LLB from National University of Juridical Sciences, Kolkata and began her career as a capital markets lawyer in Mumbai.

Sachin Malhan is the co-founder of Agami, a non-profit catalysing innovation, entrepreneurship and collaborative action to advance new and improved systems of law and justice. Before Agami, Sachin was the Executive Director of the Changemakers program of the leading global non-profit Ashoka. Sachin has previously co-founded three ventures in India – test prep pioneer Law School Tutorials (LST, now called CL LST), Rainmaker, a learning and talent platform that ultimately spun off Vahura and mylaw.net, and Inclusive Planet, a policy and platform venture focused on greater literary access for the visually impaired. For his work in technology, media, social impact and education, Sachin became an INK Fellow in 2010. Sachin is a graduate of the National Law School of India University, Bengaluru, and began his career with law firm Amarchand Mangaldas in their Mumbai offices. Sachin cares deeply about the aspirations and potential of every young person in India.

Sarthak Raizada is an advocate practising before the Supreme Court of India. He completed his first degree in law from Dr Ram Manohar Lohiya National Law University, Lucknow and pursued his LLM from the Georgetown University Law Center. He has worked as a Research Assistant to a sitting member of the United Nations International Law Commission at its seventy-first session held in Geneva, Switzerland.

Shailaja Shukla is a Senior Associate at CIIE.CO, where she has contributed towards creating sector intelligence tools through reports, chapters, personas, infographics and other forms of publications. She has almost 5 years of experience in building landscapes of emerging entrepreneurial sectors and the incubation ecosystem. At CIIE.CO, her research focus has been on legal tech, climate tech, startup

incubation, civic tech and crafts. In the last few years, she has published reports and chapters on legal tech, the crafts sector and the startup incubation ecosystem in India.

Shakti Prakash is currently employed at the School of Forensics, Risk Management, and National Security at Rashtriya Raksha University in Lavad, Gujarat. Mr Prakash is a Scientific Assistant (Forensic Science) and pursuing a PhD in Forensic Science from Rashtriya Raksha University (INI) MHA, GOI. He earned an MSc in Forensic Science with a specialisation in Questioned Documents, Fingerprints, and Photography from Rashtriya Raksha University and a BSc (Hons.) in Forensic Science from the Institute of Forensic Science and Criminology at Bundelkhand University in Jhansi (UP). Mr. Prakash has received training in various capacities from government organisations such as the State Forensic Science Laboratory in Mahanagar, Lucknow, the Directorate of Forensic Science in Junga (HP), the Central Forensic Science Laboratory (CBI) in New Delhi, and the Directorate of Forensic Science in Gandhinagar. His research has been published in national and international journals.

Shaurya Shriyam is currently an Assistant Professor in the Department of Mechanical Engineering at IIT Delhi, India. He is also an associate faculty with the Yardi School of Artificial Intelligence. He received his PhD from the University of Southern California, Los Angeles, USA, in 2019. Previously, he obtained his BTech from IIT Kanpur, UP, India, in 2014. His teaching is primarily in the fields of industrial engineering, operations research, and robotics. His research interests are related to designing AI algorithms for multi-robot systems and solving optimisation problems for improving the utilisation of resources in public systems of LMIC countries.

Soham Ghosh is a public policy professional who specialises in public systems and governance. He has worked with various stakeholders in the policymaking ecosystem including national projects of Ministries of Government of India (Ministry of Rural Development Ministry Of Commerce & Industries), UNICEF, and CSRs. He has worked with a global program on SDGs; UNLEASH (a program by Dalberg) as a Talent Acquisition Partner for identifying social impact start-ups in India and provides Monitoring & Evaluation services as a consultant for policy implementation to non-profits. He is a founder of Co-Create Labs; a global matchmaking platform between start-ups, investors and mentors. He is also part of the global community of PDIA researchers at the

Kennedy School, Harvard University. He currently anchors the execution of initiatives at the Centre of Excellence, Law & Tech at IIT-Delhi, as a Project Manager.

Sri Harsha Dorapudi is currently a doctoral researcher in the Department of Mechanical Engineering at the Indian Institute of Technology Delhi. He has over 7 years of valuable teaching experience and previously held the position of Assistant Professor at MVGR College of Engineering (Autonomous), Vizianagaram, Andhra Pradesh. His strong academic foundation includes an MTech in Industrial Engineering from NIT Tiruchirappalli, Tamil Nadu, and a BE in Mechanical Engineering from SRKR Engineering College, Andhra Pradesh. In addition to his engineering qualifications, he also holds a postgraduate diploma in yoga and an MA in Philosophy from Andhra University, reflecting his diverse interests and commitment to personal development. His research interests are in Operations research, Supply Chain analytics, and Artificial intelligence/Machine Learning.

Supriya Sharma is a Partner and head of research at CIIE. CO, where she has led the development and publication of 400+ research articles, reports, cases, articles and 30+ workshops, sprints and training programs. Her 15+ years of work experience has included roles in research, strategy, academia and enterprise sales. Supriya holds a PhD in organisational behaviour from IIM Ahmedabad. She is an academia-industry translator and a Hindi-Urdu poetry aficionado.

Surbhi Bhatia is an independent data journalist. Her experience in telling stories with numbers and charts spans journalism, public policy and academia. Her work on gender, health, media, public finance and the Indian economy has appeared in Mint, IndiaSpend, The Hindu, Moneycontrol, Nikkei Asia and other prominent publications. She holds a Bachelor's degree in Economics from the University of Delhi and a Master's degree in Public Policy from St. Xavier's College (Autonomous), Mumbai.

Susan Thomas has studied at IIT Bombay and the University of Southern California. She has been a faculty at the Indira Gandhi Institute for Development Research. Her research lies in the areas of finance, markets and the economy. She worked on the design of the NSE-50 ("Nifty") index and the risk management systems of the Indian equity derivatives markets. Her policy engagements

with the Ministry of Finance included being a member of the Standing Council of the Competitiveness of the Indian Financial Sector (2013), and the Bankruptcy Legislative Reforms Committee (2014). She led the research team that designed and drafted the Insolvency and Bankruptcy Code (2016) and worked with the Ministry of Corporate Affairs on the organisational structure of the Insolvency and Bankruptcy Board of India and the National Companies Law Tribunal.

Vikramjit Banerjee is a Senior Advocate and Additional Solicitor General of India at the Supreme Court. Before serving as the Additional Solicitor General of India, he was the Advocate General of Nagaland. He earned his undergraduate law degree from the esteemed National Law School of India University in Bangalore and pursued his LLM from the University of Leicester (UK) as a recipient of the Chevening Scholarship. He frequently delivers lectures at prominent universities, institutions, and think tanks throughout the nation. The opinions expressed by the author in the article are personal and do not reflect the views of the Government of India.

Vrinda Bhandari is an Advocate on Record in the Supreme Court of India and an independent legal practitioner. She has worked as a visiting faculty member at the National Law University, Delhi, and as a consultant for the Law Commission of India. She works on a variety of digital rights and privacy issues alongside a commercial and criminal law practice. Also, she is an Off-Counsel for the Internet Freedom Foundation and an empanelled lawyer with the Delhi High Court. She has completed her BA LLB (Hons.) from National Law School of India University, Bengaluru, and Bachelor of Civil Law from the University of Oxford. She was honoured with many awards including the Goldman Sachs Global Leader award, and Ralph Chiles CBE Award for Comparative Human Rights issued by the University of Oxford.

Vrinda Maheshwari is a lawyer who studies the regulation of emerging technologies. She has worked at the intersection of technology, law and policy for over a decade. She holds a BA LLB (Hons.) from the National Law School of India University, Bangalore and an MBA from the Indian Institute of Management, Lucknow. She served as a Visiting Faculty at NLSIU, Bangalore for a Seminar Course on 'AI and the Law'. She has also authored a report "Banking and Accessibility in India" for the Centre for Internet & Society (2012).

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CHAPTER 1

India's Law and Technology Landscape

Surbhi Bhatia, Krishna Shah, Surya Prakash BS and Nomesh Bolia

"If your time to you is worth savin', then you better start swimmin', Or you'll sink like a stone, for the times they are a-changin'."

–Bob Dylan (The Times They Are A-Changin', 1964)

SUMMARY

- A bouquet of institutional reforms in the run-up to and since liberalisation modernised India's laws and legal services;
- The use of technology became the backbone of this mammoth transformation;
- Some of the notable changes became obvious in the perception and diversification of legal services. For example, the emergence of legal tech as a sector;
- Today, legal tech represents an umbrella of services: from intellectual property protection for entrepreneurs to legal spend management through software analytical tools;
- Apart from private players, even government agencies in India are employing technology to reform the criminal justice system, maintain law & order, and increase engagement with citizens.

Introduction

A lawyer's office in India in the late 1980s was typified by desks piled up with papers, drawers overflowing, cabinets crammed with folders, fax machines beeping, and photocopy machines clicking all day. Legal documents had to travel by post to be physically delivered, signed, sealed and returned. The court of law relied heavily on dictation and typewriting of judgments. Stenographers recorded court proceedings in shorthand and clerks maintained books manually. This was India at the cusp of liberalisation. Getting legal work done was time-consuming, laborious, and expensive. Cut to the 2020s: a lawyer's office today has embarked on a paperless journey. Spreadsheets, smartphones, and scanners have replaced note-taking in journals and record-keeping in ledgers. Electronic mailing (e-mail) services over the World Wide Web have revolutionised communication by replacing the inter-office paper-based mail system. Drafting has moved from typewriters to word processors and file storage from cabinets to cloud computing services like Dropbox and Google Drive. Courtrooms, too, have tried to move from hard-to-access-or-refer-to paperwork to case management software, speech-to-text tools, and digital archives. Whether it has made access to justice easier, faster, or affordable will not be debated at this juncture; but wherever successfully done, it has made information available at the click of a mouse. Figure 1 provides a bird's-eye

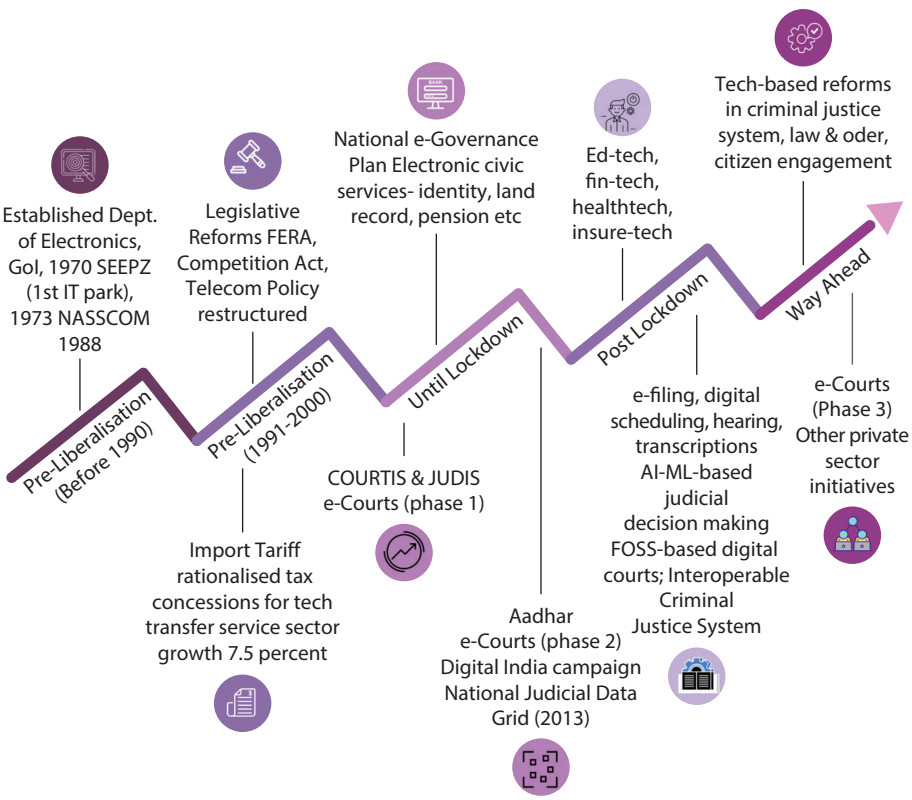

Figure 1: Evolution of the Law and Technology Landscape in India

view of the evolution of this landscape. The two major milestones that have driven this evolution are *liberalisation* and *lockdown*. A more detailed description follows in the rest of this section.

India's rapidly changing institutional landscape in the run-up to liberalisation set the tone for reforms in Information Technology (IT) and Information Technology Enabled Services (ITeS). The Department of Electronics (DoE) was established in 1970 and India's first IT park—the Santacruz Electronic Export Processing Zone (SEEPZ), was set up in 1973. The National Informatics Centre (NIC) was established in 1976 with the vision to integrate Information and Communication Technology (ICT) with government services. A blueprint for implementing IT services in banking was laid down by the then Deputy Governor of the Reserve Bank of India (RBI), Dr C. Rangarajan in 1983, called the Rangarajan Committee. Railways were computerised with the introduction of the passenger reservation system in 1986. The DoE framed the new Computer Policy in 1984 and set up software technology parks (STPs) in an attempt to liberalise IT services. This was followed by the Software Policy of 1986 and the establishment of the National Association of Software and Service Companies (NASSCOM) in 1988.

However, protectionism from the planning era cast a show over these policies and led to private players such as International Business Machines (IBM) pulling out of the country. Legal frameworks including the Foreign Exchange Regulation Act (FERA) stood in the way of technology entering India. From the 1980s, tech giants of today—Wipro, Tata Consultancy Services (TCS), and Infosys—faced licensing barriers that kept them from expanding production capabilities. Back then, obtaining a telephone connection took the founder of Infosys, NR Narayana Murthy, one year; and importing a computer three complete years! The masses resisted as well. In 1984, bank employees burnt effigies of computers, and political parties marked labour day as 'anti-computer day'.[1]

In the first few years post-liberalisation, India's new dispensation paved the way for tech-based innovation in the country. Laws which were seen as a hurdle to foreign investment were amended. Computer software and consumer electronics industries, among many others, were delicensed, under the Industries Development and Regulation Act (IRDA). FERA was amended to remove the ceiling on foreign equity. The Monopolies and Restrictive Trade Practices (MRTP) Act, which would later be replaced by the Competition Act, was restructured to allow entry and growth of new enterprises. Foreign direct investment (FDI) was welcomed through the automatic route, without bureaucratic approvals from the government or the RBI. Tariffs on the import of capital and intermediate goods were rationalised, and tax concessions made both technology transfers from abroad and innovation at home lucrative.

Between 1991 and 2000, the services sector grew at 7.5 per cent per year[2] on an average—much faster than agriculture (3.1 per cent) and manufacturing (5.8 per cent). Telecommunication, banking, business, and hospitality services contributed heavily to the growth of the service sector. Software services expanded[34] at the rate

of 40 per cent and their export constituted 80 per cent of all software sales by the year 2000. The availability of low-cost, skilled labour made India the back-office of multinational corporations for IT services. Around this period, the failure of the National Telecom Policy of 1994 to attract private investment was corrected. The New Telecom Policy, 1999 removed licensing requirements and encouraged multiple service providers to compete in the market. In 2000, the Information Technology Act recognised electronic records and electronic signatures to be at par with physical ones.

One way to consider the debut of technology in India is to ask whether it was economic policy and the law that enabled the pace of tech-based innovation. Today, however, this question is reversed. We either ask, 'How will tech-based innovation enable the law?' or think about it in the way Australian jurist Michael Kirby put it[5] in 1987: 'The hare of science and technology lurches ahead. The tortoise of the law ambles slowly behind'.

From Liberalisation to Lockdown

On 24 March 2020, India went into a nationwide lockdown to combat the spread of the novel coronavirus—an outbreak that was shaping itself into a deadly global pandemic. People were mandated to live without close contact with each other; movement was restricted as part of public health guidelines, and stay-at-home orders were in place. The mobility restrictions had a far-reaching impact on every sector—from tourism, hospitality, and recreation to education, banking, and finance. Big tech companies like Google, Microsoft, and Twitter allowed employees to work from home, as did other private sector firms in India and across the world. And so, the future of how human beings work suddenly seemed to be going in unchartered waters. To keep businesses afloat, companies had to restructure their business models. State functions—right from delivery of goods and services to the working of the Parliament and courts—also needed to be re-imagined amid the pandemic.

In this new imagination, the use of technology emerged as the sole connecting link – a backbone for digital transformation. Digital alternatives seemed to be the only way forward, and so, the masses embraced the power of Zoom, QR codes and UPI payments. A combination of cheap mobile data plans and UPI ensured home delivery of groceries, access to online classrooms and tele-consultations with doctors. E-commerce marketplaces such as Grofers, Amazon and Big Basket were not the only players anymore. The neighbourhood *kirana* store,[6] the local florist, the gym trainer, school teachers, restaurants, offices, government agencies, and even courts, were adapting digitally. An explosion in the volume of UPI transactions marks this trend. It took four years since its launch in 2016 for UPI to cross a billion transactions. The next one billion was clocked in a matter of just one year[7] between 2019 and 2020. In March 2022, the volume of transactions crossed a record 5 billion in a single month.

Before the digital disruption due to COVID-19, the pace of digitisation in India was good and ready to take flight. The National e-Governance Plan (NeGP) laid out in 20006 by the Department of Electronics and Information technology (DeitY) and Department of Administrative Reforms and Public Grievances (DARPG) designed 44 Mission Mode Projects[8] (MMP) under an e-Kranti framework with the vision to 'transform e-governance to transform governance' and lofty aims to provide service delivery to citizens through the electronic mode. A three-layered IT infrastructure, viz., i) Data networks (state-wide area networks), ii) Data repositories (state data centres), and iii) Common service centres (CSCs) located in remote areas was designed to realise this vision. According to TRAI, between 2004 and 2011, India witnessed an average annual growth rate of 51.8 per cent in wireless/cellular/mobile phone subscriptions[9] and from 2000 to 2011, a compounded annual growth rate of 33.3 per cent in internet subscribers.[10] The data revolution was around the corner.

A McKinsey global survey in 2020, established that the pandemic accelerated the speed of tech adoption globally by several years.[11] In India, this sentiment was echoed by the CEO of Digital India Corporation, who said that the pace of digital adoption in the country had been phenomenal[12] since the pandemic struck, and that technology was being leveraged not only by businesses but also by government departments and the common man. However, the most conspicuous of this leverage, viz., the choice of working remotely, was available only to a small set of highly educated workers[13] across a few industries. While Tech-solutions became the pat response for several issues, including more citizens in the beneficiary set has emerged as an important task. That is, with great power implicit in digital solutions, came the great responsibility of building digital infrastructure and a digital workforce. Here, digital infrastructure encapsulates all open data ecosystems – registries, stacks, platforms, marketplaces, and web portals.

The Indian government stepped in and began contact tracing to identify close contacts of the person infected with the COVID-19 virus; and launched the Aarogya Setu app; and for vaccination, the CoWin platform. The earlier National Health Mission, urban and rural, was combined with the National Digital Health Mission and was renamed as the Ayushman Bharat Digital Mission in 2020.[14] The aim was to create digital health records.

A National Health Stack, the digital infrastructure required to generate and store digital health IDs for a billion Indians has been well underway since 2018. Tech companies emerged as all-weather friends for investors. Valuation of fintech, edtech, agritech, and healthtech soared[15] as consumers increasingly expected mobile apps and web portals to be the solution for everything – from ordering pizza – to filing taxes. The great reliance of businesses on data and technology for streamlining processes came to be known as the 'The Domino(s) Effect' after Dominos, the pizza company, redefined itself 'as a tech company that just happened to sell a lot of pizzas'.[16] It was the comfort of ordering, not the pizza, that

the average educated Indian had come to expect, of services in the country. As for businesses, the product was being sold in exchange for customers' data.

Amidst all this, how did the pandemic pivot the world of an average lawyer, the legal industry and the judicial ecosystem? The Bar Council of India (BCI) estimates there are 2 million advocates in India. A majority of India's lawyers, especially those working in lower courts, earn their wage on a per-appearance basis on hearings or on fresh filings.[17] During economic downturns, it is common for transactional work, contract and litigation work, to remain stable.[18] However, a crisis curtailing physical movement and courtroom gatherings, along with negative growth economic growth, meant lawyers did not just lack new clients, but also could not earn their daily income at the courts. A 2019 survey of 2,800 lawyers across eight High Courts in Delhi revealed that 80 per cent believe that a lawyer's income in the first two years of practice never[19] exceeds Rs 20,000 per month. And so, at the peak of the second wave in India, lawyers turned to the Bar Council of Delhi for financial help and ration kits.[20] Many returned to their hometowns. The courts closed. Only urgent matters were being prioritised, that too virtually.

Just as it did across the world, the pandemic pushed lawyers, law firms, courtrooms, law-making and law-enforcing agencies into a natural experiment. There was no option but to make a quick and smooth transition to tech-based alternatives. Law firms in India, working towards maximising efficiency and minimising costs, were able to rely on a pre-existing cushion of tech support. Blending into the remote working model was the matter of re-directing cash flows – away from the fixed costs of office real estate and fresh hirings – towards already existing cloud-based systems. The impact has been swift: of the 63 law firms surveyed[21] by the Indian Business Law Journal in 2021, 59 per cent were optimistic about revenue growth, and just 9 per cent expected lower profits than last year. The lawyers surveyed believed corporate matters were only deferred, not discontinued, unlike litigation work, which was stalled.

Thus, the positive note in the legal ecosystem is not across the board. Even before the pandemic, law firms have dabbled in software solutions that speed up back-office operations for decades. This demand initiated a new genre of tech companies – the legal-tech companies or start-ups – which innovated and marketed directly for the efficiency needs of the legal ecosystem. The solutions aimed at standardising legal documents (as in the case of LegalZoom in 2001); online case law research (Manupatra in 2001, SCC Online in 2009); efficient case management (Zelican in 2013) and automated client billing and invoicing (Invoicera in 2005).

In contrast, courtrooms and law-enforcement agencies struggled to migrate to digital processes. Before the pandemic, only 14 per cent of the 3,280 court complexes[22] in India had operational access to video-conferencing facilities. Just one in four of the 1,355 prisons were equipped with the same. Despite initiatives that aim to modernise the judiciary and increase its reliance on ICT, capacity constraints routinely lead to costly delays in the delivery of justice in India. But

in the two years following the pandemic, case pendency rates soared to reach record highs. The pendency rate quadrupled,[23] from 5.29 per cent in 2018-19 to 20.4 per cent in the subsequent year, in the 25 high courts across the nation. In the lower courts, backlogs crossed a record four-crore mark.[24] In a September 2020 report on virtual courts in India,[25] the Standing Committee on Personnel, Public Grievances, Law and Justice urged that virtual courts continue as a model that makes digital justice faster and cheaper, compared to traditional courts. The report submitted to the Rajya Sabha, emphasised the enabling of infrastructure. The working of the Indian parliament was also affected by the pandemic. In the first four months, for instance, no parliamentary committee met virtually or in person.[26]

It is not that the Law and justice ecosystem has triggered all its efforts only after the pandemic. While this volume delves into this in more detail, efforts at modernising India's judicial processes using technology date back to the development of the Court Information System (COURTIS) and Judgement Information System (JUDIS) in the 1990s. Implemented by the NIC, these systems facilitated case filing, cause-list generation, issuance of orders, and access to the text of judgments for Supreme Court cases. A similar system called List of Business Information System (LOBIS) was implemented to track case load in the high courts as well. However, after failed attempts[27] at taking computerisation to subordinate courts in the following years, the eCourts project was formulated as part of the National Policy and Action Plan for Implementation of Information and Communication Technology in the Indian Judiciary, in 2005. As a Mission Mode Project under the NeGP, the project envisaged streamlining court procedures using ICT, across district and subordinate courts in three phases. The first phase (2010 to 2015) emphasised on building hardware and software capabilities, such as server rooms, LAN connectivity, court websites, and case information system (CIS), along with training staff to use web-based applications. Phase II (2015 to present) is running in tandem with the Digital India campaign and has led to the creation of the National Judicial Data Grid (NJDG) in 2013 to monitor pendency. This phase includes video conferencing facilities, software upgrades, mobile apps, SMS-based updates and digital archiving of cases for easy retrieval.

As described in more detail in the chapter on the future of the Indian justice system, in the third phase, it is proposed that the project will move the focus towards building services on the foundation of sound digital infrastructure. It envisions a justice system that is modern, inclusive, accessible, interoperable, and sustainable. This includes online case management systems, registries, and digital courts (e-filing, automatic scheduling, online hearing, transcriptions), built on free and open-source software (FOSS). It also aims to build an Interoperable Criminal Justice System (ICJS) where information can be shared between courts, police and prisons, within certified data-sharing protocols. Phase III of the project recognises that institutions, private or state-owned, need to talk to one another to build digital architecture. It recommends behavioural and administrative changes, among citizens and government, to strengthen technology adoption in the

judicial system, and for the ecosystem to evolve as a whole. An example of digital architecture that phase 3 can draw ideas from is IndiaStack. The digital payments sector in India has witnessed a coming together of government, banks, businesses, start-ups and developers to create a unified system that has no physical presence, is paperless, cashless and consent-based in principle. IndiaStack has been developed as a means to achieve the larger goal of financial inclusion. Similarly, to widen access to justice, there have been calls for a convergence in law and justice is in the form of the proposed JusticeStack.[28]

A key endeavour of this chapter is to map the contours of a fast-transforming law and justice landscape in India. This conversation cannot be limited to the practice of law or the delivery of justice in courtrooms. It is embedded in the scale and speed with which technology is changing our daily lives. Emerging technology is perceived as innovation, invasion, intrusion and infusion, all at the same time, based on the degree to which it disrupts traditional methods. The legal landscape exists in sync with India's evolving digital public infrastructure, and the questions of how to build, regulate and finance it. The authors hope that the framework presented here will enable a comprehensive stocktaking and, where needed, transformation by leveraging appropriate technology.

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Legaltech and its many definitions

In the middle of mass layoffs during the global financial crisis of 2008, Dr. Richard Susskind, one of the early thinkers on the evolution of legal services, wrote the book, 'The End of Lawyers?: Rethinking the Nature of Legal Services'. In the book, he theorised one of the first models of legal evolution. This model, or a fundamental transformation as he termed it, followed the fast-changing nature of legal work. It progressed from bespoke or custom-made legal help to a standardised, systematised, and finally, a packaged and commoditised legal product. In the bespoke form, the work and fate of a lawyer are compared with tailors who custom-fit clothes and artisans who craft objects by hand. The book predicts a quick decline in their livelihoods in the face of a modernising market. At the heart of Susskind's chain of transformation were gains from efficiency[2930]. Even before technology disrupted legal work, most of the routine demands of clients needed lawyers. The work included drafting contracts, agreements, wills and leases. These tasks did not need solutions to be bespoke, or designed from scratch. They were standard and relied on templates. But in defining packaged legal products, Susskind predicted what is now called cloud-based access or software-as-a-service. These services to be part of a law firm's tool kit are packaged and provided to the client electronically, for use at their end, in return for a fee. In its most mature form, legal services become commoditised, available in the marketplace for purchase. A commoditised legal product for regularly repeated tasks such as drafting contracts, wills and leases, therefore, would not

only be cheaper compared to customised solutions but also faster and less prone to human error.

In his 2013 book, 'Tomorrow's Lawyers: An Introduction to Your Future', Susskind took a more forward-looking approach. He outlined three factors that were radically disrupting the market for legal services: i) budget constraints since higher demand for legal products would mean more work to be delivered in less time and cost for law firms which could become cost-efficient by making cuts on spending and staffing, ii) liberalising legal sector, where the delivery of legal services was moving from being concentrated only among qualified lawyers to a Do-It-Yourself (DIY) model, and its archetype changing from law firms and partnerships to alternate business structures. Today, Alternative Legal Service Providers[31] (ALSPs), legal departments of corporates such as the big four (EY, KPMG, PwC and Deloitte) and start-ups, all form a part of this landscape, and iii) information technology, which has played a key role in liberalising the legal sector since large amounts of data can be generated, stored at low costs and this resource can be tapped into by entrepreneurs, engineers, developers and educators, who could automate paper-based legal processes for clients. Citizens accessing legal solutions built by emerging technologies would not require a middleman for process-oriented work like contract drafting or tax filing and lawyers themselves would not need to manually go through a dossier of documents to establish case facts, and could be assisted by software, web portal or machine. Susskind took the example of computerised accounting systems replacing paper-based ledgers, to define sustained innovation. But for disruption, he outlined 13 legal technologies, ranging from document automation, electronic marketplace, e-learning, to machine prediction, and online dispute resolution.

In more contemporary definitions of legal technology, the Boston Consulting Group (BCG), in 2016, provided a three-layered framework.[32] The first layer comprised enabler technologies such as a cloud server, a platform infrastructure and connectivity, serving not only the legal sector but also various industries. This level of technology ensured that routine tasks were digitised. Above this, a mid-level layer of support-process solutions included back-office management tools. These software created efficiencies in accounting, billing, human resource management, and employee or customer-relationship management. Software that could electronically store, organise, classify documents and track the workflow of cases fell in this category. The final layer on top of substantive law solutions included the two key tasks lawyers undertake – litigation and transaction. The skills required under both could vary from basic contract drafting to specialised research for judicial precedents.

In Susskind's chain of events, bespoke solutions fade out as the sector becomes more commoditised. With more mature, artificial intelligence-based tools building on digitised resources, BCG's framework of legal-tech predicts that this chain will reverse. In other words, technology would go beyond automating standard legal tasks, and be able to provide made-to-measure solutions as a product.

With the understanding that each case may not be unique, the legal ecosystem moved from a monopoly to a marketplace. Like other goods and services in a globalised market, legal services were also bought, sold and priced differently. The market forces attacked two key asymmetries in the practice of law – billable hours and profit per partner. Traditionally, lawyers have been compensated for the number of hours devoted to working for a client. This created perverse incentives. The most efficient lawyer got paid the least. The laziest lawyer got rewarded the most. As legal systems became less opaque, clients preferred knowing the cost of legal services beforehand. This led to new pricing equations called the alternative fee arrangement, which emerged in the form of value-based or fixed-cost billing. Today, companies like Digitory Legal have developed an AI-enabled cost analytics platform that uses past data to predict future legal fees and costs. Such predictions can help companies and law firms create efficient pricing models. Legal Tracker developed by Thomson Reuters is another spend management tool that helps organisations monitor and control legal costs.

If the structure of a traditional law firm were to be visualised as a pyramid, it would go from law clerks and paralegals at the bottom, associates in the middle, and equity partners at the top. The sole function of this law firm and its employees is to maximise profit per partner. Legaltech commentator[33] Mark A Cohen, in 2018, theorised that digitised, outsourced, consumer-centric legal practice would topple this pyramid and flatten the hierarchy. It would compel law firms to restructure and diversify.

In more attempts at defining legal tech, many companies, publications, blogs and research centres, globally, have categorised the explosion that the sector has witnessed. In 2019, US- based software firm Mitratech classified the products and services[34] into four suites. These were grouped based on functionality and stakeholders. The more conventional case management and business management tools were assigned to the law firm management suite and enterprise legal suite. Legal research and analytics were assigned to the attorney suite. Products that citizens could directly use to access the law, or educate themselves, were classified under the business to consumer suite.

Online information portal LegalTechHub,[35] has curated an alphabetical directory of legal tech tools by their global presence. Lawtomated,[36] an online blog, categorised the products on a timeline before and after 2011. Another blog called the Legal Geek,[37] made a distinction between tools that help manage work versus perform work. The frontiers of legal tech broadened a little when Legal Evolution's[38] Jae Um included a social impact category along with tools in retail law and enterprise law. This category listed tools that would help get legal recourse in cases pertaining to social inequality or economic justice.

One of the largest databases of start-ups in the legal tech sector -- CodeX Techindex (comprising 1893 companies and growing), sits at CodeX, Stanford's Centre for Legal Informatics. For India, Omidyar Network (ONI) and Agami have made attempts at mapping the sector. Both approaches document changes

that are at the cusp. ONI's classification[39] divides the legal-tech market into demand and supply. The demand side enables access to legal services by individuals and businesses. The supply side enables practitioners to provide these services.

Susskind theorised 'decomposing' regular functions into smaller tasks as the modus operandi of this revolution. In the supply side of the legal market, both litigation and transaction cycles can be broken down into subtasks. Some of these subtasks are manual and administrative and can be outsourced – managed better by non-lawyers, computerised, subcontracted or even off-shored based on the cost of labour. Some others require human judgement and rely solely on the expertise of a lawyer. The pizza analogy posited by IBM architect, Albert Barron, is useful to understand the changing model of legal process outsourcing (LPO) and technology disruption. Much like in-house legal advice, a pizza can be prepared from scratch at home. This would include purchasing raw ingredients, kneading, baking, preparing the toppings, and cleaning up after. Compared to buying a semi-prepared frozen pizza, home delivery, or dining out, this process could take up more time and energy, and even turn out to be more expensive. In the alternative models, the subtasks of the assembly line are outsourced. Barron draws a parallel of infrastructure, platform and software-as-a-service for each of these models. A readymade pizza requires you to only have the infrastructure of heat-and-eat at home. The experience at a diner does not even require that. You just have to show up and consume upon purchase.

Each of the models makes you, the customer, better off in terms of time and money, while satiating the pizza craving. Applied to the world of information technology, these models remove complexities for the provider and present choices to the client at each step. Readymade solutions are available at the click of a button. A complete dine-out experience is guaranteed to the consumer upon signing into the software. There are limited tasks that system administrators or developers perform in the chain. Breaking up the delivery of legal services into subtasks easily renders itself to this transition. Technology providers are constantly re-engineering the assembly line. Websites, portals, software and apps are empowering the end user, and enabling the DIY model of law.

A flurry of models and definitions makes it hard to point at one meaning of the term legal-tech. The etymology of the term does not have a date. Nor does it have a single person to whom its discovery can be attributed. The advances in the four V's of big data: volume, variety, veracity and velocity, have transformed the legal sector[40] as much as any other business. The touch of technology in finance, insurance or education, for example, has led to the emergence of Fintech, Insurtech and Edtech as terms in common parlance. In 'The LegalTech Book: The Legal Technology Handbook for Investors, Entrepreneurs and FinTech Visionaries', Chishti et al call this the Uber-isation of law.

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How big is the legaltech zeitgeist?

Many landmark innovations feature along the road that leads to the law and technology junction today. Of the early ones, the most notable were Lexis' UBIQ terminal and Westlaw's West Automatic Law Terminal (WALT). Short for ubiquitous, the red bulky UBIQ made computer-aided legal research a reality in the 1970s. The name itself prophesied the all-pervasive nature of technology in the future. Personal computing soon evolved into 'ubiquitous computing',[41] a catchphrase termed by Xerox PARC's Mark Weiser in 1988. The software will be 'everyware', working in the background as invisible forces, Weiser predicted. And truly so! Functions of dictation, recording, indexing, calculating, scanning, faxing, and interconnecting computers, carried out by heavy-built machines of yesteryears, are all integrated into the small smartphones of today. Sophistication in operating systems and processing speeds enabled this metamorphosis. It further enabled the generation, storage and analysis of gigantic amounts of data. The spectrum of 'jurimetrics' (Loevinger, 1949), or the application of statistics in law today, can be expanded to include emerging technologies – empirical research, algorithms, computational law, machinesfeb2 reading, writing and executing contracts, and virtual assistance in the form of chat-bots and law-bots. IBM's artificially intelligent attorney ROSS (2014) is a case in point.

Stanford's CodeX database categorises legal tech companies into nine sub-sectors: analytics, compliance, document automation, legal education, legal research, marketplace, online dispute resolution, practice management, and eDiscovery. It also annotates the target client of each company to be an individual, other firms, the government or service providers. The size of the legal-tech market is hard to estimate even within this fixed outlook. Technology solutions are not just ubiquitous but are also difficult to contain within a geography or sector. Despite this, some estimates exist, globally and for India.

According to Tracxn, a database of start-ups, 6,041 new businesses were classified globally as legaltech in 2021. The size of investments in the legaltech start-up ecosystem, worldwide, is estimated by Tracxn at USD 2.6 billion in 2021. Of this, the US alone accounted for USD 1.4 billion in investments, and India stood at 29 million. Overall, the data on investments in legaltech start-ups in India show that external funding has picked up only in the last seven years. The fintech sector in comparison is sized at USD 28 billion,[42] booming by a multiple of 1000 times when compared to the 29 million legal tech investments in India. Over one-third of the 6,041 newly founded start-ups are located in the United States alone, while their services are listed online, and can be purchased across the globe. This is not surprising, as the US is the biggest spender[43] on legal services in the world. In absolute numbers, this may be a large share.

However, the growth over the years in the US market has been steady. The number of legaltech start-ups in the US has expanded only by a multiple of three in the last decade. In contrast, the Indian market has exploded. As per Tracxn data, only 52 legaltech start-ups came up in the Indian market between 2000 and 2010,

while 574 of them were founded in India between 2010 and 2020. This points to a 10-fold increase! The largest number of start-ups in Tracxn's legaltech database focuses on lawyers and law firms. As a result, there is more innovation and investment in workflow automation -- practice management, contract management, and intellectual property management. Courtroom solutions and dispute resolution are much less crowded sub-sectors in comparison. A more disaggregated analysis of the law and technology start-up space in India conducted by the CIIE.CO in this volume points to a similar trend. Combing through Tracxn's broader classification of this space, CIIE.CO identified a subset of 336 Indian legaltech start-ups which are working towards 'enabling or improving access and usage of legal and justice delivery services' in India in 2021. Distribution of these start-ups based on the customers cater to gain points at the market being skewed towards the needs of legal professionals and businesses. At least 65 per cent of the start-ups in their sample, design workflow management and process efficiency tools. Just 32 per cent cater to the increased access to justice for citizens. The analysis also attributes peaks in the growth of these start-ups to policy changes such as the Start-Up India initiative in 2015-16, and COVID-19's push towards digital alternatives in 2020. Geographically, most start-ups are concentrated in and around Delhi, followed by Maharashtra and Karnataka.

While a buzzing start-up space is an indicator of the mood in the sector, the bigger picture includes many other stakeholders. Beyond lawyers and law firms, courts, law-making and law-enforcement agencies, IT businesses, corporates, law schools and technical institutions, the government and an average citizen, everyone has a role to play in this transition. The use of technology in the domain, therefore, can be scoped in three ways – 1. The business of law, 2. Access to justice, and 3. digital transformation of public services.

In the nineties, firms such as Thomson Reuters and FTI technology providing legal, compliance, and accounting solutions, found their feet as publicly listed companies. Around the same time, the privately owned Big Four for accounting and audit, apart from tech giants Infosys, HCL, and Wipro, were emerging on the scene. Their global presence pre-dating the age of home-grown start-ups, led to the phenomenon of legal process outsourcing (LPO). India was both a market and a destination, especially for back-office legal work arising from bankruptcies and cost constraints during a global crisis. In 2010, just after the global financial crisis, the LPO market in India became the fastest-growing segment[44] and formed 17.5 per cent of the knowledge process outsourcing (KPO) market. Non-essential work such as patent support, litigation support, contract review, and compliance, was cheaply outsourced to India and allowed global corporate legal departments time to focus on core tasks.

Technology's emergence in the business of law can also be gauged by its adoption among lawyers and law firms and the growth in budget allocations. A host of global reports and surveys indicate that the reality is not as theorised by the models of legaltech. According to the US-based consulting firm Gartner, firms spent about 3.9 per cent of their budgets on legaltech solutions in 2020. This

proportion is projected to grow to 12 per cent of their budgets being allocated to legaltech purchases by 2025,[45] marking a shift from spending on in-house or outside counsels, and towards hiring non-lawyers in technical roles.[46]

However, a survey[47] of legal departments across 30 countries and 71 industries conducted by the Association of Corporate Counsel (ACC) in 2019, indicates that the shift to alternate legal models and technology has been slow. Apart from patenting, where outsourcing is rampant, and discovery which involves analytics, over 90 per cent of the work in contract management, due diligence, invoice review and legal research is still being performed by the in-house lawyer. Susskind's 'more-for-less' challenge is at play here. Work volumes and tech budgets are expected to increase,[48] and the in-house workforce is shrinking. But spending on outside counsels has plateaued[49] and the flat-fee model is yet to breakeven. Over two-thirds of the lawyers surveyed by ACC in 2019 were still on hourly billing arrangements. Results of multiple other global surveys corroborate this divergence between the rise in budgeting for tech and the current use-case of tech in law. Elementary operational work – compliance (e-signatures), project and document management, workflow, and collaboration[50] (e-meetings) – has had higher adoption. Cloud-based services, AI and ML-based tech, block chains, robotic process automation, big data and predictive analytics solutions are less understood[51] [52] or purchased.[53] [54] [55] This is reflective of a huge skill deficit among the legal community.

Firms and individuals are more agile than institutions in adapting to change. In the bigger picture, courts and governments globally have realised the need to be tech-savvy. GovTech and CivicTech[56] have emerged as terms that loosely translate into using data for improving efficiency and engagement in public sector systems. The World Bank's understanding of GovTech is based on the digital transformation of the public sector, where the government is not just a provider, but a platform.[57][58] Progress in creating digital governments has been measured using indices such as the OECD digital government index[59] (2019) and the UN e-government development index (EGDI, 2020). The latter is a composite score of online services, telecom connectivity and human capital. In 2022, India ranked at 100 among 193 nations[60] on the UN EGDI, on which Denmark and Korea are top performers.[61] The UN also measures online citizen engagement using an e-participation index (EPI). The EPI scores citizens' access to public information (e-information) and their engagement in policy making (e-consultation and e-decision-making) to arrive at a ranking. India's rank of 29 among 193 nations[62] on the EPI, has dropped 14 points between 2018 and 2020. On both these indices, India is also much below other emerging economies such as China (EGDI: 45, EPI: 9), Brazil (EGDI: 54, EPI: 18), and Russia (EGDI: 36, EPI: 27).

Compared to firms and digital governments, fewer attempts have been made at estimating the speed, scale and size of technological integration in the justice system. There is no global database or index that ranks the digital-*ness* of courtrooms, police and prisons across countries. The Massachusetts Institute of Technology conceptualises access-to-justice technologies under justice as a

platform[63] that has layers similar to those on which IndiaStack is built and JusticeStack is proposed.

DAKSH India's 'Next Generation Justice Platform'[64] visualises virtual courts by mapping tech's intervention every step of the way in the lifecycle of a case. This includes online solutions for alternate dispute resolution, filing and payment, notification, summons, discovery of documents, evidence and arguments, judgement and appeal.[65] Their assessment of how sophisticated the solutions currently deployed in digitising the judiciary ranges between basic to medium levels of technology. The use of advanced computational tools involves AI's application in the administrative and decision-making processes of the judiciary. While India is at the early stages of developing these, cases of robot judges, real-time transcription of court hearings, and programmes that can predict the settlement probability of a matter, do exist globally.[66] In a more detailed analysis, the Hague Institute for Innovation in Law (HiiL), sampled 150 tech-in-judiciary innovations across 85 nations to find that just 15 per cent of them were built on AI/ML and only 6 per cent used advanced technology (defined as block chain/IoT).

Far behind the court digitalisation process, is tech reform in policing in India, where estimates indicate routine absence of access to computers, wireless networks, and forensic technology.[67] For the justice system to modernise using advanced technology, incentives need to align for private players to innovate. HiiL's findings show that private solutions fail to scale, and often need the government's support. This support could be in the form of resources or regulations that enable innovation. It could also be in the form of partnerships. So far, the authority to digitise government and public services has remained with the NIC alone.

Finally, the purpose of all technology in law – private, government or courtroom – is to reduce costs, and improve access to justice for the citizens. Data from DAKSH's Approaches to Justice Survey, 2017 covering 50,000 households across India in 2017, revealed that time and cost remain the biggest deterrents to a smooth functioning justice system. About 26 per cent of the households surveyed felt that the cost of litigation was too high;[68] 21.5 per cent found the legal system too complex, and 17.3 per cent said that cases took too long to be resolved in courts.

Mapping Technology for Law and Justice

This volume aims to go beyond the legaltech products developed by and for the private sector. As indicated in figure 2, we catalogue the universe of products and services based on, a) the interplay between the public and private sectors, and b) their use case. In doing so, we expand the current definitions of legal tech tools to include innovations in state functions of justice, governance and law enforcement. The second classification helps take stock of the state-of-the-art tools. The scope of every tool included in this exercise is of value to one or more stakeholders – lawyers, law firms, businesses, citizens or courts and the government. The technology component in our definition ranges from digitisation to automation.

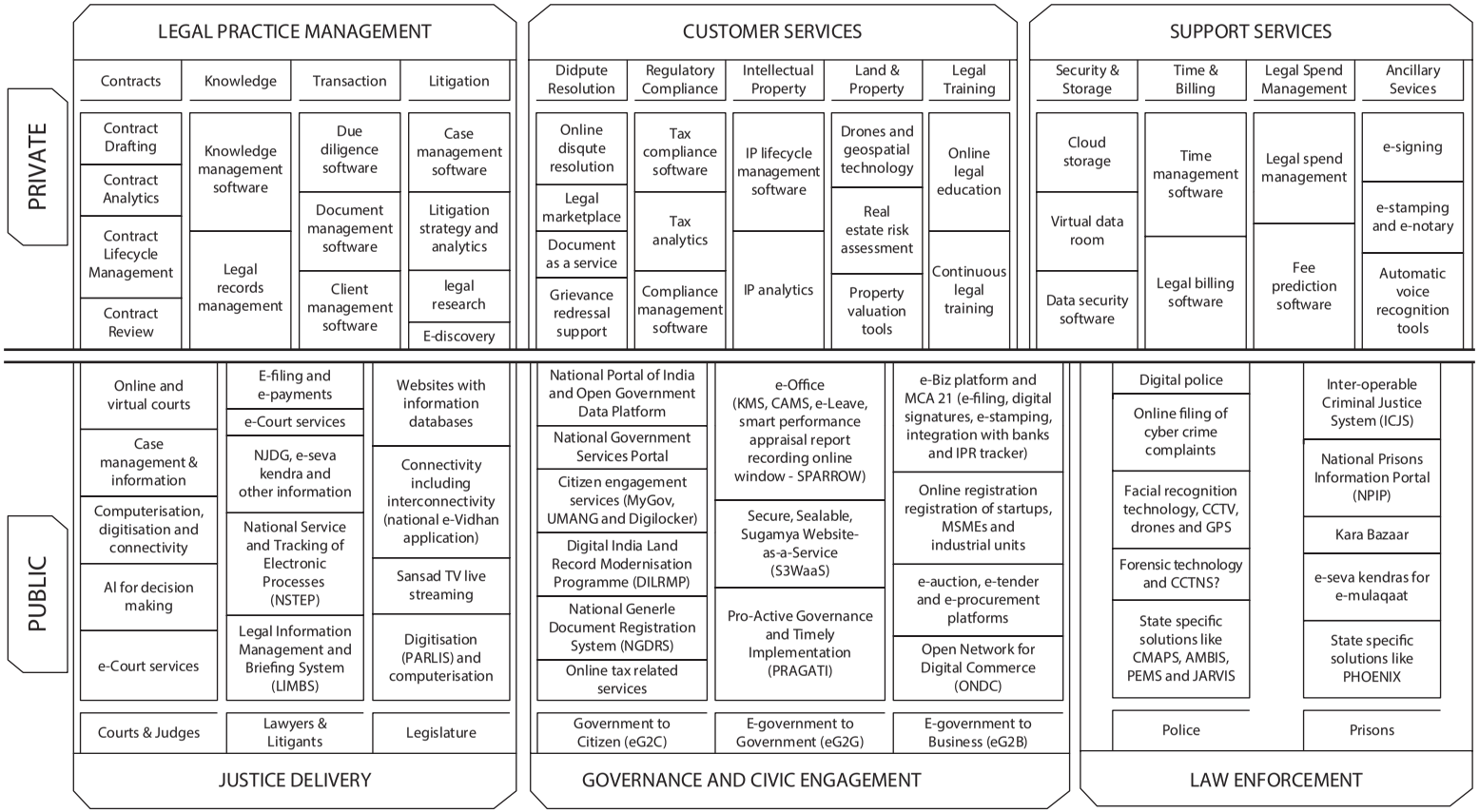

Figure 2: Technology Map for Law & Justice

The public sector products and services are sub-categorised into the delivery of justice (including courts and legislature), governance technology (regulation and service delivery), and law enforcement (prisons, police and defence security). On top of this are the private sector tools. The private side is classified into legal practice management (including law firm workflow management), customer services (including dispute resolution and compliance), and support services (including cloud-based support). If the ownership of the service lies with the government, we classify it as public, even if the tool was built by a private vendor or in partnership with one.

These include products where the government is either, a client, a partner, or a donor. As an example, think of Aadhaar-based e-KYC or e-signature for identity and verification; data.gov.in website for open-data; bharatmaps for GIS; Co-Win app for healthcare; e-Shram portal for employment and labour; m-kisan for agriculture; Aaykar Setu for taxation; India Code as a repository of all Acts; NJDG for courts; MCA-21 database for companies, and the BHIM app for payments.

Across most sectors, private alternatives also exist. These would include, Veri5digital for identity verification, Indo ArcGIS for GIS, Practo for healthcare, Simpliance for labour compliance, Extentia for agriculture, Avalara for taxation, Indiankanoon, Manupatra and SCC for case laws and acts, Zaubacorp or The Company Check for business-related information and PhonePe, Paytm and Google Pay for payments.

The use case of all products in this market is to either bring in efficiency in simple, routine work, or aid and simplify highly complex work. This holds true across law firms, judiciary and governance. An exercise in mapping firms and products in this space is prone to overlaps and double counting of the many features that are developed to cater to more than one kind of user. For example, certain legal practice management software like Sunsmart and Libra also offer service features like time and billing. Tools like Kira and Litera Transact can be used by both law firms and businesses to streamline legal workflow. Similarly, the e-courts services mobile app can be accessed by multiple stakeholders. For this reason, we take a bird's eye view of the sector and make demarcations based on ownership.

Before diving in, some disqualifications would help fine-tune the contours of the map. Every sector in India today is brimming with digital goods – databases, portals, websites, apps and platforms. Technology emerging in any other sector such as finance, healthcare, insurance, or defence, whether owned privately or publicly, is outside the scope of this mapping. We confine ourselves to law, governance and the justice system, but we make an exception for land because of the disproportionate burden it puts on courts. It is estimated that two-thirds of all litigation in India is related to land or property[69] disputes. We endeavour to paint a comprehensive picture of this ecosystem. Our sub-categorisation may be all-encompassing; however, the list of products selected per category is not exhaustive, only indicative. Its objective is to give the reader a flavour of the many products available in the market.

Private sector products and services

The private sector has done reasonably well in the diversity of its offerings. We elaborate, based on figure 2, on the various categories of products and services that have come up.

I. Legal Practice Management

Tools used by lawyers, law firms and corporate legal departments for a faster and better churn in core legal tasks. The core legal tasks are sub-categorised into four: contracts, knowledge, transaction and litigation.

- **Contracts:** Software analytics are available at every step of managing contracts from drafting to review. Tools such as Komtrakt, Contractum, Riverus Umbrella and Contracts Plus have flooded the market with claims of replacing manual drafting and reducing drafting errors. In India, SpotDraft, Provakil and Volody are leading start-ups that manage the contract cycle end-to-end. They provide digital repositories, analytics, insights and AI-based assistance for optimising the language of contracts, version control, and automated checklists for contract management. Smart contracts, or self-executing contracts, most commonly based on the Ethereum block chain, are bringing speed and security to the process. They also minimise the need for a lawyer's assistance in contract enforcement.
- **Knowledge:** Process, network and advisory knowledge created by law firms on a case or transaction often needs to be replicated, or re-discovered for other clients with similar needs. This knowledge could be factual, procedural or conceptual.[70] Knowledge management solutions offered as part of RazorLex by PracticeLeague, Lexis Search Advantage by LexisNexis and West KM by Thomson Reuters are tools that help manage the knowledge created by lawyers in a law firm. Firms are now unburdening lawyers involved in this task by hiring knowledge managers competent in information management and data-driven R&D.
- **Transaction:** A series of operational tasks including due diligence, document management and client management precede transactional legal work. Tech support for these tasks identifies potential risks, runs conflict checks for new clients, and collates databases for connected transactions and payment dates. Document management software provides a range of services from storage, security, and collaborative access, to time-keeping, and e-signatures, in a single package. Some of these tools currently in the market are Razor Cube by Practice League, Kira by Litera, Imprima and Luminance.
- **Litigation:** Case management softwares such as CaseWatch, mykase, LegoDesk, Mercury, nTirelegal, KomLit by Practice League and Zelican help lawyers keep track of hearing dates and ensure they stay on top of multiple cases across courts. Instead of pouring over books, law databases

such as Manupatra, and search engines like Indian Kanoon and LegitQuest, are now referred to for legal research. Digitisation of court cases has enabled litigation analytics. Firms such as LexMachina, provide litigation strategy globally, and CubicTree, Manupatra, CaseMine, Loom Analytics, Mike Litigator and Premonition, in India, provide litigation data analytics, AI-assisted case summaries of judgments, and allow for case prediction based on past outcomes. With an increase in electronically stored information (ESI), the process of e-discovery has become common during a trial. E-discovery involves collecting, reviewing and presenting ESI as evidence before courts. This has also resulted in the rise of e-discovery professionals who help litigants and lawyers.

II. Customer services

Privately developed solutions for consumers of legal services. These services cover legal aspects that businesses and individuals engage with, and may not necessarily be rendered by a court or lawyer. Functions of dispute resolution, regulatory compliance, intellectual property (IP) and legal training are clubbed here.

- **Dispute resolution:** Private assistance for getting into an agreement, finding a lawyer, addressing grievances, and resolving disputes are made available by products in the domain of document-as-a-service, legal marketplace, online grievance and dispute resolution mechanisms. Private players like ConsumerComplaints.in act as mediators to facilitate the resolution of consumer disputes after consumers file complaints against companies on their platform. DIY templates offered by LegalDesk, Rocketlawyer, LegalKart and LegalRaasta, help draft rent, non-disclosure and employment agreements. Online directories such as Legaliser and LegalHelpLine India, and platforms like LawRato and MyAdvo in India are easing the search for a lawyer. These services allow individuals and businesses to go lawyer shopping by comparing areas of expertise, experience, and lawyers' fees, across cities. Alternative dispute resolution in the form of arbitration, mediation and negotiation now has the option of being conducted online. Presolv360, Jupitice, SAMA and ADRes Now are tech platforms that are enabling online dispute resolution in India today.
- **Regulatory compliance:** With compliance requirements constantly changing, businesses can lose track of various regulatory compliances related to labour, tax, company law, intellectual property and the environment. Compliance irregularities at the business end can lead to lawsuits, penalties and investigations. Complius by OneDelta, Komrisk, Complicheck, Libryo are packaged compliance management solutions available in the market that help businesses manage their compliance requirements. Tax calculation and compliance, for instance, are recurring tasks for accounting firms such as Deloitte and KPMG. These firms are now being offered automated solutions and cloud-based analytics for tax strategy.

- **Intellectual property (IP):** Entrepreneurs often need to engage with the law to protect original ideas by filing for patents, monitoring infringement or value and acquiring new intellectual property. Softwares developed by Legistify, Patracode, Practice League, and Mike Legal tracks IP violations, and use analytics to create, expand and manage portfolios.
- **Land and property**: While central and state governments are digitising land records, private players like Zippr are using technology to give each address -- residential or commercial -- a unique identification code to make it more accessible. Companies like MapmyIndia offer drone services, and AI-based geospatial analytics to help businesses work more efficiently. With the goal of making property due diligence easier, start-ups like TEAL have developed online databases -- TEAL Terminal and TEAL Check -- to provide customers with property-related information, documents and an automated risk profile of that property. Automated valuation of land and properties is also being offered by several websites including Property Science, Orange Book Value and Housing.com.
- **Legal training:** Access to online legal education for non-lawyers, continuous legal training and technical up-skilling among lawyers and law students is now made possible beyond the doors of law schools. LawSikho, Lawctopus, LawSkills are some online law schools that curate courses that bring together academics, lawyers, and data scientists.

III. Support services

Tools that enable secondary functions of businesses and law firms. These tools target operational efficiency so that firms can focus on delivering core functions.

- **Security and storage:** Confidential information stored digitally needs protection from potential threats of leakage and malware. The use of virtual data rooms and other cloud-based storage solutions offering security from potential breaches, end-to-end encryption, customised access and multi-factor authorisation, help build trust among clients. Legodesk, doxandbox and Securus Records Management provide these services today.
- **Timing and billing:** A lawyer's time is demanding and should be utilised better than manually clocking billable hours. Legal billing, time and expense tracking softwares such as Clio, TimeSolv, Invoicera, RazorLex, and Ankpal automate the billing process, based on customised fee arrangements.
- **Legal spend management:** Software analysing trends in expenditure on external legal help, allows for budget optimisation and fee prediction. Wolters Kluwer's LegalVIEW and TyMetrix 360, MitraTech's Quovant, and LexisNexis's CounselLink bring cost efficiency to the business by providing insights into spending patterns.
- **Ancillary services:** Digital assistance for paperless documentation, such as e-signature, e-stamping, and e-notary, is provided by Leegality, stamp.it by

SignDesk, Cygnature by Cygnet Infotech and e-Notary by Homaa Binary, in compliance with government regulations. Privately built products also help with dictation, transcription, voice-to-text conversion, and automatic speech recognition. Some of these tools are Winscribe Dictation and Dragon Legal Anywhere by Nuance, legal dictation software by Bilr, Lexacom 3, Lexacom Echo and Lexacom Scribe.

Modernising Law and Justice in the Public Sector

The public sector hasn't been far behind. In fact, it has attempted to touch almost all major aspects of this broad space as described below.

I. Justice delivery

State initiatives that aid digitalisation of judicial and law-making processes. Tools considered in this category equip courts, judges, litigants, lawyers and lawmakers with the means to access and use digital judicial infrastructure.

- **Courts and judges:** Early phases of the e-court mission put in place information kiosks, wireless connectivity, video conferencing, digital archives and case information systems. The project has built and implemented versions of the FOSS-based CIS National Core software across high courts and lower courts. It provides every case with a unique ID (the CNR number), which brings together aggregates for the NJDG dashboard on case tracking and pendency. The e-courts service mobile app launched in 2021 makes cause lists, court orders, and case tracking accessible on our phones in 14 regional languages. The JustIS app provides this feature exclusively to judges. Online adjudication of cases, albeit only for traffic *challans*, is also available at the virtual courts (https://vcourts.gov.in/) website. Justice Clocks, or a digital display of judiciary-related statistics such as case-clearance rates, are installed outside various high courts. The apex court too uses AI-based techniques to streamline caseloads. An in-house software called SCI-interact has been developed for judges to access files and take notes. The use of optical character recognition (OCR), data mining and natural language processing (NLP) has helped develop the Supreme Court Portal for Assistance in Courts Efficiency (SUPACE), which quickly assists judges with facts and legal research, and aids decision-making. The Supreme Court Vidhik Anuvaad Software (SUVAAS) translates judicial documents into the vernacular.
- **Lawyers and litigants:** E-filing portals are available to lawyers and litigants for filing cases or RTI requests. For litigants who may not have the digital wherewithal, assistance with e-filing, case status, hearing dates, copies of judgments, or any other case-related query, is available by approaching the nearest e-seva kendras. Just like a legal marketplace offered by private players, the government also has a telelaw initiative[71] through which video

conferencing services are available at a pre-litigation stage. The facility aims to make legal aid available to the vulnerable sections of society. It connects litigants to lawyers and makes legal advice available at a nominal fee. While the legal validity of sending summons via WhatsApp and Telegram is often contested, the National Service and Tracking of Electronic Processes (NSTEP) app, is a legally admissible digital alternative to auto-generation and delivery of summons.

A well-known fact in India is that the government is the biggest litigant. To reduce government litigation, and track cases where the government is involved, the Legal Information Management and Briefing System (LIMBS) portal came into being in 2015. The portal, however, is not available for access to the general public. The e-payments portal addresses court fees, judicial deposits, fines and penalties. The Integrated Grievance Redressal Mechanism (INGRAM) portal provides an online platform for consumer complaints and grievance redressals.

- **Legislature:** Digitisation of parliamentary debates, budget allocations, and regular proceedings contributes to making the law-making process flexible and transparent. The Parliament Library Information System[72] (PARLIS) set up in 1985 by the NIC was a first step in this direction. The library now has an open-access portal (https://eparlib.nic.in/) which acts like a search engine. The NIC also set up the National e-Vidhan Application (NEVA) using its cloud technology MeghRaj in 2015 for paperless workflow between the two houses of parliament and the state legislatures (assemblies and councils). The latest addition to the eParliament toolkit is the Digital Sansad app (2022), which provides access to live proceedings of the parliament, and grants parliamentarians the option to digitally log in attendance.

II. Governance and civic engagement

This refers to the use of ICTs in the Indian government's Digital Seva (also a portal's name under Digital India) or serving citizens via the online provision of information and services. This category includes e-governance initiatives, portals, apps and platforms that are created for the public, for businesses and for governments themselves.

- **E-government to citizen (eG2C):** As part of the NeGP, digital services by the government for citizens include access to information and documentation such as digital identity, filing taxes, land and vehicle registration, birth, death, marriage or passport-related requirements. These services are made available at the local level under the e-district mission mode project. The Indian government uses the National Portal of India (NPI) as the official source of online information dissemination. It is a gateway to 6,700 other government websites and its counterpart on open-data is the Open Government Data Platform

(OGDP). The National Government Services Portal (NGSP) is a one-stop website for accessing 13,205 citizen-targeted services. Online RTI, citizen engagement platforms such as MyGov, mobile applications such as UMANG and DigiLocker, and the government's social media presence are all part of this cohort of services. The income tax website provides online tax calculation and e-verification of tax returns. For land records digitisation, the centrally sponsored Digital India Land Record Modernisation Programme (DILRMP) is now being supported by others such as SVAMITVA which conducts drone surveys, maps land parcels in villages, and issues legal ownership cards. The National Generic Document Registration System (NGDRS) software provides citizens with property registration and valuation features and stamp duty calculation. State governments also maintain their own land record portals. Gujarat's e-dhara or AnyRoR, Karnataka's Bhoomi or Maharashtra's Maha Bhulekh, are some such projects.

- **E-Government to government (eG2G):** For the government to be productive, transparent and coordinated in its processes, its internal administrative work also needed to go paperless. Just like e-courts and e-districts, the e-office is another mission-mode project that aims to bring efficiency in inter-government workflow. The project includes a suite of services such as e-filing, a centralised online repository for document storage (called the e-office KMS), internal collaboration and messaging (CAMs), personnel information management system, eLeave system and a Smart Performance Appraisal Report Recording Online Window (SPARROW) for government employees. Government departments can also get their websites on NIC's cloud, using S3WaaS (Secure, Scalable, Sugamya Website-as-a-Service), offered by the NIC. For the PMO to track the implementation of various government programmes across the country, a multi-modal platform called Pro-Active Governance and Timely Implementation (PRAGATI) has been in place since 2015.
- **E-government to business (eG2B):** Launched in 2013 by the Department for Industrial Policy and Promotion, the eBiz platform was India's first online single window for businesses to obtain licences, regulatory clearances, permits, approvals and no-objection certificates. However, the portal was shut down in 2018. An earlier initiative of the Ministry of Corporate Affairs, the MCA-21, has been around since 2006, to enable registration and automate compliance for companies. The MCA-21 architecture is built on the e-filing of annual reports and company accounts, e-stamping, use of digital signatures, online integration with banks and income tax departments, and fast-tracking IPR. It provides citizens with access to company accounts for a nominal fee. MCA's Simplified Proforma for Incorporating Company Electronically (SPICe), has a new web-based form called the SPICe+, which integrates services such as name reservation, Director Identification Number (DIN) allotment, issue of PAN, TAN, allotment of GST, EPFO registration, and opening of bank accounts, for a new company. Similarly, registration of start-ups, MSMEs and

industrial units can be done online on portals powered by the Department for Promotion of Industry and Internal Trade (DPIIT). Platforms for e-auction, e-tender and e-procurement are designed with the vision of creating an investor-friendly environment and boosting the ease-of-doing-business rankings. To reduce the cost of doing business, the DPIIT has proposed the Open Network for Digital Commerce (ONDC), which helps onboard small-scale retailers to e-commerce platforms.

III. Law enforcement

A host of tech initiatives targeted at reforming the criminal justice system are being deployed by state government agencies, with support from the Centre and with the help of technologists and start-ups. These are solutions which can be leveraged by the police and prisons, for investigations, maintain law and order, and increase citizen engagement.

- **Police:** Various state governments in India now have online portals for citizens to file and track FIRs. The Central Government also has a smart policing initiative called Digital Police (digitalpolice.gov.in), which in addition to online filing of physical and cybercrimes, provides verification services to citizens. To the police, the portal provides access to crime databases, alerts and reports of trends and incidents of crime. Portals dedicated to a particular cause such as the Punjab government's, Saanjh, for lost and found; Maharashtra's police clearance portal; Delhi police's Himmat app for women's safety; e-challans for violating traffic laws, are now part of digital policing. For investigations, the police often use facial recognition technology, GPS tracking, CCTVs, drones and forensics.

  The Crime and Criminal Tracking Network & Systems (CCTNS), another mission mode project under the NeGP, implemented by the National Crime Records Bureau (NCRB), integrates crime records among police stations across India. Big data repositories hosting crime data yield themselves to the application of data mining, crime mapping and predictive analysis. These techniques can allow the police to play a proactive role in reducing crime. Police departments across India are also collaborating with other government agencies, business schools and private companies in building data-based solutions.

  The Jharkhand police partnered with IIM Ranchi in 2012 for support on crime analytics; Bangalore police in 2015 leveraged IBM's tech capabilities to design software training for their personnel; Delhi police with ISRO in 2016 created the Crime Mapping, Analytics and Predictive System (CMAPS)[73] for identification of crime-hotspots; Andhra Pradesh police in 2017 launched the 'Locked House Monitoring System' to prevent break-ins in the houses of out-of-town families; Maharashtra police in 2019 adopted the Automated Multimodal Biometric Identification System (AMBIS) built by a French firm for fingerprint matching. More

recently, the Bihar government in association with Hitachi, is digitising police stations across the state. Telangana police's intelligence unit with help from a Gurgaon-based start-up is using AI tools for crowd management. The Police Emergency Management System (PEMS) taken up by the Allahabad police is another AI-based tool that uses sentiment and geographical analysis for crime mapping. Joint AI Research For Video Instances And Streams (JARVIS), built by AI start-up STAQU, provides video analytics and real-time alerts to eight state police departments in India. These alerts range from spotting blacklisted persons in public spaces, to tree-fall detection on roads.

- **Prisons:** The e-prisons project,[74] introduced in 2018[75] to computerise the functioning of prisons across India, is now integrated with courts and police under the Inter-operable Criminal Justice System (ICJS). For the authorities, the project consists of a database of prisoners, visitors, hospitals and legal aid facilities in the form of information systems. For citizens and investigating agencies, the project offers the National Prisons Information Portal (NPIP), a dashboard of data on prisoners, where visits or video-conferencing can be requested and grievances can be filed. For prisoners, the Kara Bazaar is an online portal to sell products manufactured within jails. Prison management systems and portals deployed so far are maintained by the NIC. During the pandemic, e-seva kendras of various states facilitated e-mulaqaat (or virtual meet-ups) for relatives of families in jails. The Haryana government has implemented PHOENIX,[76] a technology developed by a former inmate, in 19 of its jails. The kiosk-based tool uses the biometrics of prisoners to update them on their case records and next hearing and has replaced coupon-based food purchases within jails.

Use-case based mapping

We further classify these products and services based on the core functions that they offer to lawyers and citizens, as in figure 3. The four broad stages in which technology interacts with individuals in this ecosystem are: a) digitised public information, b) self-service or do-it-yourself services, c) user engagement platforms, and d) value-added services. The public-private distinction is retained to ascertain the sector's development across these stages.

- **Information dissemination:** This stage covers the dissemination of information relevant to, and important for, masses, via website, mobile or electronic mediums. It includes the availability of statutes, cause lists, notices, notifications, and open databases, on a simple web search. Websites of courts, tribunals and legislative bodies make this achievable.

  IndiaCode for instance, is a one-stop solution for citizens to access the latest acts and amendments. Government initiatives like Digital India Land Records Modernisation Programme (DILRMP), which provide citizens with land record details, National Judicial Data Grid (NJDG) that

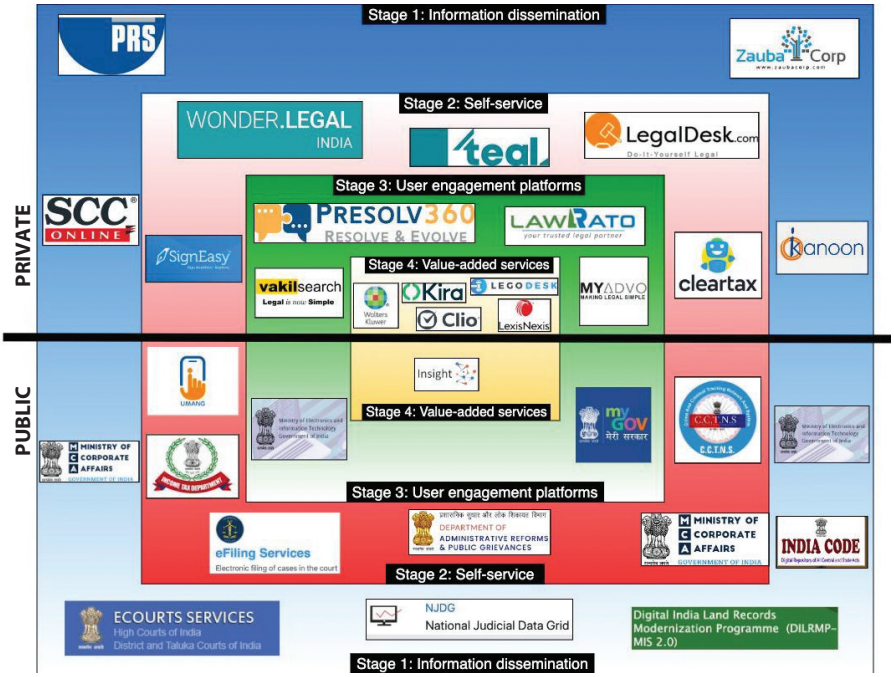

Figure 3: Use-Case Based Mapping

outline statistics of cases in Indian courts, websites of legislative bodies, which provide citizens with information about the Indian Parliament, and state legislative bodies, are some examples on the public sector side. The MCA website also gives citizens access to company-related information. Independent organisations like PRS Legislative Research also provide legal and legislative information. Privately built repositories for court orders and judgements, such as IndiaKanoon, Manupatra, and SCC and databases of company-related information, such as Zauba Corp have also existed in this space, either as an open-access model or behind paywalls.

- **Self-service or DIY services:** Technology that lowers transaction costs by facilitating otherwise tedious tasks such as document filing, tax calculations and filing and grievance redressals are covered under DIY services. This category includes one-way engagement of the user with an online website or application. For example, the government's Unified Mobile Application for New-age Governance[77] (UMANG) app is an interface to access multiple e-government services. Another initiative is the Crime and Criminal Tracking Network and Systems (CCTNS) which envisages simplified processes for citizens to apply for verifications, certificates and permissions, for grievance redressal, for tracking the progress of criminal cases, and for reporting and viewing unclaimed vehicles. Online filing of RTIs, e-filing of court documents and e-payment systems for court fees on the e-courts website, online filing of tax forms and returns on the income tax website and Centralised

Public Grievance Redress and Monitoring System (CPGRAMS), are examples of services where technology eliminates the middleman. Here again, private entities offer DIY services.

Companies like LegalDesk, Wonder.legal provide standard templates of legal documents where users are required to simply fill in relevant information, removing the need for a lawyer to draft legal documents. Other companies such as Signeasy and Docusign equip users to execute legal documents by affixing their electronic signature, and websites such as ClearTax allow users to calculate their taxes. There are also companies like Terra Economics and Analytics Lab (TEAL) that conduct property valuations based on information filled by users.

- **User engagement platforms:** Portals where citizens and lawyers can have a two-way engagement with service providers are covered under the user engagement stage. On the public side, they include citizen engagement platforms like MyGov and the website of the Ministry of Electronics and Information Technology (MeitY) where citizens can participate in discussions and debates, take polls and quizzes, and volunteer for various activities. This boosts civic participation and bridges the gap between the government and citizens. Private platforms such as Vakilsearch, MyAdvo, and LawRato act as a legal marketplace where the legal queries of users are answered and/or users are connected with lawyers. Other platforms such as Presolv360 allow parties to file complaints and resolve them through online dispute resolution methods thereby reducing the need to file court cases.
- **Value-added services:** Non-essential services with enhanced value or benefits, for instance, solutions which ease complex tasks, or add value to existing legal processes are covered in the last and final stage. These include tools that usually rely on more sophisticated technology, such as artificial intelligence, data analytics, machine learning or tools that can be customised to suit the client's needs. Practice management software, legal spend management software, and litigation analytics are examples of some private sector solutions. While the government is using advanced technology to provide a lot of citizen-centric services, it has not created a lot of value-added services.

The use case-based mapping keeps the user/citizen at the centre. The first three stages are important from the perspective of outreach, engagement and access to information among the masses. Products in this cohort are based on basic ICT tools. But their existence is a prerequisite for advanced technology to build value-added services mentioned in Stage 4. For example, databases yield themselves to analytics, and case laws can serve as a corpus on which case prediction tools are designed. While this list of tools is not exhaustive, their spread across stages of sophistication shows most public sector development is entrenched in the first two basic tech stages. However, private solutions tend to lean more towards creating platforms and value-added services.

Building and Financing Digital Infrastructure

Classifying the law and technology landscape into public and private segments raises questions of digital sovereignty. No single entity owns the internet. India has a history of internet shutdowns[78] and it is telling of the government's authority over telecom companies and has warranted questions of constitutionality. State regulations can either shape markets or stifle businesses.[79] Being sensitive to the optimal level of state intervention in building digital infrastructure is difficult. On one hand, there are challenges of inclusion, financing innovation, and preventing monopolies. On the other hand, there are risks of state surveillance, data security and privacy. Either way, a view of law and technology that incorporates modernising the public sector, cannot be insulated from the debate on who brings about this revolution.

Kitchin et al. (2015),[80] identify 14 ways of funding open digital infrastructure. Some of these channels are institutional i.e. they leverage state finances or partnerships. Some others are endowments based on corporate sponsorship and research grants. Then, there are subscription models such as the pay-per-use service. Finally, there are open-source models which are maintained voluntarily and are free to access. An example of crowdsourced efforts at collating Indian legal and judicial data, for instance, is the JusticeHub (2019), created by the CivicDataLab and Agami.

Overall, three main views have emerged[81] on the source of financing digital initiatives. The first view posits innovation to be publicly funded. This model suggests that the government should be the key entrepreneur[82] and investor in developing technology for the welfare of society (Mazzucato 2013). State policy and resources must be directed towards the creation of digital goods, which may be riskier for the private sector to build.

The second view topples the state-led model and recommends reliance on private capital for building DPI (Ridley 2010).[83] It proposes that the state should lower licensing, compliance and taxation requirements so that the private sector can get a free hand in garnering the resources to innovate.

The third way is to rely on philanthropic financing, which mobilises private resources towards this cause without a profit-seeking motive. In the Indian context, Matthan et al. illustrate examples of these funding channels. Digital payments, for instance, gained momentum after the NPCI launched BHIM in 2016. iSPIRT, a non-profit think tank, for instance, helped build IndiaStack. The authors compare the efficacy of each of these funding channels based on principles of cost, accountability, equity and efficiency, and their ability to minimise market failures. They find government financing to be a more relevant channel for building information access portals. The private sector is best suited for developing marketplaces and data exchanges, and donor financing is ideal for creating open stacks. For data registries and other open digital ecosystems, a mix of the three channels is recommended. The adoption of a 'blended approach' (Kitchin et al 2015) is also a view that is echoed by international organisations[84] on this issue. This blend has

come to the fore in many instances where the private sector and civil society have built to support governments, courts, legislatures and law-enforcement agencies. EkStep Foundation's Project Anuvaad has assisted in building the apex court's SUVAS; WIPRO Infotech has been the software agency for the development of CCTNs; SBL Corp has brought about digitalisation in parliament.

In the context of judicial digital infrastructure, Natarajan et al. take this conversation further in this volume through their chapter titled "Sovereignty and financing of technology in justice". They maintain that in the absence of a state's regulatory oversight, justice may get commoditised as a service. They divide the private sector into businesses, academia and legal tech companies. Based on capacities of funding, talent, public commitment and risk-taking behaviour, the authors ascertain the suitability of each of these funding channels. Their results also indicate that co-developing solutions would allow for each sector to play to its strength. So far, the NIC has been the overarching regulatory body for public sector digital reforms in India. But the way forward may lie in digital ambidexterity, where digital initiatives grow without hampering already established business processes (Magnusson et al., 2020).

Despite the policy push towards digital alternatives, India's last decade was headlined by the wastefulness of a 2012 case[85] involving a famous conglomerate, the Securities Market Regulator (SEBI) and the Supreme Court. Documentary evidence on money collected via the issue of debentures to the investors of the company was sent to SEBI in 31,669 cartons over 127 trucks. Reportedly, SEBI had to hire a godown to store these documents. The regulator spent close to INR 60 crore[86] on scanning, digitising and categorising this information into a database. In 2022, the firm's bondholders are still awaiting justice in the form of refunds, which cannot be processed since the documents cannot be traced.[87] The pandemic has acted as a catapult in making technology indispensable and the coming decade will see the transformation of India's law and technology revolution.

Plan for this volume

This volume aims to provide a state-of-the-art overview of research into, and the scope of current thinking and practices in the area of analytics and technology for law as understood in its broader framework that includes justice and key aligned elements of governance. It intends to contain a wealth of information to survey the issues surrounding technology and analytics in legal settings, as well as legal issues concerning their application in different domains. To cater to various interests and user segments, chapters take a broad paradigmatic view of a particular domain or illustrate ideas through specific issues and case studies. Thus, they analyse both cases anchored in a particular legal setting and approaches relevant across multiple practice areas. Accordingly, the volume is a mix of the current state of affairs, envisioning a future in the medium term, and steps required to realise the vision.

It is divided into 4 parts. The first 3 parts deal with the three A's of Access, Assistance and Analytics, and the fourth one provides ideas on how the three A's can be leveraged for institutional transformation by providing pointers for Building Capacity (for Technology development through a discussion on financing and caveats on sovereignty), Disruption (through startups), Effectiveness and Efficiency (through an illustrative case of a tribunal) and Future roadmap.

The first part, titled "The Big Question" deals with the first A of Access to Justice in chapters 2 and 3. Chapter 2 highlights issues therein, particularly the digital divide in the Indian judicial system. Providing a glimpse of an organic response, Chapter 3 deals with *Justicemakers*, a new class of groups or individuals who work with local communities and authorities to smoothen legal processes.

The second part, "Technology for Law & Governance" deals with the second A of Assistance to Law, Justice and Governance through technology. The first chapter in this part, chapter 4, narrates a story of technology hits and misses where it all starts: Indian Legislatures. Since land administration and taxation are key elephants in the room when it comes to justice and governance, chapters 4 and 5 respectively deal with technology assistance in these domains. This volume suggests that leveraging technology for land administration should be a key focus area, including for better justice. It has a high potential to improve system performance, as the use of technology in taxation shows notwithstanding the initial hiccups and ongoing iterations for further improvement. Chapter 7 presents an approach for avoiding disputes using smart contracts, thus strengthening the Rule-of-Law infrastructure. It is reflective of the promise of technology in reducing the judicial burden and facilitating law enforcement.

Chapter 8 takes a different flavour and takes the reader through a journey on forensic technology, essentially digital forensics, and how it can play an important role in the criminal justice system as well as national security. It highlights that scientific breakthroughs in emerging branches of forensic sciences such as digital forensics, CCTV forensics, drone forensics, and multimedia forensics are a boon for the legal ecosystem. Chapter 9 follows it up with a discussion on technologies that determine guilt or innocence and thus help significantly in the law and justice processes. It argues that forensic science and behavioural science are two sides of the same coin since the former scrutinises forensic clues at the scene of a crime, while the latter seeks to elicit stored crime scene information from the mind-body realm of the living. It also points to the use of technologies such as Vocal Stress Analysis (VSA) and Electroencephalography (EEG), including in high-stakes law and justice situations. Finally, this part concludes with another broad-brush analysis of emerging technologies and national security, especially in terms of the armed forces. The chapter not only makes the reader aware of this high-profile and high-impact domain but also offers suggestions on focus areas for the future in the context of the present preparedness.

The third part of the book is all about the third A of Analytics, and is titled "Data, Data & More Data". Each chapter in this part presents a story of

how data, through analytics based on Artificial Intelligence (AI), Operations Research (OR) and other relevant disciplines, can be used to address the myriad challenges in the law and justice space. The first chapter here, Chapter 11, starts with the collection of data. It describes MCA21, a digital recordkeeping system introduced by the Government of India. It indicates its current success, and usage across sectors, and provides suggestions for its revamp to take it to the next level. The next two chapters, 12 and 13, provide a practitioner's perspective on the use of AI for governance and law enforcement. While highlighting the strengths and possible benefits, they point to key issues that must be resolved for the solutions to be just and effective. These issues include standardisation and ratings of AI systems, privacy violations and lack of adequate regulations around the same.

The next couple of chapters deal more with the judicial side of the ecosystem. Chapter 14 provides a thorough and conceptual description of AI for legal data mining that can be used by researchers and practitioners alike. Chapter 15 deals directly with justice delivery itself, presents how AI can aid the process, but also emphasises the caveats around biased, discriminatory or sheer incorrect outputs. Chapter 16 discusses the various ways in which the discipline of Operations Research (OR) can address the problems of this space, and chapter 17 a specific optimisation-based application of OR to the justice system. Chapter 18, the last chapter in this part, provides a much-needed reality check by bringing forth the key pitfalls of data analysis. It indicates how, unless one is careful, data analysis and by extension data-based solutions such as those from AI, can be misleading and just plain manipulative if that's the intention of the analyst.

The fourth and final part of the volume gives an overview of how the three A's can impact institutions. Aptly titled, "Institutional Focus", it begins, in chapter 19, with the issue of building capacity for the introduction of technology in justice. It argues that while the private sector can build such capacity through innovation, efficiency and human resources, the accompanying sovereignty challenges must be addressed. The next chapter presents how startups can disrupt the legal tech space and play a crucial role in supporting the state to address the first A of this book, the big question of access. Chapter 21 deals more directly with the institutions and, through the case of the National Company Law Tribunal (NCLT), illustrates how scientific methods can make them more effective by supporting better capacity planning.

For the benefit of analytics and other technology to reach the masses, the institutions of the state need a transformative change. They need to enable the private sector to participate and unleash their power, while the state focuses on building the right infrastructure and regulations. How such a futuristic vision can be realised forms the subject matter of chapter 22 which concludes the volume.

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ACCESS

CHAPTER 2

Access to Justice and Great Digital Divide in the Indian Judicial System

Vikramjit Banerjee and Sarthak Raizada[1]

"I should like to be able to love my country and still love justice."

– Albert Camus, French philosopher

SUMMARY

- India has one subordinate court judge for 50,000 citizens;
- The staggering 'justice gap' in the country became more conspicuous with the outbreak of the COVID-19 pandemic;
- The digitisation of India's legal system is more complex than can be imagined, though several projects undertaken before the pandemic sought to bring the courts up to speed;
- The 'connectivity divide' strikes at the very root of a 'fair and effective adjudicatory mechanism';
- The real challenge before a hybrid model of justice is the inclusion of stakeholders who do not have the same level of access to technology and digital infrastructure.

Introduction

Justice lies at the heart of inclusive, representative, and accountable governance. It represents the central tenet of the rule of law that every society strives to achieve. The idea of justice has become so important to the global polity that the United Nations Sustainable Development Goals (SDG), in particular, SDG 16.3 implores

all countries to 'promote the rule of law at the national and international level and ensure equal access to justice for all' by 2030. Despite the aspirational idea underlying SDG 16.3, a study conducted by Pathfinder's Task Force on Justice found that approximately 5.1 billion people across the globe — two-thirds of the world population — lack meaningful access to justice. According to the United Nations Statistics Division Report 2018, SDG 16.3 recorded the slowest growth among all the goals and targets of the Sustainable Development Programme.

In India too, the situation is not very different. The staggering disparity in the high population per subordinate court-judge ratio, which currently stands at 50,000 citizens per judge, demonstrates that the 'justice gap' in our country is significant. The effects of this justice gap were felt more acutely during COVID-19 as India faced massive challenges in providing access to justice to its huge populace. It made the task of achieving access to justice for citizens as set out in SDG 16.3 even more challenging since there was much uncertainty over the short and long-term impact of the pandemic. All institutions and actors responsible for justice delivery — be it the government, judiciary, police, prisons, or legal aid — struggled with addressing the justice gap. The onslaught of COVID-19 thus had a great impact on every sphere of governmental activity, in particular, access to justice. It compelled all branches of government to respond to the unprecedented crisis with extraordinary measures.

In the context of the judicial landscape, the Indian judiciary's greatest challenge was striking a balance between the proper functioning of courts and the public health emergency caused by the pandemic. Indian courts quickly embraced technology and organised remote virtual hearings to resolve cases. To mitigate the impact of the pandemic on the administration of justice, several procedural reforms were implemented, including e-filings, exemption from filing sworn affidavits, and the extension of the limitation period. While the adoption of technology and procedural measures staved off a total collapse of the judicial system, the pandemic highlighted the divide that plagues our legal environment.

Apart from exacerbating the long-standing crisis of an overflowing court docket, it exposed the beleaguered state of the Indian judicial system. The backlog of pending cases increased exponentially at all three levels of our judicial system — the Supreme Court, high courts, and district courts. The establishment of virtual courts became a great impediment to access to justice for lawyers and litigants who could not afford to onboard a digital infrastructure.

This paper seeks to investigate the impact of measures taken to digitise India's judiciary and allow the masses access to justice. First, this investigation would include a review of the nature and state of India's judicial infrastructure and the legal fraternity in the days leading up to COVID-19 in terms of technology. Here, the authors will examine the technological changes introduced in India's judiciary and the significance of these changes on the digital divide and access to justice.

Second, this paper will assess the impact of post-COVID-19 reforms implemented to digitise the Indian judicial system and critically evaluate them to

understand why these reforms did not achieve the desired success. This was primarily because our judicial system was unprepared to go digital overnight. This stage would argue that the judicial reforms introduced were not modelled on a people-centric approach to access justice. Instead, they widened the already-existing digital divide and made the judiciary, less accountable and less democratic.

Following these developments, this paper will eventually propose solutions to bridge the digital divide affecting our judicial and legal environments following the principles that facilitate access to justice. For the sake of clarity, the authors would like to state that this paper will only discuss the concept of access to justice in the context of a digitised judicial system. It does not attempt to discuss how the principle of access to justice has evolved and been applied in other contexts that have no bearing on its meaning about judicial institutions.

Digitising Access to Justice: A Legal Context

Innovation in technology has profoundly revolutionised and re-engineered the functioning of the legal sector through the development of e-documentation, e-notices, e-courts, legal search engines, online methods of dispute resolution, and AI-based predictive analysis tools. The indubitable purpose of these developments is to make the task of rendering legal services more efficient, productive, and strategic. For instance, legal web search engines such as SCC Online, Westlaw and Manupatra, enable lawyers to pursue legal research by accessing an enormous pool of judgments delivered in India and other jurisdictions. Artificial Intelligence (AI) has been deployed to develop a predictive analysis programme in the US that could anticipate the outcome of US Supreme Court cases with 70 to 75 per cent accuracy.[2] A similar AI prototype named eLegPredict has been developed for the Indian context to anticipate the outcome of Indian Supreme Court cases.[3] While many of these developments may be focused on improving the delivery of legal services to those with the financial means to pay for them, very little attention has been paid to improving access to justice for ordinary citizens who face social, economic, and cultural challenges every day. To overcome these barriers faced by the socio-economically disadvantaged, it is essential and non-negotiable to guarantee access to justice for these groups.

Under the Indian Constitution, the right of access to justice is considered to be an integral facet of the right to equality and the right to life, guaranteed by Articles 14 and 21 of the Constitution. There is a long and unbroken chain of decisions, which has recognised the inviolability of this right as a constitutional imperative.[4] In *Anita Kushwaha v. Pushap Sudan*,[5] the Supreme Court fleshed out the meaning and content of the right of access to justice and ruled that it comprises four basic but essential parts:

(i) The State must provide access to an effective adjudicatory mechanism;
(ii) The adjudicatory mechanism must be reasonably accessible geographically;

(iii) The adjudication process must be speedy; and
(iv) The litigant's access to the adjudicatory process must be affordable.

These main aspects of access to justice serve as the foundation for an independent, transparent, accessible, accountable, and democratic judicial institution. These principles are regularly interpreted and applied by Indian courts to protect litigants' rights and administer justice in accordance with our constitutional goals.

In the context of COVID-19 and the concern over the physical functioning of courts, the Supreme Court stepped in to ensure access to justice by embracing technology and conducting digital hearings. Within a few days of India going into complete lockdown, the apex court issued a series of directives in the exercise of its powers under Article 142 of the Constitution - an extraordinary power - to tide over the crisis caused by the pandemic in administering justice.

According to the court, the adoption of technology was its 'duty' and not 'discretion' and it was imperative to do so in 'furtherance of the commitment to the delivery of justice'.[6] The court's endeavour to prevent the pandemic from widening the justice gap was therefore both speedy and commendable. India's prompt implementation of digital hearings was in sync with its counterparts in other regions of the world[7] and the recommendations made by international bodies such as the Inter-American Commission on Human Rights, regarding the continued functioning of courts and the duty of judges to uphold the rule of law during the pandemic, is noted as follows:

> "…access to justice is a fundamental pillar of democracy, the exercise and functioning of which cannot be suspended or limited. This implies that the current emergency cannot be used as a reason to suspend judicial proceedings that guarantee the exercise of rights and freedoms, particularly those that seek to oversee or check the actions of authorities during this time. It is therefore essential that states ensure there are suitable, flexible means available for filing appeals that seek to oversee and keep check on provisions and rulings that are issued during emergency situations. In this regard, all public institutions must be able to oversee and keep check on each of the temporary measures adopted that suspend or restrict rights. States must also adopt measures to protect judicial personnel and ensure judicial services continue to operate."

The pandemic thus necessitated striking a balance between access to justice and the public health emergency by ensuring courts functioned and guaranteeing the right to life and health, of all stakeholders.

While the adoption of technology by our judicial institutions has transformative potential in realising access to justice for all, especially in the context of COVID-19, the digitisation of our judicial system is more complex than can be imagined. The technological solutions implemented so far do not promote access to justice for people or empower them in a manner that increases their agency. As Stephen Golub argues, 'legal empowerment is necessary to give

people the agency to make choices and assert their rights better by taking control of their own lives'.[8]

Some of the challenges in developing people-centric technology solutions are funding constraints, a lack of innovation, and limited resources. There is a lack of proper methodology for integrating empowerment and accessing technology, as well as the absence of data-driven monitoring of the impact of technology on people. Against this backdrop, the authors will now discuss the implementation of technology to digitise the judicial system before the pandemic, whether those changes had any impact on access to justice, and whether they resulted in better outcomes for stakeholders. This section will also discuss measures the Supreme Court could have taken before the pandemic to test the digitisation of our judicial system by adopting a system of virtual courts on a pilot and a limited basis.

Digitisation Reforms before COVID-19

We first begin with a brief summary of the digitisation reforms before the pandemic hit the world.

(a) The e-Courts Project

The initial steps taken to integrate technology with our judicial systems such as the automatic process of preparing the cause list, digitisation of court orders and their publication on the internet did not further the access to justice. This limited use of technology did not contribute to democratising our courts by enhancing the interaction between people and the judicial process.

Hence, in 2005, the e-Courts Project was launched in a collaboration between the Indian Supreme Court and the Union Government under the 'National Policy and Action Plan for Implementation of Information and Communication Technology in the Indian Judiciary – 2005'. The object and purpose of the e-Courts Project was to make the judicial system more accountable and transparent by 'providing speedy, qualitative and cost-effective justice, reducing harassment and corruption' through Information and Communication Technology (**ICT**).[9]

The most significant aspect of the e-Courts project was that the structural composition of the body responsible for its implementation was grounded in multi-sectorial participation. The project pooled resources from the higher and subordinate judiciary, which included judges of the Supreme Court and high courts, judicial magistrates, civil judges, administrative staff, the executive branch and ICT experts and advisors. The e-Courts project recognised that inclusive institutional participation, domain expertise and technical assistance are essential for fostering innovation. The authors call this collaborative framework the 'innovation equity' where different institutional actors come together and make their respective contributions to the formation, development and progress of an initiative.

The e-Courts Project, thus, overcame one of the major criticisms levelled at the legal sector, which is that it lacks innovation because it is 'inward looking' and functions like a 'guild-like' system. This does not allow people from outside the profession to participate in its evolution and development.[10]

However, the e-Courts Project had shortcomings as the innovation equity granted to it did not include the participation of civil society, which is the most important stakeholder for ensuring a people-centric judicial system. For the success of such institutions, we need to create an environment that supports innovation.

To create conditions that push and propel innovation, there must be an all-encompassing model. This model should utilise the convening power of the public sector, harness the innovative capacity of the private sector to increase its scale and impact, invite participation from civil society to introduce inclusive perspectives and get academicians on board to weave these strands together.[11]

Given the lack of civil society participation in the formulation of the e-Courts Project, reforms that were capable of addressing the needs of the people, especially the socio-economically disadvantaged groups, could not be absorbed. Instead of following a rights-based and people-centric approach, the entire architecture of the e-Courts Project was evolved by merely looking at the procedural laws and rules prevalent in the country.

The formation of the initiative was based on a set of laws and rules that were inherently complex and difficult to comprehend. This made the e-Courts Project a typical top-down institution-based reform, despite being an ICT-based access-to-justice initiative.

In this context, the author will now discuss the reforms in the e-Courts Project initiated to alleviate the justice crises and its subsequent failure to achieve the desired results due to the absence of a people-centric and democratic approach to access to justice.

(b) ICT Reforms under the e-Courts Project

As generally understood, ICT-based initiatives include explanatory websites and mobile applications, instructive videos, legal search engines, and encyclopaedias.[12] They carry an inherent potential to facilitate access to justice that comports with its modern paradigm. Under the e-Courts Project, several ICT-based measures were introduced for the computerisation of district courts and subordinate courts and the upgrade of the infrastructure of the Supreme Court and high courts. One of these measures is the Case Information System for the district judiciary –- a software that digitally catalogues the details of a case including the case number, date of hearing, orders passed, and the daily cause list.

The CIS Software is interlinked with the national e-Courts website and mobile application from which the lawyers and litigants can directly access information about their cases.[13] Other measures implemented under the e-Courts Project include the National Judicial Data Grid for high courts and district courts, which consolidates data on pending and disposed of cases across the aforementioned

courts.[14] The data on the National Judicial Data Grid is updated on a real-time day-to-day basis.[15] Data uploaded on the National Judicial Data Grid is used by the government for formulating policies about the judiciary.[16]

Other measures include increasing (Wide Area Network) WAN Connectivity for courts across the country, ICT training and awareness programmes for judges and the administrative staff of the courts, JustIS Mobile App for judicial officers to effectively manage their caseload, and the installation of kiosks within the court premises to provide litigants with daily order sheets without approaching court officials. With the e-Courts Project entering its third phase, the progress of ICT-based initiatives in India's courts appear to be a continuous process, as seen by the current computerisation, cloud computing, digitisation of case data, and the constantly expanding provision of e-Services. Given that India has over 19,000 district and subordinate courts, it is easy to understand why this is a complex task.

It is important to understand that ICT-based justice initiatives are modelled to bring our justice delivery system closer to people. ICTs, because of their general accessibility, show promise in democratising the typical top-down centralised state-building process[17] and building on a bottom-up approach to justice initiatives. These initiatives include the 'needs of civil society and local communities as beneficiaries of the justice system, which are the driving force behind the reform agenda'.[18] The initiatives are very successful in defeating geographical barriers faced in areas where conventional justice initiatives cannot be taken. Equally, ICTs can facilitate communication by their horizontal and vertical integration with various actors, who are part of the justice delivery system.

For instance, several districts in Telangana have established interoperability between the Case Information System and the Integrated Criminal Justice System which allows bipartite exchange and transmission of information between the court and the police.[19] This integration allows the police to share First Information Reports (FIR) and chargesheets with the courts and, in turn, the courts can share bail orders with the police on a real-time basis. This is a revolutionary step in the administration of the criminal justice system, which is otherwise a victim of inordinate delays, heavy corruption and oppressive bureaucracy. The interoperability platform also found judicial recognition from the Telangana High Court in *K. Mathamma v. The State Of Telangana*[20] judgement.

The digitisation of the judiciary through ICTs is a reasonable undertaking, but there are some inherent problems and challenges with the e-Courts Project, and they must be recognised and addressed. Union Law Minister Kiren Rijiju in Lok Sabha recently stated, "As of 28 March 2022, 4,09,85,490 cases were pending in district and subordinate courts. Meanwhile, 58,90,526 cases were pending in high courts." This problem of an ever-exploding docket is not a recent phenomenon, but one that has paralysed our judicial system for decades. Given the pendency of cases, naturally, the most affected stakeholder group is the general populace. It is, therefore, imperative to measure the impact of ICT as part of the e-Courts Project and see how they have fared in delivering access to justice to our citizens.

The ICT-based justice initiative can be assessed against four broad parameters, some of which have evolved about the access to justice jurisprudence under the Indian Constitution.[21] The parameters are awareness, availability, accessibility, and affordability. The awareness element relates to the knowledge of the people about the use of ICT to enforce their rights. In this context, Phases I and II of the e-Courts project lacked a robust institutional structure that informs and educates people about their rights. Generally, interventions that allow people to be informed about the judgments and decisions of our constitutional courts on fundamental rights and freedoms are useful. For instance, the legal awareness programmes implemented in the reconstruction of post-war Afghanistan after the fall of the Taliban included the publication of a gratis database of select, important, cases on the Afghanistan Supreme Court website. More importantly, the website was hosted in three languages — Dari, Farsi and English — to target a wider audience.

The second aspect, which is availability, deals with geographical proximity, infrastructural capacity and institutional data management of ICTs. The Subordinate Courts of India: A Report on Access to Justice 2016, says, 'people residing in large and hilly states often have to undertake long and arduous journeys to reach courts'.[22] ICT-based justice initiatives implemented in Phase I and Phase II of the e-Courts Project focused on improving digital infrastructure without increasing the number of courts at the local level to mitigate geographical challenges. Therefore, the pre-existing problem of geographical barriers to justice was never addressed.

Availability of ICTs under the e-Courts Project is also hindered by poor technical infrastructure including the lack of pan-India broadband connectivity.[23] As per the 2019 Report on the National Broadband Mission, the rural broadband connections are just 27 per cent.[24] The main reason for poor broadband connectivity in rural areas is lower infrastructural capacity and population density. Even the Objectives Accomplishment Report of the e-Courts Project: Phase II, acknowledges[25] that WAN connectivity has not been extended to all courts in the country.

The low broadband penetration in rural and remote areas results in digital exclusion and disables the courts from accessing available IT systems.[26] In view of the poor infrastructure and the resulting digital divide between urban and rural areas, it is difficult to envisage how the e-Courts Project could have successfully delivered access to justice to remote parts of the country.

The discrepancies in the data entered into the Case Information System Software[27] also indicates that without proper institutional conditions, long-term sustainability of ICT-based justice initiative may become a challenge.[28] The sampling data collected from the Case Management System revealed that several data entries such as data for final orders (approximately 70 per cent), values for date of filing, last date of hearing, and in some cases, the entire case history, were missing.[29] The data deficiency, therefore, retains the pre-digitisation status quo where litigants are not able to derive the full benefit of the ICT Systems. The

root cause of incorrect data entry seems to be the absence of a comprehensive quality control system to regulate the entry and quality of data.

With a gigantic caseload burdening our judicial systems, there is no doubt that some aberrations are inevitable; however, it is imperative to have quality control conventions of sustainability. Although the Objectives Accomplishment Report as per Policy Action Plan Document: Phase II, notes that training programmes for change management are regularly conducted, there is no clarity on the nature of quality control training imparted to officers and staff. The test of accessibility to the justice system is a measure of the people's ability to use ICT systems and enforce their rights. Therefore, the fundamental question that arises in such cases is whether access to justice by using technology is a remote possibility for those lacking digital literacy.[30] Is the digital divide preventing vulnerable sections from navigating the ICT systems?

The e-Courts Project did attempt to bridge the digital gap through measures such as the publication of e-Court guidance manuals — in more than 14 languages — to help users navigate the e-Court services mobile application. However, this text-based ICT system also has its own shortcomings. There was no visual and speech software, which could have improved a user's interaction with the website.

The website therefore catered to a small group of literate or partly literate groups. Similarly, the internet kiosks installed in court premises to enable seamless transaction of business for lawyers and litigants is problematic because both lawyers and litigants often lack digital literacy.[31] Where problems of technical or digital literacy exist, a people-centric approach to access to justice advocates that ICT solutions have to be re-engineered and modulated in accordance with the cognitive and literacy levels of users.[32]

(c) Digitisation of the Supreme Court before COVID-19

Before COVID-19, several measures were implemented to digitise the Supreme Court. For instance, e-filing of cases (2007),[33] the introduction of the Integrated Case Management Information System (ICMIS), dissemination of information to stakeholders, and issuing e-notices to advocates on record, litigants, and government departments.[34] Also, the development of Supreme Court Vidhik Anuvaad Software (SUVAS), an artificial intelligence software, translated Supreme Court judgements into nine languages.[35]

On the awareness front, SUVAS is a commendable step in the direction of increasing legal literacy among citizens. It is one of the first pilot projects that kicked off the use of artificial intelligence in the judicial sphere. While the intention behind SUVAS is well-received, as awareness programmes are one of its legal empowerment initiatives, its real outcome is unclear. One of the most fundamental aspects of integrating technology with legal empowerment and access to justice is whether the product deploys a solution-based approach by improving outcomes for its users.[36] In this context, there are no field studies that measure SUVAS' role

in generating legal awareness. The availability of judgments in multiple languages does not automatically ensure that less literate or illiterate groups would be more likely to read as well as understand the translated judgments. It is often difficult for lawyers to gauge the true import and significance of judgments rendered by the Supreme Court.

Another notable initiative to digitise and create a paperless Supreme Court was the ICMIS. While inaugurating ICMIS in 2017, Hon'ble Chief Justice JS Khehar said that the system 'will electronically pick up records from trial courts and high courts' and the appeal will have to state the grounds for challenging the impugned judgement.[37] The project did not progress as planned and after going paperless for a few months on a pilot basis, the court resumed using physical copies of files and petitions.[38] The push for the ICMIS e-filing was also met with resistance from various members of the bar, who believed that the system was not error-free[39] and demanded that manual filings continue.

(d) Article 32(3) and the geographical alienation of the Supreme Court

India is a large country and the world's most populous nation which indicates that geographical proximity is a major hurdle in the access to justice. The Supreme Court observed that proximity to the court is a factor that contributes to the essence of access to justice.[40] The court held that distance as a factor not only affects accessibility to justice but also hampers affordability and timely adjudication of justice.

The regional disparity concerning access to justice is also observed in the study conducted by the Vidhi Centre for Policy[41] which concluded that 'the centralised structure of justice dispensation, by geographically locating, and limiting the Supreme Court to the national capital, has resulted in serious issues of accessibility for litigants who wish to approach the court for redressal'. Statistically speaking, the right to appeal, an inherent part of access to justice, has only been utilised by litigants from three high courts that are in close proximity to the apex court.[42]

It is in this context that the authors would like to discuss the relevance of Article 32(3)[43] of the Constitution which empowers the Supreme Court to establish a seat in other parts of the country to adjudicate upon matters within the powers of the court. The relevance of the provision to set up additional seats of power was foreseen by the makers of the Constitution.

The Vice-president of the Constituent Assembly, HC Mookerjee, stated that 'the provision to delegate the powers of the Supreme Court, in certain cases to other courts, is a welcome move. It is a blessing for people from distant places such as Assam and Coorg who will find it extremely difficult to approach the Supreme Court, which is bound to be located somewhere in the United Provinces or Delhi'.[44] However, the Supreme Court even after being nudged by multiple representations[45] has fallen short of delivering access to justice to litigants residing in distant areas. The court has neither, in principle nor in practice, initiated any measure to bridge the geographical gap by invoking Article 32(3).

Digital courts, forms of video-conferencing, and online systems could have afforded an opportunity to the Supreme Court to bridge the geographical divide and 'improve timely access to court proceedings'[46] and 'ameliorate the national dislocation between courts and the communities' to at least fulfil the spirit of Article 32(3).

The Supreme Court could have, on a trial basis, set up virtual courts to adjudicate routine matters like matrimonial disputes, interlocutory applications, vacation of stay, domestic violence cases, and bail and interim bail matters, among others. However, virtual courts were never envisaged until the pandemic posed a serious threat to the dispensation of justice in our country. A pre-existing pilot project on these lines may have allowed the court to test the structural inequalities and socio-economic barriers people face in approaching the court. The project could have provided a foundation, and perhaps, helped fight the deleterious consequences of the pandemic on the justice system.

The above discussion and analysis reveal that ICT-based justice initiatives of the Supreme Court and e-Court's Phase I and II did not act like a silver bullet to address the justice gap. On the other hand, they exposed the infirmities of the system in providing access to justice to the vulnerable population as well as the vast digital divide that had already engulfed our judicial institutions, lawyers and ordinary citizens, even before the onset of the pandemic. In this context, it becomes important to turn our focus on the digitisation measures implemented after the pandemic, particularly digital hearings, and highlight the scale of their adoption.

Digitisation reforms after COVID-19

(a) Digital Hearings

The advent of the novel Coronavirus was the biggest challenge for the Indian judicial system in its role of administration of justice. The social distancing norms to prevent the spread of the virus required that access to courts, which are populated by judges, lawyers, and litigants, is regulated to minimise physical interaction. As a result, our judicial institutions had to formulate rules and procedures, which balanced the access to justice with the countervailing demands of a public health emergency. To maintain this balance, detailed standard operating procedures were issued by the Supreme Court,[47] high courts[48] and district court for filing, listing, mentioning, and hearing of cases.

In the context of digital hearings, 1,43,626 cases were heard by the Supreme Court along with a footfall of 12,01,443 participants through video conferencing between March 2020 and September 2021. This feat was accomplished by 6,484 benches, which disposed of 34,515 cases during the above-mentioned period.

The transition from physical to virtual hearings was not seamless, but it was other stakeholders such as lawyers and litigants lacking access to internet

connectivity and requisite infrastructure, who felt the actual tremors of the digital divide and the justice gap. As noted by the 103rd report on the functioning of virtual courts,[49] this digital divide has three aspects — access divide (lack of infrastructure), connectivity divide (lack of broadband connectivity) and skill divide (lack of technical literacy). These aspects were more prevalent in rural areas. This deep-rooted digital inequality was echoed by various stakeholders ranging from the bar council to the Chief Justice of India.[50] Their primary concern was the inability of lawyers to change in accordance with the digital wave, which robbed them of their livelihood, as well as denied access to justice to litigants in rural and tribal areas of the country.

This inability arises from the large pay gap between the earnings of advocates in the legal profession as evidenced by a survey conducted by the Vidhi Centre for Legal Policy.[51] The pay scale, extremely low in semi-urban and rural areas, renders the technological change ushered by the judiciary, expensive to lawyers. It goes against the principles of the right to access justice if the judicial system expects low-income lawyers to equip themselves with the required digital infrastructure and technical know-how. This results in a scenario wherein litigation as a profession is dominated by a group of economically privileged advocates who have the required access to digital tools. The resultant rift between advocates was evidenced by the submission made to the Supreme Court by two groups of lawyers, one seeking the continuation of a hybrid court system, and the other for the resumption of physical courts.[52]

The digital divide was exacerbated by the infrastructural deficit at the institutional level, which proved to be more cumbersome at the lower levels of the judiciary where both courts and lawyers were not equipped to function virtually.[53] The preliminary findings conducted by the office of the Chief Justice of India (CJI)[54] with regard to the functioning of the trial courts, draw our attention to the alarming picture of inadequate technical infrastructure, in the subordinate courts. The findings state that only 27 per cent of these courtrooms have a computer on the judge's dais, while 10 per cent do not have the minimum required internet access to function virtually. Poor digital connectivity paves the way for a plethora of problems ranging from audio/video disruptions to loss of broadband connections.

In a study conducted in the UK, a survey found that 44.7 per cent of the respondents experienced technical glitches during the course of digital hearings and perceived that physical appearance in courts offers better participation than digital hearings.[55] Recently, the CJI expressed his displeasure at the new digital hearing software of the Supreme Court.[56] In the above context, the connectivity divide strikes at the very root of a fair and effective adjudicatory mechanism, an important aspect of access to justice. The fair and effective adjudicatory mechanism encapsulates an inextricable relationship between access to justice and public participation[57] and mandates that the adjudicatory mechanism must facilitate the full and effective participation of the parties in legal proceedings.

In the context of digitisation, this relationship entails that 'technologies must be built and deployed ethically to enhance, rather than compromise, user participation in courts, while simultaneously upholding fundamental legal principles such as fairness, impartiality and access to justice'.[58] Therefore, a study of the type and quality of digital hearings is imperative in understanding how existing structural inequalities and power imbalances affect access to justice and substantive outcomes in digital justice projects. However, no such study has been conducted on this front in the Indian context and it is recommended that ICT-based justice initiatives are developed keeping in mind the virtual court experiences of lawyers and litigants.

(b) FASTER — Fast and Secured Transmission of Electronic Records

After coming across several instances relating to the non-release of prisoners despite the grant of bail under the orders of the Supreme Court, suo moto proceedings were initiated by the court under Article 32 of the Constitution for creating a mechanism, which swiftly transmits the bail orders of the court to the concerned authority.[59] Known as FASTER, this software has been developed in collaboration between the Supreme Court Registry and the National Informatics Centre. FASTER has a transformative potential for the criminal justice system and due process, and the rights of undertrial prisoners in the country. While the project is thoughtful, its implementation is likely to be hindered by factors such as internet penetration in rural areas.

A review of the post-pandemic measures taken to digitise judicial institutions demonstrates that the ICT-based justice initiatives have theoretically immense potential to advance access to justice. However, the success of these models can be ensured only when their development is done in the context of specific institutional and societal conditions.

Possible Solutions for the Future

In a report published by Engine Room,[60] it was emphasised that in developing technology solutions it is critical to take into account the feedback of people who are interacting with the technology. This broad formulation of the solutions we propose to offer would allow us to focus on the needs of the people, the context in which those needs are experienced, and what measures can be taken to address those needs.[61] In pith and substance, the solutions would be outcome-based, consistent with the principles of access to justice and would cater to the needs of the people.

As indicated by the Supreme Court e-committee model rules,[62] the post-pandemic future of the judiciary shall be a hybrid of physical and virtual courts. The implementation of this hybrid model must not be at the cost of exclusion of those stakeholders who do not have the same level of access to technology and

digital infrastructure. As yet, there is no concrete evidence to prove that virtual courts are successful.

Although some scholars suggest that a forum is irrelevant as long as there is a fair and democratic process, their findings might not be directly applicable in the Indian context.

As the first step in bridging the digital divide, the authors recommend a judicial census be made part of the national census conducted under the Census Act, 1948. The questionnaire of the judicial census should be developed on the basis of a slightly modified version of SDG Indicator Metadata 16.3.3, which collects data on the number of persons who have experienced a dispute over the past two years, and accessed a formal dispute resolution, by type of mechanism.

The modified indicator would collect data on the number of people who experienced a dispute over two years but could not secure access to courts because of technological constraints. The advantages enjoyed through the implementation of the indicator are that they are people-oriented. It gives a metric of the problems from the perspective of the people who faced them and can be easily incorporated into national censuses in the future.

Based on the data collected and the categorisation under the heads of geography, income, and identity distinctions — collaborative and innovative models of the scale required can be developed — in accordance with the specific needs of each categorisation. Suitable amendments will have to be made to the Census Act 1948 through parliamentary intervention. The poor state of digital infrastructure was a major reason for the failure of the implementation of technological changes in the judiciary. The sudden decision to go virtual resulted in the exclusion of areas from the judicial process, which had inadequate digital infrastructure.

As noted by former Chief Justice of India NV Ramana, adequate judicial infrastructure is critical to addressing the massive backlog of cases in the judiciary and providing timely access to justice. As a result, establishing a National Judicial Infrastructure Corporation (NJIC) is critical. The NJIC, which can include the CJI, SC judges and Chief Justices of High Courts, and finance secretaries from both the centre and the states, will act as a coordinating agency in lowering bureaucratic barriers. Its intended purpose would be to monitor and respond to logistical issues. It could also serve as a point of contact for various ongoing government schemes and missions, bringing them under the purview of the judicial system. Timely coordination with the National Broadband Mission, which envisages universal access to broadband services, would equip the judicial infrastructure with much-needed internet connectivity[63]. The NJIC should also support civil society participation — both in the form of eminent members who have expertise in law, technology, infrastructure, and economy — and direct participation of ordinary citizens. Participation can be made possible through public hearings and/or invitations of objections/suggestions on policy proposals of the NJIC. Of course, the establishment of the NJIC would require

dedication of financial and manpower resources, but this is a non-negotiable cost in securing access to justice for all.

Apart from making institutional and societal changes as discussed above, there is also an emerging need to revamp the curriculum in law schools, by incorporating the rapid and transformative changes occurring in the digital space, into our legal education. For this, it is crucial to incorporate an ICT perspective in the learning experience of our students, which can be achieved by creating platforms that permit greater interaction between law students and professionals from other domains. This pedagogy is completely absent from our current legal teaching which is traditionally dominated by discussions strictly about law and no other fields.

Some inspiration in this regard can be drawn from the 'Privacy Legislation in Practice: Law and Technology' course taught jointly by faculty from the Massachusetts Institute of Technology (MIT) and Georgetown University Law School. The course involves a weekly joint interaction between law students from Georgetown University and engineering students at MIT to discuss emerging technologies and their impact. The course encourages students to approach problems from a multidisciplinary perspective and present policy solutions, which can serve as actionable inputs for government actors.

These solutions are not meant to be a one-stop-shop for all the problems that arose in relation to the digitisation of the judicial framework that dispenses justice. It only provides a few milestones in a long journey that our institutions must cross before they can harness the true potential of digital technology for the benefit of people.

Conclusion

The biggest accusation against the legal profession is that it remains averse to change. This is evident from the delayed implementation of the vision laid out in the e-Courts Project to digitise the Indian judicial institutions. It was only the onset of COVID-19 that generated a widespread debate and push for digitisation of the judiciary. The judicial system managed to go virtual, but as discussed in this paper, the under-prepared transition came at the cost of alienating justice seekers. The transition placed the entire burden of adjusting to the new institutional setup on the most vulnerable and marginalised sections of society.

While the situation was distressful and unfortunate, the judiciary has reacted constructively to suggestions made by various stakeholders in rebooting the institutional design that makes it consonant with a people-centric approach to access to justice. This is reflected in the vision and roadmap for Phase III of the e-Courts Project which enables data-based decision-making for building a digital judiciary and creating conditions, that are predictable and transparent for end beneficiaries in the food chain of justice. More details on this, with some remarks to put this vision into perspective and practice, will be found in the last chapter of this volume.

Editors' Comments

While this chapter highlights issues with access to justice, with inputs on and details of possible interventions by the state, the citizen response has led to the emergence of *justice makers*: a new class of groups or individuals who work with local communities and authorities to smoothen legal processes and thus enhance access to justice, including its digital version. The next chapter titled "Justice for One and All: New Enablers for Legal Redressal" introduces and delves into further details of this interesting trend.

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CHAPTER 3

Justice for One and All: New Enablers for Legal Redressal

Keerthana Medarametla, Sachin Malhan and Rashika Narain

"You may never know what results come of your actions, but if you do nothing, there will be no results."

– Mahatma Gandhi

SUMMARY

- India is seeing a rise in the number of 'justice makers'—individuals or groups who are working with local communities and authorities to smoothen legal processes;
- At the core of this kind of work is the desire to make the common people aware of their legal rights as well as the benefits and entitlements they are eligible for;
- The 'justice makers' are not always students or practitioners of law;
- They are usually connected with a public platform—such as community radio or a rights organisation;
- The 'justice makers' try to bridge India's digital divide by taking the law and its processes to the doorstep of the average Indian.

Introduction

Archana is from Samastipur, Bihar.[1] The 19-year-old college student's routine is slightly different from most other youngsters of her age. "There is a lot of unemployment in Samastipur and people there are in desperate need of the

benefits of the MNREGA (The Mahatma Gandhi National Rural Employment Guarantee Act 2005)", Archana says. The plight of the wage workers around her stays on top of her mind as she goes through her day. A volunteer with the Jawahar Jyoti Baal Vikas Kendra in Samastipur, Archana is a regular listener of Mobile Vaani, a community media platform. Started by Gram Vaani (a participatory media platform), Mobile Vaani (a voice-based social network for rural India) is Archana's window to the world of problems that people in her region face. One pressing issue is that of application for work under the MNREGA. The programmes and discussions on Mobile Vaani first helped her understand the problems workers face in filling out the forms needed to obtain job cards and/or register their demand for work. This moved Archana to act on this issue, instead of just being a listener. Using the forwarding features built into the Mobile Vaani platform, she shared the grievances with MNREGA officials such as the rozgar sewak and the block programme officer. Her persistence made the Rozgar Sewak commit to holding a Rozgar Diwas at the Panchayat Bhava every Wednesday, in order to help people register under the employment scheme. This is over and above the mandate for a Rozgar Diwas once a month. Just promises, however, are not enough for Archana, who tweaked her daily routine to ensure that the officials kept their word. Her work is far from over as she continues to look out for people in Samastipur. "*Haan, college se time nikalna padta hai par satisfaction bhi bahut hai* (Yes, I have to take time out of college [for all this work], but it brings me immense satisfaction)", she says.

Ajitesh,[2] a law graduate who recently turned 21, spent the better part of the summer of 2019 distributing pamphlets in Kolkata, Patna and Ranchi. The purpose was to encourage the use of mediation in resolving legal disputes. "Again and again, I had to clarify – mediation, not meditation", he recounts. Ajitesh was a part of the Indian Mediation Week, an annual mediation awareness campaign organised by SAMA, a leading online dispute redressal (ODR) platform. In 2019, upon entering his second year of college, Ajitesh decided to work as a case manager at SAMA, actively supporting and often co-mediating with those seeking to settle disputes on the platform. "I knew what I wanted to do", he says. His good work made him the lead of the Maharashtra Online Lok Adalat enabled by SAMA. The Lok Adalat handled 18,000 disputes, with the total settlement value crossing INR14 crore in just 17 days. Ajitesh and his team of fellow law students and technologists listened to stakeholders and added platform features to solve problems on the go. "It was very demanding but also very rewarding", he says.

Poonam Yadav,[3] a resident of Akolikala village in Chhattisgarh, described herself as a "regular housewife" before she started working for Haqdarshak, an organisation that makes access to Government Welfare Schemes easy by enabling last-mile access through agents as a part of their work. Despite being educated, she felt she did not do anything constructive for herself and her family. It was the desire "to do something" that propelled her to undertake the Haqdarshak

training. Post that, she would go house to house raising awareness on government schemes, registering households for government entitlements and processing their documentation for enrolment. In 2015, there were no Sukanya accounts, a Government-backed saving scheme for the girl child, in her village. Poonam was the first one from Akolikala to get such an account. Today, there are more than 400 Sukanya accounts in the village. When Poonam started out, she was hesitant, unsure if people would even listen to her. Today people from across the village invite her home for an understanding of the benefits they are entitled to. Before she joined Haqdarshak, she was merely a resident of the house in her father-in-law's name, but today, in her own words, "no matter where you go, anyone will guide you to Poonam's house".

Archana, Ajitesh and Poonam are the faces of a new tribe of actors making justice possible in India. With creativity, fresh energy and enterprise, these young 'justice makers' are bringing something new to problem-solving for justice. From being patient seekers of justice, they are transforming into smart and thoughtful leaders who understand the needs of people, mobilise communities and work with local authorities and processes to deliver justice.

'Justicemakers' can be told apart from enthusiasts or even activists by the following features:

- **Acting with agency:** They are prepared to see a problem as something worth solving. They do not stop at naming a problem, they take steps to address it. They draw from their personal pool of resources, knowledge, and skills in the process of solving the issue at hand. They recognise their own power and possibility.
- **Solving the issues around them:** Justice issues are often localised and understood in the context of the community and surroundings in which they originate. 'Justicemakers' act in that reality, i.e., what is happening around them. They feel and act on the pain and distress that they themselves and others in their community experience.
- **Bringing creativity and collaboration:** They are creative problem-solvers who find pathways for action where others see only problems. They often take others along on the journey, finding common language and energy in the face of obstacles.

Thousands of 'justicemakers', often young, are emerging all over the country. With or without a law degree, they are taking on justice issues that others have given up on. In 2021, over 870 young case managers participated in bringing the Lok Adalats online, thereby resolving 1,56,962 cases in the year amounting to over INR 9.38 crore. In Uttar Pradesh and Jharkhand, young women community leaders are working with lawyers and the Association for Advocacy and Legal Initiatives (AALI) to identify local cases of gender violence and abuse and support legal interventions. In Mollem, Goa, young people of the state rallied under the banner of the Save Mollem campaign, in order to design the best legal strategies to protect local forests; and in Shivpuri, Madhya Pradesh,

law students are working with community leaders from villages inhabited by tribes to use the best legal tools to solve issues pertaining to environment and livelihoods. As Ajitesh puts it, "*Baithe rehne se kya milega* (What can you get by just sitting around)?"

Platform power

Behind Archana, Ajitesh and Poonam are platforms such as Mobile Vaani[4], SAMA[5] and Haqdarshak[6] that are helping people realise their full potential as 'justicemakers'. The real revolution is in the *jugalbandi* (fusion/orchestration) of 'justice makers' and these enabling platforms.

Platforms are technology-powered environments that give people the option to organise differently.[7] People separated by time, place and language are able to connect in various ways and create value for each other.[8] Over time, platforms can gather a huge amount of data on their activities and interventions; this data can fuel a virtuous cycle of insight and innovation.[9] The genius of platforms lies in overcoming the transactional asymmetry of society, i.e., the inability to find someone who is willing to fulfil your needs.

The age of platforms

We are all familiar with the power of platforms in the for-profit space. Uber and Ola have generated income opportunities for drivers whilst fulfilling the commuting needs of a large number of people; Zomato and Swiggy have created opportunities for thousands of shops and restaurants to access a wider pool of consumers whilst leveraging a vast network of delivery agents. They help people answer each other's needs by organising smartly, thanks to technology. Whether it is transport, food, logistics, health or anything else, platforms have the power to unlock an entire world of solutions.[10] There has been much criticism directed at these platforms as well because they tend to maximise their own profits at the cost of every other part of the system - buyers, sellers and delivery people.[11,12] The platforms argue they should be allowed to claim a significant percentage of revenues because they are providing opportunities at a scale where few exist. Given the huge class-linked power imbalance in our country, this argument stands on shaky ground.

Platforms for social change

Platforms for social change are a different animal altogether. They do not just offer a blueprint for harnessing platform power for social change; they also offer guidance for all platforms to realise their true potential in facilitating the well-being of people.[13]

The community radio platform *Mobile Vaani*, which enables Archana in Samastipur to do what she likes doing, was set up in 2009.[14] With an intention

to build a bottom-up, voice-based social media network platform for rural India, founder Aaditeshwar Seth wanted to empower people in small towns and villages to share their concerns and experiences with their community.[15] The focus on voice-via-mobile was a game-changer, letting hundreds and thousands of listeners find their voice. Rather than sharing individual complaints via a discrete helpline or literacy-requiring systems like the post, people air their grievances via voice messages, catalysing other community members, civil society organisations (CSOs) and even government officials to step in and take action.[16] The Gram Vaani media and governance team also trains volunteers such as Archana to raise awareness and to work with the departments concerned to resolve issues. For instance, building on the success of the Samastipur, Gram Vaani volunteers delivered letters to the representatives of nearly 300 panchayats, urging them to organise a Rozgar Diwas on a regular basis, publicise the same amongst communities and ensure that anybody who needs work finds work.[17] Through collaborations with legal literacy-oriented organisations such as Nyaaya, legal needs that arise through the Mobile Vaani platform are picked up by other volunteers who can help resolve them.[18] Relevant grievance-related information is also shared with government officials, increasing their accountability and responsibility.[19] Of the 60,000-plus complaints it received, Mobile Vaani volunteers successfully resolved more than 40 per cent of the issues related to individual schemes and entitlements and community grievances.

SAMA is a young organisation in its very DNA. Its founders and case managers, i.e., people who ensure that a case is taken through the right resolution processes, are in their early twenties. The case managers and dispute resolution professionals, i.e., mediators, conciliators and arbitrators who actually address the cases, are called 'resolutionaries'. That is because SAMA sees its work as stewarding a movement towards collaborative resolution of disputes outside courts. Like commercial platforms such as Uber or Swiggy, they are also 'matching' disputes to case managers and dispute resolution professionals. The SAMA platform has grown tremendously in the last few years. Since 2020, SAMA has partnered with both state and private players to onboard over 1.2 crore disputes of which more than 25 lakh have already been resolved by 2022. Some time back. SAMA collaborated with the Maharashtra State Legal Services to handle motor vehicle *challan* cases. SAMA has 3,000+ case managers and mediators in 443 cities, fluent in over 31 languages.[20]

Aniket Doegar started Haqdarshak with a passion for creating impact at scale. An ex-Acumen and Teach for India fellow, Deogar and his team are building systems to enable welfare delivery service at the last mile at scale. On the one hand, they train women such as Poonam in communities (*haqdarshaks*) to use the Haqdarshak platform to enable service delivery. On the other, the team also collaborates with foundations, governments and other agencies to ensure last-mile delivery. Until 2022, they have trained more than 23,000 haqdarshaks, impacted over 31,000 micro businesses and unlocked benefits worth nearly ₹4,000 crore.[21]

Mobile Vaani, SAMA and Haqdarshak are platforms for social change. These platforms distinguish themselves from ordinary commercial platforms in some or all of five key ways:

a. ***Centrality of intent*:** The intent of the innovators behind these platforms for social good is to solve significant social problems by unlocking the potential of people.[22] Commercial platforms also claim similar goals but these goals often slip from the centre. For platforms for social good, there is a razor-sharp focus on the original intent of problem-solving and this unlocks creativity around that. For instance, SAMA, while registered as a commercial platform, collaborated with five State Legal Services Authorities on the Lok Adalats almost entirely *pro bono*, and is working on new economic models that will help them serve the system and enhance the experience of dispute resolution at cost. Sanjay Purohit of Societal Thinking, an organisation that unlocks our ability to solve exponentially says, "The difference in societal and commercial platform is in the intent. If you want to maximise market share, return on investment, competitive strength, etc., that will give you a certain way of configuring your platform. If you want to design for a societal outcome—dignity, choice and agency for the most underserved people, sustainability, the interplay between government, civil society and markets—that intent will manifest itself in a very different design."[23]

b. ***The way they see their users*:** All these platforms are essentially unlocking the agency of their target audiences and distributing the ability to solve problems. SAMA sees their case managers as key stakeholders who bring kindness and empathy into dispute resolution - a space that is usually devoid of it. Haqdarshak empowers women in communities with information on rights and entitlements and provides them with a mobile app, that helps them ensure rights and entitlements for their communities – all this for a small fee that provides them livelihood. The Mobile Vaani platform does the same for Archana by sourcing the concerns of the community and giving her simple tools to act. While the 'transaction' that a commercial platform enables might be tightly scoped, for example, carrying food from restaurant to home, most social platforms equip their users to approach problem-solving more flexibly. This is because there is less uniformity in the problems themselves and a need for greater resourcefulness by the user.

c. ***The way they approach sustainability*:** Commercial platforms mostly monetise the transaction itself—for example, the ride on Uber, the food delivery through Swiggy, or the purchase on Amazon—but platforms for social good, need greater creativity. The person who has the need may not always be able to afford the solution. Recognising this, Haqdarshak works with other stakeholders in the system who are invested in facilitating solutions. They tie up companies keen on ensuring that citizens at the last mile receive the state entitlements they are eligible for.[24] Mobile Vaani allows

people to bring their own community members into any of the existing groups on their platform or even start their own groups for free whilst charging for other services such as moderation and content creation.[25] Some of these platforms may solve social issues at such a great scale that they attract philanthropy to meet the revenue gaps. Finally, platforms for social good may spawn many different monetisation models within the ecosystem they build. For instance, in the health sector, the Avni Project developed an open-source community health worker platform to aid programmes at the village and slum levels. While anyone can set up and use the platform for free, Avni charges for managing and maintaining the platform.[26] Gram Vaani is also soon going to set up an open-source voice stack, which will allow other organisations and individuals to set up a mobile vaani.

d. ***Their use of data*:** Data is the powerhouse of innovation and enables platforms to identify opportunities and make informed decisions. Commercial platforms tend to collect data, including personal information, for commercial purposes.[27] Platforms for social good aim to collect only such data as is necessary for their services, and to use that data and insights to improve the system and to benefit the stakeholders involved.[28] For instance, Mobile Vaani does not require users to register on their platform and does not collect any personal information.[29] SAMA, while collecting the data necessary to address grievances and disputes through its platform, abides by strict data storage and privacy mechanisms, and also has a data ethics advisory board in place.[30] Platforms for social good have historically been much more receptive to sharing the data they collect with interested users and even the ecosystem as a whole.[31] For instance, Shikshalokam is using data to allow citizens to see and solve the problems related to the state of schools.[32] In the justice space, the grievance and dispute data on platforms such as Mobile Vaani, Haqdarshak, SAMA and others is integral to shaping how we resolve disputes; right from understanding best practices to commonly occurring roadblocks. These platforms have been keen to collaborate on making such data more widely available, something that is largely unheard of amongst more classic commercial platforms.

e. ***Their technology approach*:** Platforms for social good are much more likely to use open-source software and, more importantly, make their software more widely available to others.[33] For instance, the India Labourline uses existing open-source frameworks and the software is also open-source. These platforms also tend to create Open APIs and generally collaborate with other organisations at the technology level. They recognise the power of interconnected systems that talk to each other. For instance, Project ECHO is an "all teach, all learn" platform in the health sector that democratises access to knowledge and best practices in public health. Its digital infrastructure and methodology are available as open public goods that allow anyone to start and run a practice-based learning community to deliver expertise where

it is needed the most.[34] Avni Project[35] and Glific[36] are also both designed as open-source platforms for organisations to plug in with. As mentioned above, Mobile Vaani also allows people to bring their community members onto the platform for free. More recently, SAMA and other ODR startups are looking to collaboratively build Open APIs to connect their platforms with those of other industries/sectors; such that users can seamlessly move from the industry platform (say commerce, payments or finance) to an ODR service provider where a dispute arises.[37]

Another commonality that platforms for social good have is their recognition of the digital divide and their use of appropriate offline infrastructure along with an online architecture. For instance, SAMA enables young law students to be case managers, a crucial offline role that connects the digital infrastructure with the stakeholders in the ODR ecosystem. While the "mandate" of the case managers is to be a bridge between the digital infrastructure and the stakeholders, many of them often go out of their way. For instance, Ankita Rawat, a student of the Himachal Pradesh National Law University, was a case manager on the pilot collaboration between Madhya Pradesh State Legal Services Authority and SAMA to address cognisable criminal offences through ODR. As the pilot required police officers to file their cases online, she travelled 50 km in a car with her parents and checked in on eight to 10 police stations a day to ask if they needed help. Her ability to empathise with police officers and clarify their questions directly led to more confidence and trust in the system and more cases filed online.[38]

At the core, these platforms for social change are designed around the goal of empowering *all* their participants to create exponential change. The focus on unlocking agency for every user is in stark contrast to maximising profit by squeezing a user with less power than the other. This "societal thinking" approach empowers citizens to solve problems and tip society towards exponential change.[39] Societal Platforms is working with leading non-profit Ashoka to empower social entrepreneurs to incorporate this thinking in their work. The result of this could be the creation of platforms that marry the rich insights of decades of grassroots work with the power of platforms to connect people and resources at scale.[40]

Solving for Population-Scale Access to Justice

Access to justice in India is a hydra-headed challenge that is unlikely to be solved with a single service, however remarkable. One billion Indians fall within the ambit of free legal aid and only a tiny fraction avail of it owing to a lack of awareness, trust or ease of use.[41] These one billion speak 19,500 dialects and encounter a wide range of issues such as property, entitlements, employment and family.[42] Many issues are intersectional and cannot be looked at as legal issues in isolation.

The millions of justice problems in their unique contexts require tens of thousands of justice solutions.[43] Often it is only local 'justice makers' such as Archana, Ajitesh and Poonam who understand the needs of people, mobilise communities, work with local authorities and processes, deal with imperfect information, create awareness, find solutions and take action. Abhay Jain of Zenith recounts an example from Shivpur, MP, where, despite several efforts, the government officials did not undertake safety measures for sewage workers (or implement the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act 2013).[44] Tired of government inaction, Jain and his team carried bags of sewer waste, placed them at the Collector's table and threatened to open the bag if nothing was done. Within a week of this incident, most workers were provided with safety equipment and manual scavenging had ceased.[45]

These 'justice makers' are the foundational building blocks that we need to make justice for all a reality. It is imperative for us to invest in their leadership and make locally accessible resources available to them, in order to unlock their fullest potential. Platforms for social good enable this by creating efficiencies of time, space and location, and providing space and encouragement to transform young people into 'justice makers'.

Language has historically been a big barrier to the reach and effectiveness of platforms for social good. Every 50-100 km, dialects in India change and most people are voice-users more than text-users. Language codes for trust and when people are not able to share their concerns accurately or even understand the nuances of any support offered to them, they are inadequately empowered. This is a challenge but innovations in this area are flying thick and fast. Bhashini is a project of the Ministry of Electronics and Information Technology (MeITY), which aims at enabling people to access content and resources in their own language.[46] Building off a massive data set of speech in Indian languages, Bhashini is leveraging cutting-edge artificial intelligence to transcend the language barrier and allow localisation in a country like India.[47] The Bhashini portal has software that allows for voice-to-voice translation between most Indian languages.[48] Soon, any Indian platform for social good can onboard and process a query in a local language and then provide a local solution in the same language without the need for expensive translation or cumbersome workflows.

Platform-age investors are even challenging the concept of the 'platform' itself in order to birth a new model that delivers network benefits of a platform without downsides such as centralising control, capturing excess data and creating dependencies. The Open Network for Digital Commerce (ONDC), an initiative of the Central government and supported by a wide range of private collaborators, is the most notable among these.[49] Using protocols that enable buyer apps, seller apps, delivery and settlement apps to connect with each other and some critical enabling components such as a reputation ledger to increase trust and ease of use, ONDC is creating an interoperable, decentralised network ecosystem to make

e-commerce possible without platforms.[50] Systems like this could connect a wide range of public and private legal services—legal advice tools, dispute resolutions, digital court apps, signing and notarisation apps and more—to create a vibrant ecosystem that can work for every Indian.

The Role of Government

The Government of India has historically seen itself as India's largest service provider. Over time, we are seeing the government pay as much attention to unlocking ecosystems. Parts of the government have already seen a role for themselves in unleashing the power of networks and platforms. As mentioned earlier, Bhashini and ONDC are examples of this thinking where the government plays the role of creating critical public goods and innovation ecosystems to unlock more government and private innovation.

In the Digital Courts roadmap published by the e-Committee of the Supreme Court, the stated intent is to create a 'platform' that not just powers the courts in an adaptive and scalable way but also a host of attendant services that even private actors can provide. Each one of the five features of Phase III is about enabling the network through a platform-based approach as summarised in Figure 1.[51]

As this ecosystem thinking translates to every part of the government to solve large-scale 'wicked' problems, there is scope in the justice space also for the government to evolve from being a service provider to an ecosystem enabler.

→ PHASE I	→ PHASE II	→ PHASE III
AUTOMATION	**BUILDING 'SYSTEMS'**	**BUILDING 'ECOSYSTEMS'**
1. Installing hardware infrastructure	1. Creation of linkages between juidical systems and other institutions	1. Open, interopable digital infrastructure allowing for unified, evolutionary systems
2. Development of web based solutions	2. Development of monolithic services and capabilities for ease of use across users	2. Standards and specifications governing intergration of services and capabilities
3. Digitisation of judicial records	3. Basic data analytics	3. Infrastructure capabilities allowing market players to innovate and collaborate
		4. Analytics led, evolutionary system leveraging judicial date
		5. Reimagined processes leveraging new capabilities.

Figure 1: Digital Courts Roadmap[52]

The Department of Justice's Nyaya Bandhu programme, which connects individuals with pro bono lawyers,[53] can partner with CSOs and community justice networks. This can help legal professionals create a more holistic and robust response than a straightforward direct connection that may lack the requisite trust and support structure. Nyaya Bandhu can also collaborate with CSOs and community justice networks towards a shared commitment to develop the capacity of community paralegals.

The Telelaw program by the Department of Justice, which allows marginalised people to connect with panel lawyers at the pre-litigation stage,[54] can become a national mission that drives access and innovation. A sandbox model can be piloted by inviting organisations to extend Telelaw across the country. The broader community around Telelaw can also develop other tools such as local language chatbots that extend access where needed. Both Nyaya Bandhu and Telelaw can become 'platforms for social good' that work with multiple actors by providing technology access, human resources as well as potentially financial resources to truly extend access to justice.

Conclusion

These new ways of distributed problem-solving—platform-thinking, network-thinking and ecosystem-thinking—make it possible for us to solve the complex problems associated with access to justice at scale. They are 'how' we can unlock the agency and creativity of millions of Indians who are unable to express themselves without access and empowerment. They go well beyond mere 'automation' and 'digitisation' to connecting problems with solutions in an infinitely varied way. Access to devices, local capacity building and local language translation can put these solutions in the hands of citizens. They can shift the experience of the citizen from being stymied by the law to being empowered by it. This 'new power' can also counterbalance the other forces that thrive in the status quo. A resource-constrained litigant is often at the mercy of lawyers, the system and even the other party. The matter is then no longer really about law but an inadequate solution for the problem. When this resource-constrained litigant has more information, a local guide and easier access to expertise, justice is much more likely to be the outcome - as seen in the examples cited above.

The fear that platforms will become the new oppressors can be mitigated by the different characteristics of platforms for social good and the evolving form of the open network where no one platform controls or concentrates power. Justice innovators have shown themselves far more ready to create new models, open resources and collaborate. For instance, the Working People's Charter (WPC) network is a coalition of organisations that work on issues related to informal labour in particular and labour in general. WPC along with Aajeevika Bureau set up the India Labourline in September 2021 to provide legal aid and mediation services to workers, specifically migrant workers.[55] Any migrant worker can reach the helpline and be immediately connected to the resource to aid them. In less than a

year, the Labour line reached 25,000 workers, registered 2,342 cases, resolved 788 of those and recovered over ₹1 crore in wages for migrant workers.[56]

Behind all these innovations and initiatives are human beings. When we act from mindsets of scarcity—a frequent condition of legacy actors—the result is incremental innovation. But where we develop the capacity to see and do differently, the result is leaps of imagination. In order to nurture more such powerful justice innovators and the resultant new generation of networks and platforms, we need to invest in developing capacity and community. The capacity of innovators to integrate their inner worlds and outer realities to drive disruptive yet sustainable change, and a community of change-minded people that can discover, support and enable ideas. Between 2019 and 2021, over 50 innovators participated in Agamishaala, an initiative by Agami (an organisation that enables ideas and entrepreneurs in law and justice) to do just this kind of capacity and community building.[57]

Avanti Durrani of Artha Global, a public policy research, consulting, and network facilitating organisation says, "We've, you know, just carried this colonial legacy on for the last 70-80 years; we never rethought how the policing structure should look like for a society like ours. We just have one model to police us all. And then there is this preconception of what justice should be within this construct. But you need to reimagine it. And I think we are still carving out our role in that."[58]

Editors' Comments

We need much more of this in a sustained manner. Whether change happens or not is not entirely up to us, but as a citizenry, we can use new technology, knowledge and mindsets to create the conditions that make it highly likely. And in this endeavour, Technology can turn out to be transformative. The next part of the volume, aptly titled "Technology for Law & Governance" deals with the second A of this book, that of "Assistance" through Technology. It takes the reader through a journey of broad ideas and specific solutions, large-scale systems and specific cases, as well as limited technical areas and broad subject areas, all highlighting the key role technology can play as a game-changing Assistant.

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ASSISTANCE

CHAPTER 4

Technology and Indian legislatures: A story of Hits and Misses

Prachee Mishra

"Modern technology has become a total phenomenon for civilization, the defining force of a new social order in which efficiency is no longer an option but a necessity imposed on all human activity."

– Jacques Ellul, French philosopher

SUMMARY:

- In the last few decades, similar to most other institutions, Indian legislatures have used technology to become more transparent and accessible;
- Overall, Parliament has made significant strides in using technology to improve its functioning;
- While state Assemblies publish their work on their websites, in several cases the information is not comprehensive, and not updated regularly;
- Currently, e-Vidhan, a national programme, is underway to digitise and make the work of state legislatures available online;
- Open, transparent and accessible legislatures ensure that citizens have a deeper understanding of policy issues.

Introduction

Legislators pass laws, approve the government's expenditures, hold it accountable, and represent citizens. Exercising these responsibilities and ensuring accountability to citizens necessitates transparency of the legislature's work. In the last few decades, similar to most other institutions, Indian legislatures have used

technology to become more transparent and accessible, and also improve their functioning. This chapter discusses how Indian legislatures (both Parliament and state Assemblies) have used technology to become more effective institutions and the scope of reforms needed.

Overall, Parliament has made significant strides in using technology to improve its functioning. Parliamentary proceedings are televised live. Almost all of its work is shared on the Lok Sabha and Rajya Sabha websites – including questions and ministerial responses, debates, and schedules and reports of standing committees. A significant portion of Parliament's secretariat's work uses technology. Notices for questions and other interventions can be filed online, and there is an electronic voting system (for voting on the floor of the House).

On the other hand, while state Assemblies publish their work on their websites, in several cases the information is incomprehensive and not updated regularly. Other reforms needed relate to enabling Indian legislatures to make proper use of such technology. In 2020, with the outbreak of the COVID-19 pandemic and government response through emergency measures, the role of legislatures became more important than ever. During such a crisis, one would expect legislatures to scrutinise government decisions closely, authorise additional expenditure and pass urgent legislation. However, Indian legislatures (including standing committees) fell short of the mark. One of the reasons cited for this gap was certain rules of procedure that do not allow legislators to meet online. In comparison, legislatures in other countries figured out hybrid ways of meeting (a mix of physical and online presence) and ensured the smooth execution of their business.

Role of Legislatures

Legislatures are one of the key pillars of our democracy. Legislators have four key roles – they discuss and pass laws, they approve the budget of the government to ensure efficient allocation of resources, they oversee the work of the government and hold the executive accountable, and represent citizens. To exercise these functions and hold the government accountable, legislators have various tools at their disposal. These include raising questions on policies and schemes, flagging matters of importance in the House and highlighting issues through debates. Since they exercise these functions in their role as representatives of citizens, it is important that citizens have access to the questions and responses, debates within the legislatures and the arguments presented thereof.

In India, constitutionally mandated secretariats, which are independent of the executive, manage and facilitate the work of the legislatures.[1, 2] In the last few decades, similar to most other institutions, Indian legislatures have also used technology to make their work more transparent and accessible. With advances in technology, the work of legislatures is available in multiple formats and across forums. For example, debates that take place in Parliament are telecast live and webcast, the text of these debates is available on the website of the House concerned, and video clippings are also available on private websites like YouTube.

This easy availability of data in various formats and across fora helps citizens and media assess the functioning of elected representatives, and gather knowledge of government policies and work.

Two years ago, the World Health Organisation declared the outbreak of COVID-19 a pandemic, following which countries across the world went into lockdown. These lockdowns limited physical and social interaction, forcing people and organisations to reorient the way they meet and work. Legislatures were no exception to this. In fact, the role of legislatures became more important during the pandemic as they had to examine the actions of the government, examine the funds being allocated for relief measures and pass emergency legislation for immediate relief to citizens, apart from empowering government bodies to enforce certain COVID-19-related guidelines.

Across the world, legislatures responded to this situation in three ways. Some legislatures continued meeting in person while adhering to social distancing guidelines; some met in a hybrid manner with some members meeting online with others physically present in legislatures, and some legislatures met entirely online. Several legislatures accelerated the pace of modernisation and digitisation during this time, which helped them manage their work online. In India, legislatures continued meeting in person while adhering to social distancing guidelines. However, both Parliament and state Assemblies met for fewer number of days in 2020 as compared to previous years. The Parliamentary committees did not meet during the lockdowns. This begs the question of what stopped Indian legislatures from meeting more regularly, and why they could not meet online or in a hybrid manner.

House Proceedings and Technology

The use of technology in legislatures can broadly be categorised into two categories. First is deploying technology to improve the functioning of the legislature itself, which is carried out by an independent secretariat. This would include informing MPs and MLAs of the agenda of the House for the day on the website or through an online app, enabling members to file questions and other notices online, preparing parliamentary documents, and making research material available to them online.

The second category of technology use is in increasing public access to the work of the legislature and bringing in more transparency in its functioning. This would include publishing the debates of the House and questions asked in the House online, informing citizens about Parliamentary Committee meetings, publishing reports of the Committees and other documents and reports that are tabled in the House, and televising the proceedings of legislatures. Greater transparency allows citizens to see the work their elected representatives are doing and also gives them access to data on the government's work and policy intent. How easily legislatures make these documents available and make them easy to understand determines their level of transparency and accessibility. This ties in with their role of being accountable to citizens.

Across both these categories, the secretariat associated with the legislature plays an important role. Article 98 of the Constitution of India provides separate secretarial staff to each House of Parliament. The recruitment and conditions of service of persons appointed to the secretarial staff of either House will be regulated by Parliament by law. Till such law is made, the President may, in consultation with the Speaker of the Lok Sabha or the Chairman of the Rajya Sabha (as the case may be) make rules regarding the recruitment and conditions of service of such secretarial staff. As no such Act has been passed, the Lok Sabha and Rajya Sabha secretariat staff are regulated by Recruitment and Conditions of Service Rules made in 1955 and 1957 [3] Article 187 of the Constitution makes similar provisions for an independent secretariat for state legislative Assemblies and Councils. These secretariats carry out the overall day-to-day functioning of the legislatures they are associated with.[4]They provide assistance and support for the effective functioning of either House, cater to the Parliamentary Committees associated with the respective Houses, prepare research and reference material for legislators and publish relevant material.

The increasing use of technology by the secretariats has vastly improved the functioning of Parliament and ensured that citizens get timely access to its work. For example, the official report of the proceedings of each House, i.e., debates, are prepared by the respective secretariats under the authority of the Speaker and the Chairman respectively. Rule 379 and Rule 382 of Rules of Procedure and Conduct of Business in the Lok Sabha provide for the publication, printing and distribution of a full report of the proceedings of the House as directed by the Speaker.[5,6] Rule 260 of the Rules of Procedure and Conduct of Business in the Rajya Sabha has similar provisions to publish proceedings of the House as directed by the Chairman.[7] Uncorrected verbatim reports of proceedings are usually made available on the respective House's website (parliament.nic.in; loksabha.nic.in; rajyasabha.nic.in) on the same day of the sitting. These debates are later verified and checked and the text of the debate is also published.

Bills are available online within a few hours of their introduction in Parliament. Information on Parliament's business for the next day along with the list of questions to be raised are available online in advance. Responses to these questions and a summary of the day's business are available online immediately. MPs also get access to the Bills, list of business for the next day and relevant research material prepared by the secretariat on the member's portal. Live telecast of House proceedings and the availability of video clippings of debates have vastly improved the ability of citizens to watch what their elected representatives are discussing and debating in the House.

Evolution of Technology Adoption in Parliament

This section presents a description of technology adoption in the parliament, categorised appropriately.

a. Website and library

The Parliament Library provides information on parliamentary activities, including historical data and archival records, in physical form. To bring about automation in the Parliament Library, a computer-based information retrieval system, the Parliament Library Information System (PARLIS) was launched in 1985.[8]

The Parliament website (parliament.nic.in) was launched in 1996 to provide information on parliamentary activities.[9] It provided the debates and committee reports from 1998. Today, secretariats of both Houses maintain their own separate websites. These provide a rich repository of information on various topics; such as the history of the Indian Parliament, rules and procedures of both Houses, details of the business and proceedings in both Houses, details of questions, details of Bills introduced, pending in and passed by Houses, profiles of members of both Houses and their socioeconomic background and attendance of MPs in parliament.

Around 2012, suggestions were made to make the historical information in the Parliament library available online. The aim was also to create a single window for all parliamentary information. Following this, in July 2012, a one-man committee chaired by S.S. Ahluwalia (a former MP at that time) was constituted to suggest ways to digitise parliamentary documents. The Parliament Digital Library was created by the Lok Sabha Secretariat, with CDAC providing support with the scanning of historical documents and NIC providing software support to develop the website.[10] The website (parliamentlibraryindia.nic.in/) was launched in December 2018.

The digital library contains historical debates from 1854 (Proceedings of the Indian Legislative Council) to 1952 including the Constituent Assembly debates. It also contains the entire text of every debate from the first sitting of the Lok Sabha (1952 onwards).Digitisation of historical debates has been primarily done by scanning the physical records. It also provides all presidential addresses in Parliament other than the Budget and prime ministerial speeches in Parliament. In addition, the reports of all Parliamentary Standing Committees and the details of work done by the Lok Sabha are also available in the digital library. Easy access to these documents gives citizens a deep understanding of the development of our legislative institutions.

b. Functioning of secretariats

The secretariats of both Houses have also automated their activities. For example, all circulars and office orders are uploaded on the intranet, which is accessible to all employees of the secretariats. The secretariats have also implemented an e-office system which includes an electronic file management and tracking system, knowledge management system and personnel information management system. All members are also provided with the latest computer devices. Lok Sabha members are entitled to receive up to ₹3 lakh for the purchase of

computers and related equipment; Rajya Sabha Members are entitled to a sum of ₹1.5 lakh.[11,12]

c. Television proceedings

Besides textual data, these websites provide access to video recordings of parliamentary proceedings. The Indian Parliament also has its own television channel called Sansad Television, where live proceedings from both Houses are broadcast.[13] This channel was created in 2021 by merging Lok Sabha Television (LSTV) and Rajya Sabha Television (RSTV).

Select parliamentary proceedings have been televised on Doordarshan since December 1989, including the live telecast of the President's address to both Houses of Parliament at the beginning of the first session of a year. Since 1994, the Question Hour has been telecast live, with proceedings of each House beamed on alternate weeks (Question Hour in the other House would be aired on All India Radio). From the winter session of 2003, the Question Hour in both Houses started being shown live on Doordarshan and Doordarshan News.

In December 2004, two dedicated satellite channels were launched to live telecast proceedings of both Houses of Parliament.[14] LSTV started operating as a 24-hour channel in July 2006. RSTV was launched in 2011. This shift was important as these channels were created to be independent of Doordarshan (which is the government's public broadcaster) and were operated by the respective Houses. These channels also work on the principles of a public broadcaster to ensure that citizens are aware of the workings of Parliament. The Cable Television Networks (Regulation) Act 1995 was amended to make it compulsory for every cable operator in the country to carry parliamentary channels on their cable network.[15]

Both Houses also have their own YouTube channels now, managed by Sansad TV. These channels also carry archival videos. The Sansad TV website (sansadtv.nic.in) also provides video clippings of discussions in both Houses, Question Hour, Zero Hour (where matters of public importance are raised) and speeches made by the Speaker of Lok Sabha, the Chairman of Rajya Sabha and the Prime Minister in each House.

d. Social media

The Lok Sabha Secretariat is fairly active on Twitter (@LokSabhaSectt) where it shares details of the Speaker's engagements and details of the work of Standing Committees (such as meetings scheduled). The Parliamentary Research and Training Institute for Democracies (PRIDE), which trains MPs, parliamentary staff and other institutions in parliamentary procedures, the various disciplines of parliamentary institutions, processes and procedures, also has an active presence on Twitter (@LokSabha_PRIDE). The Speaker has an active presence on social media where details of his meetings and public engagements are shared. Several

state Assemblies and Assembly Speaker offices (such as Uttar Pradesh, Kerala, Madhya Pradesh, Jharkhand and Odisha) also use social media to inform citizens of their work. This is in addition to the presence on webcasting platforms such as YouTube where proceedings of Parliament and the various Assemblies are available.

An active online presence across mediums and ensuring updated information is available to citizens shows that legislatures are engaging with a broader range of people. Legislatures actively pushing out information also bring in a wider audience to engage with, rather than only those who are seeking information on them.

Current Status of Digitisation in Central and State Legislatures

At a virtual meeting of the presiding officers of state legislatures of India, held in April 2020, the Speaker of Lok Sabha noted that during the pandemic, the Parliament made optimum use of technology to improve its functioning.[16] More than 90 per cent of notices related to questions or matters raised under various rules were received online.

Technology and State Assemblies

Similar to the Lok Sabha and Rajya Sabha, secretariats exist at the state level too. In several states, 100 per cent of the secretariat's work is being done in a digital mode. In the 2021 meeting of presiding officers, the Lok Sabha Speaker also noted that the pace of digitisation has been accelerated in state Assemblies (and Councils).[17] Several Assemblies have also installed digital/touchscreens for members. However, Assemblies lag behind the Parliament in terms of technology adoption and require additional efforts to transform into more accessible legislative bodies. Most Assembly websites provide only a basic level of information on work.

The Speaker of Lok Sabha noted that a Committee had been constituted to look into the possibility of providing the proceedings of Legislative Assemblies and Parliament on a single platform.[18] The Committee has submitted its report. Following discussions with the central and state governments based on the report, work on the suggested platform is likely to begin.

State Assemblies also do not fare well with respect to the telecast of House proceedings. Twenty-one Assemblies telecast all or part of their proceedings. These include the states of Karnataka, Uttar Pradesh, Maharashtra, Jharkhand, Manipur, Mizoram and Himachal Pradesh. The Kerala Assembly has its own TV channel. Proceedings of certain states such as Goa and Maharashtra are webcast on YouTube. The Bihar Assembly webcasts select proceedings on YouTube.Assam, Haryana, Punjab and Telangana allow private news channels to telecast proceedings. Karnataka, Delhi, Bihar and Kerala have their own websites to webcast their daily proceedings. The Tamil Nadu Assembly started a live telecast of its

proceedings in January 2022. The Odisha Assembly launched its official YouTube channel in March 2022.However, these are exceptions rather than the rule, as opposed to the Parliament where proceedings of both Houses are telecast live on dedicated channels.

It might be pertinent to note that televising all parliamentary proceedings has not been an easy policy shift. Concerns were raised earlier that televising proceedings could alter the behaviour of legislators. However, Somnath Chatterjee, Speaker of the 14th Lok Sabha, noted that in a democracy it is essential for citizens to see how their representatives are working.[19] He incidentally was the man who initiated the live telecast of Lok Sabha proceedings There have been issues with cost also. For example, in 2015, the Tamil Nadu government informed the Madras High Court that they did not have funds to televise the Assembly's proceedings.

Legislative bodies are representative institutions, and in a well-functioning democracy, their work should be easily accessible to citizens. Live broadcast of the proceedings of legislatures is one of the ways to keep citizens informed about the issues being raised by their elected representatives and the work of legislative institutions.

E-Vidhan

Currently, e-Vidhan, a national programme to digitise and make the work of state legislatures available online is underway.E-Vidhan is a centrally sponsored scheme that seeks to make the state/UT legislatures paperless. It also seeks to assist MLAs and MLCs in the use of the latest ICT tools, to help them prepare for better and more effective participation in legislative debates.Till March 2021, MoUs had been signed with 15 states to implement NeVA.[20] And the 2022-23 Union Budget allocated ₹40 crores to the National eVidhan Application (NeVA).[21]

The objectives of e-Vidhan include: (i) back-end computerisation of all branches of the state legislature secretariats, (ii) business process re-engineering of identified services and their processes, (iii) capacity building of state legislators and officials of state secretariats, and (iv) information dissemination through public portals to ensure transparency and accountability.[22] The application software will be hosted on the National Cloud (Meghraj), and state legislatures will be integrated as per technical specifications and e-governance standards. Processes and work that will be automated or done in an electronic manner under e-Vidhan include: (i) papers related to the daily business of the Assembly, (ii) preparation of verbatim debates, (iii) submission and processing of all questions and notices, (iv) laying of all papers and reports, (v) management of Bills, assurances made by the government on the floor of the Assembly, Committee work, (vi) members' portal and amenities for members, and (vii) webcasting of Assembly proceedings. Further phases of the scheme will include the creation of digital archives, automation of the library and grievance redressal.

The progress with digitisation varies across states. For example, Himachal Pradesh implemented several technology solutions under e-Vidhan back in 2014.Since then, records of all Assembly proceedings have been maintained online. Under this system, members can also exercise their votes over motions in the Assembly by pressing buttons at their seats. The Maharashtra Assembly enabled online filing of questions and notices for members in 2015. Tamil Nadu provides some archival information since its first Assembly in 1952 and certain details of work taken on and completed since 1962. It also provides details of certain debates in the House, such as Budget discussions from recent years. Kerala, too, is moving towards becoming a paperless assembly. Legislators are provided touchscreens at their seats and questions and submissions can be filed online. The Assembly's website also publishes questions to be asked in advance, unedited proceedings of the Assembly, the text of Bills passed, and reports of Assembly's Committees.

However, several other state websites provide very basic information on work. They do not provide details of the questions asked and the responses to the same, and the text of the debates held in the Assembly. They also do not feature the text of Bills that were passed, the discussion on these Bills and details of whether members flagged issues with these Bills or moved any amendments to them.

The Way Ahead

The advances in ICT have changed the way people and institutions work and communicate with each other. The technology ensures easy and quick availability of information for citizens. Open, transparent and accessible legislatures ensure that citizens have a deeper understanding of policy issues and that the engagement between citizens and their elected representatives goes beyond just the election cycles.

Technology has also made it easier for our legislative institutions to quickly communicate with a wider audience. This has also helped elected representatives immensely as they are able to keep in touch with their constituents, inform them of their work and get democratic processes documented. However, this has also placed an expectation on our legislatures to keep up with instant demands for information. They are expected to be available and responsive and engage with citizens in a more open manner.

Legislatures have not been immune to these changes and have largely adapted to the changes brought in by technological advancements.However, there is scope to improve the way our legislatures use technology.

Availability of Information

As discussed earlier, the Indian Parliament has been quite efficient in terms of publishing information in a timely manner. However, most state Assemblies have been lagging in this area. While several states have started publishing more

Table 1: Illustrative list of details available across legislature websites

Legislature	Language	Live Proceedings	Questions available on website	Debates available on website	Bills available on website	Document format	Legislator profile
Parliament	English/Hindi	Yes; live telecast and webcast	Yes	Yes	Yes	PDF	Yes
Andhra Pradesh	English/Telugu	Yes; Private TV channels allowed	No	No	Yes	Scan PDF	Yes
Arunachal Pradesh	English	Webcast on Facebook Live	Yes; some	No	No	Scans/PDF	Yes
Assam	English/ Assamese/Bodo	Webcast select proceedings	Yes		Yes	PDF	Yes
Bihar	English/ Hindi	Webcast on NIC Website; select proceedings on YouTube	Yes	Yes	Yes	PDF/ scans	Yes
Chhattisgarh	Hindi		Yes	Yes	No; list of Bills available	PDF	Yes
Delhi	English/ Hindi	Live Webcast on NIC Website	Yes	Yes	Yes	PDF	Yes
Goa	English	Live Webcast on YouTube	No; list of questions available	Yes (partially)	Yes	PDF	Yes
Gujarat	Gujarati	Livestream of select proceedings	Yes	No	Yes	PDF	Yes
Haryana	English	Select proceedings on private TV channels	Yes*	Yes	No	PDF	Yes

Legislature	Language	Live Proceedings	Questions available on website	Debates available on website	Bills available on website	Document format	Legislator profile
Himachal Pradesh	English	NIC webcast; Highlights of question hour on website	Yes	Yes	Yes	PDF	Yes
Jharkhand	Hindi	Select proceedings on private TV channels	Yes	No	No; list of Bills available	PDF	Yes
Karnataka	Kannada (primarily)/ English	Webcast on NIC Website	No; list of questions available	Yes	Yes	PDF	Yes
Kerala	Malayalam/ English	Telecast on state's own TV channel	Yes	Yes	Yes	PDF/ HTML	Yes
Madhya Pradesh	Hindi		Yes	Yes	Yes	PDF	Yes
Maharashtra	Marathi (Bills in Hindi/ English also)	Webcast on YouTube; Private TV channels allowed	Yes	No	Yes	PDF	Yes
Manipur	English	Webcast on YouTube	list of questions available	No	No	PDF	Yes
Meghalaya	English	Webcast on YouTube	Yes	No	No	Scans	Yes
Mizoram	Mizo/ English	Webcast on YouTube	Yes*	Yes	Yes	PDF	Yes
Nagaland	English	No	Yes (partially, available only for few days)	No	No	PDF	Yes
Odisha	English/ Odia	YouTube channel launched	Yes (till 2020)	No	Yes (till 2009)	PDF	Yes

Legislature	Language	Live Proceedings	Questions available on website	Debates available on website	Bills available on website	Document format	Legislator profile
Puducherry	English/ Tamil	No	No	No	No	PDF	Yes
Punjab	English/ Punjabi	Select proceedings on private TV channels	Yes	Yes	Yes (on website notice board, no separate section)	PDF	Yes
Rajasthan	English/ Hindi	Webcast on YouTube	Yes	Yes	Yes	PDF	Yes
Sikkim	English		No	No	No	PDF	Yes
Tamil Nadu	English/Tamil	Live telecast of Question Hour#	No	Yes (for budget sessions)	No	PDF	Yes
Telangana	English	Private TV channels allowed	Yes	Yes	No	PDF/ scans	Yes
Tripura	English	No	No	No	No; list of Bills passed available	PDF	Yes
Uttar Pradesh	Hindi (primarily)/ English	Live telecast on DD Uttar Pradesh	Yes	Yes (till 2019)	No; only Ordinances available	PDF/ scans	Yes
Uttarakhand	Hindi (primarily)/ English		Yes; only questions no responses	No	No; List of Bills available (as of 2020)	Scans/ PDF	Yes
West Bengal	Bengali/English		Yes; only questions no responses	No	Yes	PDF	Yes

* Haryana, Mizoram Assembly questions and answers available within detailed proceedings.
# According to news reports

information and data over the last few years, there is immense scope for improvement. First, states do not publish all the information; second, there is a significant delay in publishing the information.

For example, Andhra Pradesh has a fairly up-to-date website with detailed information on the sittings of the House, the list of Bills passed (along with the text), and the short-duration discussions held up until the last concluded session. However, they do not publish data on questions. UP publishes all questions (starred and unstarred), including the ministers' responses to the questions. It also provides details on all the papers tabled in the Assembly, and details of the work carried out in each session (including attendance of the Members). The Chhattisgarh Assembly provides some statistical information (such as number of questions filed) for ongoing sessions. The Madhya Pradesh Assembly provides the text of debates, details of questions and responses, text of Bills introduced and passed, and statistics on the work done by the Assembly, up until the last session. The Himachal Pradesh Assembly publishes the details of the daily business to be conducted and each day's proceedings during the session, similar to Parliament. The Kerala Assembly also publishes some details such as questions to be asked.

On the other hand, the Odisha Assembly's website provides the details of Bills and Ordinances till 2009. The details of the questions are available till February 2019.The Tamil Nadu Assembly's website provides details of debates till the last session ofFebruary 2021.While Assemblies have been updating their systems and publishing information on their work online, there are still gaps across states and the updation is ad hoc.

It may be noted that state Assemblies in India meet for fewer days than Parliament, pass Bills quickly without much deliberation and have been comparatively less transparent with respect to their work. Assemblies that meet for longer and have Committees to examine Bills and other policy matters, tend to be better in communicating their work to the public. The timely availability of legislative documents and records for both legislators and the public is essential for achieving greater legislative transparency and accountability, as well as efficiency in parliamentary processes.

Language and Data Format

Currently, most of the information provided by both Parliament and Assemblies is in PDF format. Often these documents are scans of printed or hand-written pages, which are not machine-readable. The other challenge that these records present is language. Most state documents are in their regional language, with a few providing English translations. This is an issue in Parliament also where uncorrected debates are published in Hindi or regional languages. This restricts the audience that can read and understand these documents.

Data available to the public should be in a format that is easily accessible and can be reused.While publishing documents in PDF format makes them easy to share, and allows greater security, these may not be the easiest to reuse. It may be

useful to publish data in an XML format, which can then be reused. It would also be useful to provide translation of records so that a wider audience is able to access and understand these documents.

Improving Information Management and Dissemination

While the Indian Parliament puts out all work-related information on its website, the information may not be easily understood by a wider audience. For example, when it comes to the law-making process in Parliament, the information related to a Bill is available at different places on the website. The legislation section has the Bill text, the debate section has the text of the debate on the Bill and amendments moved, the Standing Committee page has the report on the Bill, and the House business section has information on voting on the Bill (if any). Discussions on the Bill in the other House are available on the website concerned. So while Parliament is providing a lot of detailed information on a Bill, it is not put out in a way that necessarily makes this information easily accessible for citizens.

Adding details like the comments received on a draft Bill, the Bill introduced in a House and the various amendments it went through, the government's explainer on the Bill and proposed amendments, the debates on the Bill, the Standing Committee's report on the Bill, the rules and regulations notified under the Bill, and the overall legislative history of a Bill in one place in a cohesive manner would vastly improve a citizen's understanding of law.

While the volume of information made available matters in ensuring that citizens have access to all the information they need, it is also important to think about how accessible the information is and if citizens can easily understand the data and use it. The common citizen may not be aware of all parliamentary procedures and may not know where to look for specific information.While the Indian Parliament is fairly transparent about its work, it has different departments that are responsible for specific tasks, and putting information in an intuitive form for citizens is not their responsibility. This function of making parliamentary information easy to understand for citizens has not been envisaged under the current secretariats' functions. To ensure that data put out by Parliament is presented in a cohesive and easy-to-understand manner and also linked to useful government documents, a digital services office or an ombudsman could be created.

Increasing use of ICT in Functioning of Legislatures

During the COVID-19 pandemic, governments all over the world announced lockdowns to reduce physical interaction between people. This affected the working of legislatures, especially at a time when their work of examining the work of the government and holding them accountable became extremely important. While most parliaments use ICT to manage their day-to-day functioning, the use of technology became key to running parliaments safely and efficiently given

social distancing guidelines. Parliaments across the world innovated in how they met, how they worked and how they communicated with citizens.

According to the Inter-Parliamentary Union's (IPU) World e-Parliament report, by the end of 2020, 33 per cent of the parliaments surveyed had held virtual or hybrid plenary meetings, and 65 per cent had held virtual or hybrid committee meetings.[23] Fifty-five per cent of parliaments reported that their members could work remotely, and 69 per cent reported that their staff could work remotely.

During the pandemic, legislatures in India continued with physical meetings. This was largely achieved by both Houses sitting in shifts, ensuring social distancing by allotting seats to members in both Lok Sabha and Rajya Sabha galleries, establishing digital workspaces, and investing in an IT strategy. However, with social distancing guidelines and the spread of the COVID-19 waves, physical sessions were cut short. Note that in 2020, Parliament met only for 33 days. The last time it met for fewer than 50 days was in 2008, when the number was 46 days. Among Assemblies, 19 states (for which data was available) met for an average of 18 days in the year. The Parliamentary Committees barely met through the lockdowns.

The Indian Parliament did not meet online or in a hybrid manner, and barring one occasion, Parliamentary Committees also did not meet online. The Rules and Procedures that dictate the day-to-day functioning of our Parliament do not require MPs to convene physically only in their respective Houses. According to Rule 11 of the Rules and Procedures of Lok Sabha, a sitting of the House is duly constituted when it is presided over by the Speaker or any other member competent to preside over a sitting of the House under the Constitution or these rules.[24] The Rajya Sabha Rules have similar provisions regarding sittings of the Upper House.[25] Besides this, the Lok Sabha Speaker and the Rajya Sabha Chairman have complete discretion with respect to running the respective Houses. Considering that online sittings of the House are something not specified in the Rules, both the Speaker and the Chairman have residuary powers to decide on matters not specified in these Rules.[26,27]

With respect to Parliamentary Committees, Rule 267 of the Rules and Procedures of Lok Sabha says that Committee meetings have to be held within the precincts of the Parliament House.[28] However, the Rule also states that if it becomes necessary to conduct the meeting outside Parliament precincts, the Speaker has the power to decide it. Rule 81 of the Rajya Sabha Rules places similar restrictions for Select Committees.[29] Therefore, it may be argued that both the Lok Sabha Speaker and the Rajya Sabha Chairman have the power to allow sittings of Committees to be held outside Parliament precincts. There is also the question of ensuring the privacy of Committee meetings. Rule 266 of the Lok Sabha Rules states that all committee meetings must be held in private.[30] While security breaches may pose a problem in ensuring the privacy of these meetings if held online, significant technological solutions could be used to address such security concerns, given the limited number of users (788 MPs plus Committee officials).

Note that Committees do meet outside Parliament precincts when they go on study tours. During the pandemic, Parliament and Committees did make some changes to long-standing procedures with the help of technology.For example, the Joint Committee on Salary and Allowances of Members of Parliament (Chair: Lok Sabha MP Rita Bahuguna Joshi) met online in April 2020. The Committee met to recommend a 30 per cent cut in the Constituency Allowance and Office Expenses Allowance given to MPs. However, this is not a Standing Committee of the Parliament. The Joint Committee was constituted to frame rules under the Salaries and Allowances of Members of Parliament Act, 1954. The Standing Committee on Labour also considered and adopted the Draft Report on the Industrial Relations Code, 2019, through digital mode.[31] The report was circulated to MPs on the Committee by uploading it on the Members' portal and sending a copy by email. Another instance was when Parliament launched a mobile app in September 2020 (before the first session held during the pandemic) for MPs to mark their attendance digitally, instead of signing a physical register.

During the pandemic, a combination of technology, social distancing and reduced physical presence helped legislatures across the world to continue their work. Spain, Brazil, Norway and Finland, for instance, amended their laws to make room for remote sittings.[32] The Brazilian Chamber of Deputies introduced a hybrid plenary format on 25 March 2020, and hosted 513 MPs. Brazil also updated its system to provide secure authentication of members and voting.[33] The Chilean Senate passed a law to allow the use of video conferencing technology to conduct its affairs. In Indonesia and the Maldives, a sitting of the parliaments happened remotely. In the UK, the House of Commons Commission recommended a hybrid model of virtual and physical presence for plenary meetings. The UK Parliament gave its nod to remote committee sittings. The New Zealand Parliament set up a special committee that scrutinised the work of the government during the pandemic through remote sittings.[34]

The other key challenge with holding online or hybrid plenary sessions is voting on motions by members. In India, most of the voting in Parliament is done through a voice vote, barring a few instances when recorded voting is mandated. While recorded voting in the House is electronic, it requires MPs to be seated at their designated desks. During the pandemic, there were a few instances of recorded voting. However, since MPs were sitting across both Houses (including the visitors' galleries) and not at their designated places, votes were collected on paper slips. Countries that shifted to online or hybrid modes developed ways and means to allow online voting. Spain, Brazil and the UK developed a voting function as part of internal apps for members.[35] Argentina, Chile, Latvia and Zambia developed apps for voting. In these cases, voter verification was managed in several ways, including biometrics and two-factor authentication, and the use of national identity cards.[36]

The IPU's report also noted that the modernisation of parliaments accelerated during the pandemic, and parliamentary institutions became more agile, adopting new solutions and pivoting quickly to adapt to the changing situation.[37] Several

parliaments amended their regulations to support remote working, allowing more flexible work arrangements. It also noted that parliaments reported accelerating the use of cloud-based apps and data storage, and increased their budget for the purpose of integrating ICT in their functioning.Since 2018, the use of cloud-based applications and data storage has increased by 86 per cent.

The IPU recommended that parliaments should continue to modernise their core operations. They must amend their regulations or governing procedures to ensure that they can function seamlessly without being tied to one physical location. They should allow for more flexible participation by both members such as remote participation in plenary and committee sittings. Citizen participation should also be expanded and made flexible, especially in the working of the committees. Flexible work arrangements should be developed for staff.

According to the *Journal of Parliamentary Information* (September 2021), to promote the use of ICT, the Parliament secretariats including the Parliamentary Committees have been encouraged to use SMS and the e-portal for circulation of information related to sittings, circulation of agenda papers including background notes, draft reports, etc.[38] During a virtual meeting of presiding officers in April 2020, the Lok Sabha Speaker urged the states to explore the feasibility of using digital technology to carry out their legislative and financial work and other routine tasks.[39]

Conclusion

While digital technologies can help make legislatures more open, transparent and accessible, concerns have also been raised that online meetings are not the ideal substitute for face-to-face debate and discussion. Technical glitches, poor usability and lack of technical skills among members can hamper the process. Online systems are also prone to security risks, though these can be mitigated to a large extent. These can also help members attend and participate in discussions from remote constituencies, thereby addressing some issues of poor attendance. Online Committee meetings will allow them to gather evidence from experts from across the world, thereby enriching the consultation process. While these online systems may not entirely replace existing systems, they can be a useful value addition to the current processes of how legislatures work, as amply elucidated in this chapter.

Editors' Comments

Having seen the story of technology in Indian legislatures, it is only natural that attention now shifts to the administrative and governance side of things. The two major segments there are land administration and taxation. In fact, both are also major drivers of caseload in the judiciary. Accordingly, the next two chapters of this part of the volume deal with technology in land administration and taxation respectively.

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CHAPTER 5

Technology in Land Administration

BK Agarwal and Diya Uday

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."

– Aldo Leopold, American Philosopher and Writer

SUMMARY

- There are many challenges in land administration including the provision of land market infrastructure, delivery of services and dispute resolution;
- An efficient land administration is critical to the growth of an economy;
- In India, the use of technology in land administration began in 1988. But it has a long way to go. Use of technology must be a means to end and not an end in itself;
- This chapter provides a novel framework to evaluate the use of technology in everyday land administration.

Introduction

Land is the primary factor of production and essential for all economic activity. A vibrant economy cannot be achieved without an effective land administration system. The inability to acquire, hold and transact, in land and property, are major impediments inhibiting both investment in land, and poverty alleviation in India.[1] Land plays an important part in accelerating the achievement of sustainable development goals. The preservation and restoration of land resources are

vital to tackling climate change, securing biodiversity and maintaining vulnerable ecosystems.[2] The increasing urban population in India is likely to put pressure on land, ranging from 5 to 10 per cent of the area currently used for agriculture. To meet this demand a massive change is required in land use which has to be handled sensitively to ensure food security and prevent conflict in areas of concern like rent and environment, which may cause social dislocation, inequality, and social strife.[3]

Land administration in India was a focus of the British because it was a source of revenue and power. The existing institutional structure for land administration was created by the British to maintain control over land and maximise revenue collection. This institutional structure requires a sizable transformation to cater to present-day requirements. This has not happened to the desired extent and land administration in India has not kept pace with changing times. The repercussions are felt in other sectors of the economy as well. There are also indications of institutional failures in the land administration system across the country. For instance, administrative delays are commonplace in delivering services such as the demarcation of boundaries of land parcels and instituting changes affecting land records on the transfer of rights to land.[4] Studies have also documented administrative errors in recording information about land parcels and large intervals between registering land transactions and recording information in the record of rights.[5]

India made a spectacular improvement in its ranking in the Ease of Doing Business index by climbing from 142 in 2014 to 63 in 2020. However, this achievement is in marked contrast to the dismal performance in those factors that directly relate to land. India's rank in the Ease of Registering Property Index fell from 121 to 154 during the same period.[6] India ranks 56 among 123 countries in the International Property Rights Index 2020, which is not encouraging.[7] The high number of court cases relating to land disputes is another indicator of weaknesses in the land administration system. Land-related disputes are the cause of about 66 per cent of civil litigation in India.[8] About 25 per cent of all cases decided by the Supreme Court of India involve land disputes.[9] In the last few decades, the government has realised that like other sectors, technology can be a powerful tool to achieve administrative efficiency in the land sector too. Efforts have been made since the 1990s to introduce modern technology in land administration albeit with limited success.

Using technology may bring efficiency to operations, but it cannot solve deeper problems that require changes in the law, procedures, and the institutional structure itself. Technology, therefore, may not be a panacea for all problems in land administration. Further, the choice of technology, how technology is deployed, and the scalability and sustainability of these solutions, are important factors affecting the impact of technology. Successful outcomes will depend on how skilfully we choose, adopt and implement a particular technology. The use of technology also has privacy implications, data management and security, which will not be possible without the right framework and implementation capacity in

place. There is a need for deep thinking that is rooted in reality. Technology has to be implemented through a framework that will help evaluate the use, sustainability, cost and scalability of the application. Indiscriminate adoption of technology in the field of land administration without such a framework is likely to render efforts at improvement directionless and unfruitful.

This chapter adopts a systematic approach by first identifying some key challenges in the field of land administration. It then examines how technology can be applied to solve some of these problems by reviewing the use of technology globally and in India. Finally establishes a vision for India and proposes a novel principle-based framework that may serve as a primer for governments seeking to adopt technology in land administration.

Challenges in Land Administration in India

Land administration is the process of determining, recording and disseminating information about the ownership, value and use of land and its associated resources. Such processes include the adjudication of rights and other attributes of land, its survey and description, detailed documentation and the provision of relevant information in support of land markets.[10] There are four core functions of land administration which include: 1) Collection and recording of information about the land, 2) Provision of the land market infrastructure, 3) Delivery of relevant citizen services, and 4) Dispute resolution (Figure 1). Each of these functions entails peculiar challenges which are described in the paragraphs herein.

Collection and recording of land information

Land records in India were created mainly to serve the administrative goal of revenue collection. The design of land records has remained largely unchanged over time and, therefore, does not capture many important fields of information about land parcels. For instance, a study on urban cadastres in Mumbai demonstrated that information about disputes on the land parcel, restrictive covenants, encumbrances and easements, are not recorded in urban land records.[11] It is also well documented that information in land records may not reflect the de facto

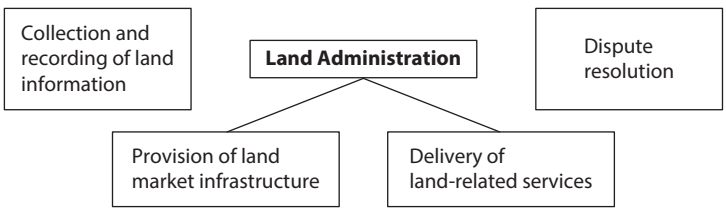

Figure 1: Functions of the Land Administration
Source: Authors' compilation

status on the ground. A field study in three states found a mismatch of information recorded in land records when compared with the reality on ground.[12] Land records are also not designed to record customary tenures that go beyond individual land rights. Such information gaps have ramifications on enforcement of land rights, operation of land markets, capitalisation of land assets, and delivery of services by the state. Due to rapid urbanisation, the volume of land transactions in urban areas is very high in comparison with rural areas. Moreover, cadastral maps and record of rights are not available in all the urban areas which are essential to facilitate an efficient land market. Town surveys have been undertaken in very few cities in the country. These surveys were also done a long time ago and have not been updated. Until recently, residential areas of villages in many states did not have a system of formally surveyed land records. The SVAMITVA scheme is now aiming to remedy this.

Provision of land market infrastructure

Land administration is a critical determinant of transaction costs associated with accessing and transferring land and must provide the infrastructure for market functioning.[13] The land sector contributes substantially to the economic growth of a nation. However, the contribution of this sector is heavily dependent on the existence of a stable and efficient land market. An efficient land market requires that there should be clearly defined property rights, minimum restriction on the use of property, transparency in all matters relating to land, a simple and inexpensive procedure for the transfer of property, and availability of capital and credit. In India, information about rights to property is spread across many departments including the revenue department, the registration officers, the town planning authority, and urban local bodies. A buyer has to seek information from multiple sources to know the status of his rights in a property and restrictions in the use of that property. It is difficult to ascertain whether a property is involved in litigation because details of litigation generally are not recorded in the record of rights. The procedure to register sale deeds and update ownership details in the land records is cumbersome and lengthy. These factors hinder the development of an efficient land market in India.

Delivery of Land-related Services

Citizen services such as marking land boundaries, granting certified copies, returning registered transaction documents, etc., have been characterised by delays. A study has found that it takes an average of 30 days for a copy of a record of rights and 46 days to complete a boundary demarcation.[14] Some states have enacted right-to-public service legislation setting time limits for the delivery of services to citizens, but these have had limited effect. For instance, a study found that service requests were completed after the prescribed time in some cases.[15]

Dispute resolution

The high incidence of land disputes is a defining characteristic of land administration in India. Land and property matters form a chunk of cases in civil courts.[16] There is also data to suggest that there is a high pendency in land matters before government officials, who are empowered to adjudicate land matters. For instance, revenue cases constitute the highest fraction of pending cases before the Karnataka Appellate Tribunal across five years.[17] The pendency of disputes over time creates uncertainty about the rights of the parties involved and hampers the capitalisation of land assets. A good land administration system should prevent disputes and also provide a robust system for resolving them quickly if and when they arise.

Use of technology in land administration in India

Having identified some challenges in land administration, we now examine the applications of technology to address some of these challenges in India. A brief review of the use of technology in land administration follows:

Digitisation of land market infrastructure

There have been efforts at digitising land market infrastructure through centrally-sponsored schemes and state-level efforts. In particular, three pieces of land market infrastructure have been targeted. These are textual records, cadastral maps and the registration process. In the following paragraphs we briefly describe the efforts towards digitising these.

Traditionally textual land records have been maintained by revenue departments in states. The digitisation of textual land records entailed the creation of online forms of records that mirrored the physical forms. Data had to be entered from physical records into an electronic database. In India, efforts to use technology in land administration began with the introduction of two centrally sponsored programmes: 1) Strengthening of Revenue Administration, 2) Updating of Land Records in 1987, and Computerisation of Land Records in 1988. In 2008 these two programmes were merged and a new scheme, the National Land Records Modernisation Programme (NLRMP), was launched.[18] This programme was again revamped in 2016 as the Digital India Land Records Modernisation Programme (DI-LRMP) with 100 per cent funding from the central government. The main activities financed under this program are the computerisation of textual record-of-rights, digitisation of cadastral maps, integration of textual and spatial data, and computerisation of offices of sub-registrars.[19] As a result of this programme, many states have digitised textual records.[20]

In the beginning, computerisation of textual records was done by entering information available in the record-of-rights into a database supported by the Unix operating system prevalent at the time. As records are maintained in local

languages, multilingual data entry was enabled using the GIST technology of CDAC. In the early 1990s, the ORACLE 6.0 database was introduced and old data was ported to the new database. A few years later Windows-based operating systems gained popularity, and data from the ORACLE platform was transported to the Windows platform.[21] Later, the data was moved to cloud storage to afford access to citizens through the web portal. These frequent changes in technology are undesirable as every change in technology involves costs in capital and time. Each time a government uses a particular technology, there are costs involved in creating systems, infrastructure and manpower. Any technology change will mean additional costs and extended deadlines. Further, not all offices in a state have the infrastructure to support these new technologies.

In a study to assess the digitisation of land records, it has been found that 28 states have digitised more than 90 per cent of their textual records. But only 14 states have made progress in the digitisation of cadastral maps, with 64 per cent of their maps digitised.[22]

Spatial land records consist of cadastral maps maintained for each parcel of land within the bounds of a city or village. This information is aggregated to create village-level and city-level maps containing spatial information about all land parcels in a given area. The first step towards better land data systems was thought to be the digitisation of these records. Old cadastral maps need to be digitised. Digitisation can be done without conducting a new survey unless of course, there has been an obliteration of field or sub-division boundaries, or if the cadastral maps do not exist, or if there is a sudden development in the area.[23]

A map is digitised by scanning and feeding it into a computer to create a raster map. This map is then vectorised by going over the outlines of each plot with a mouse. This process provides coordinates of each point on the map. This vectorised map is compared with the original cadastral map through a process called 'table check'. After ensuring the vectorised map is correct, other attributes of each of the plots are fed into the software, to create the final digitised map.[24]

Initially, states had to design their own registration systems and some states have made good progress. Maharashtra's pioneering project, Integrated Stamp and Registration of Information and Technology Application (I-SARITA), is a centralised web-based portal to allow citizen data entry, online payment of registration fees and stamp duty, and online appointment for registration. An e-search facility is also part of the system wherein citizens can conduct searches of registered documents. Similarly, West Bengal has developed a web-based portal with an e-deed facility where an e-draft of the registered deed could be made by entering data fields; it is then e-signed and submitted.

In 2016, the Department of Land Resources initiated a project called the National Generic Document Registration System (NGDRS). The NGDRS is a generic, scalable, and flexible software that links all stakeholders in the registration process. It can also be configured to specific requirements of a state. The system allows citizens to calculate stamp duty and registration fees, find circle rates and make an application for online registration. Other features of

this project include: 1) An SMS facility to send alerts to citizens and departmental users, 2) Links with the land records system, 3) Unicode-based local language support, and 4) e-KYC – a UID-based authentication with biometrics. However, for the final registration, transaction parties have to visit the office of the sub-registrar. The system allows online records of registered documents improving transparency. Currently, many states including Punjab, Himachal Pradesh, Goa, Jharkhand, Andaman and Nicobar Islands, Manipur, and Mizoram use this software.

A striking feature of computerisation is that all three major components -- digitisation of textual records, digitisation of cadastral maps, and computerisation of registration of transactions, are dealt with as independent and isolated activities by states. For instance, Andhra Pradesh has digitised 97 per cent of textual records, but 1.3 per cent of maps are digitised. Rajasthan has digitised only 9.7 per cent of maps while it has achieved about 97 per cent digitisation of textual records. Uttarakhand has completely computerised the registration process but has made no progress in the digitisation of maps.[25] This divergent progress prevents the full potential of computerisation from being exploited for improving land administration.

Generally, improvement in citizen services and land administration has not been commensurate with the level of computerisation in a state. This is because this programme places emphasis on feeding the information contained in manual records to the computerised database so that people can be given computerised copies of land records. The focus has been on the computerisation of data available in the manual records instead of improving the efficiency of the administration and giving better services to citizens. Less attention has been paid to changes in the law and procedures so that the full potential of computerisation can be utilised. There are, however, some gaps in the computerisation of land records. First, the digitisation of spatial records has not progressed as well as the digitisation of textual records. Further, there is also relatively less importance accorded to the computerisation of registration of land transactions. Only four states have fully computerised the registration process.[26]

Second, there are inaccuracies in the information captured in land records.[27] And third, the fields captured in the record are limited and not comprehensive.[28] The fourth reason is that surveys have not been conducted in many states and digitised records may not contain updated boundary information. Finally, while many states have digitised land records, few states have included digital signatures on digital records – therefore reducing their legal usability.[29] Only states like Maharashtra have special urban land records which capture information relevant to urban land such as details of buildings on the land.

The computerisation of land records and registration of transactions has largely been managed by the concerned department of a state without the involvement of the private sector or any other stakeholder. The speed and quality of implementation of this programme depend entirely on the will, motivation, efficiency, and capability of the personnel of the department. Dependence on one department

has been one of the reasons for the slow progress of this programme. A diversified and multi-layer system involving other stakeholders like surveyors, insurance and financial companies, and local bodies, could have given better results.[30]

Mapping of residential areas of villages

In most states, there are no record of rights and cadastral maps for residential areas in villages. The ownership of houses and residential land in these areas is decided by mutual understanding based on customs and traditions. In 2020, the Ministry of Panchayati Raj launched a centrally sponsored scheme called Survey of Villages and Mapping with Improved Technology in Village Areas (SWAMITVA) for making cadastral maps and record of rights for residential areas of villages. Under this scheme, high-resolution mapping of land parcels is being done using survey-grade drones along with a Continuous Operating Referencing System (CORS) to provide locational benchmarks with an accuracy of five centimetres. On completion of the survey, a record-of-rights (ROR) will be prepared just like other agricultural land in the village. The objectives of this scheme include providing financial stability to people in rural India by enabling them to pledge their property against loans. It helps create accurate land records for rural planning, calculation of property tax that accrues to the Gram Panchayats directly in states where it is devolved, adds to the state exchequer, and reduces property-related disputes and legal cases.

Dispute resolution

Disputes are an inevitable feature of any land administration system. The effectiveness and efficiency of a land administration system can be gauged by the volume of disputes, the time taken for their disposal and whether the parties are satisfied after resolution. In India, certain types of disputes like objections to a wrong entry made in record-of-rights, disputes between landlord and tenant, disputes arising out of implementation of land reform laws, etc., are adjudicated by government officials empowered under the law. Disputes related to title, inheritance, wills, illegal sale, the legal validity of a law or procedure, inadequate compensation on acquisition of land, etc., are adjudicated by civil courts.

At present, the computerisation of all the subordinate civil courts, high courts and the Supreme Court is being implemented under the supervision of the E-Committee of the Supreme Court. Courts are being computerised under this project with the system enabling the electronic filing of documents. In many states, government officials empowered to adjudicate land disputes use court management software to dispose of cases. However, this kind of computerisation is not uniform across the country. Even within a state, the use of computers varies between districts. The National Informatics Centre has created generic software for all quasi-judicial authorities, which can be used by any authority by registering at https://eqjcourts.gov.in/. This platform provides data on case details, daily

proceedings, and final judgments. The portal also provides a dashboard and SMS and e-mail services to users. The processes in revenue tribunals and cases before revenue officials must also be digitised like in higher courts to ensure transparency and speedy disposal.

Use of technology in other countries

Countries across the world have begun to harness the potential of technology in the field of land administration. Following is a review of some of the key initiatives in other countries that are relevant to India.

Electronic conveyance

In the Netherlands, electronic registration of deeds has been done since 2005. All the papers required for registration of a deed for the transfer of a property are submitted electronically with a digital signature which has the same evidentiary value as a handwritten signature. A European pilot project on cross-border e-conveyancing has been initiated by the European Land Registry Association (ELRA), using techniques from The Netherlands.

The government of Ontario in Canada, in the 1980s, partnered with a private sector company to pilot the first electronic land registration system in the world. Under this new system, documents of land registration can be drafted, signed and submitted online without the need for paperwork or a visit to the provincial Land Registry office. In British Columbia also a similar electronic system is operational. Scotland conducted a pilot to implement Automated Registration of Title to Land (ARTL) in 2001. After a successful pilot, this system has been implemented in 2008.[31]

In Maharashtra, a leave and license agreement can be drafted, signed and submitted online. However, the legal framework still requires transacting parties to appear before the sub-registrar for the registration of the transaction. So while the processes up to the point of registration can be done online, the registration itself requires parties to be physically present. The Registration Act 1908 needs to be modified if this aspect has to change. Also, once registered, transactions are not automatically updated in the record of rights. This process requires parties to apply for updating the transaction on the record of rights. Therefore, if end-to-end digitisation is to be done, legal amendments are necessary.

In Estonia, an e-Land Register system was created. This system allows citizens to access government services such as verification of data, ownership, transfer restrictions, and mortgages. The database allows gratis viewing of land registry documents, authorising another person to view documents and request a service. The data is available to both citizens and corporations. The fields of data include property number, registry, property type, cadastre code, state purpose, location, size, restricted property rights, owner, mortgage, usage rights and pre-emptive rights.[32] In India, while we have digitised a section of the land market infrastructure,

the problem of the non-capture of many important fields of information, such as usage rights and pre-emptive rights, reduces the efficacy of digitisation. Therefore even as transaction costs need to be reduced by increasing access to information, land record design also needs improvement.

Three-dimensional (3D) cadastre

Traditionally, a cadastral map depicts the property in two dimensions only. However, with the increasing population density in cities, space below and above the surface is being utilised in the form of basements, subways, flyovers and multi-storied buildings. With this kind of development, the need for a three-dimensional (3D) cadastre is being felt. A few countries have taken significant steps in this direction.

Norway and Sweden have passed laws to allow the registration of 3D construction parcels. In the Netherlands, registration of an underground construction along with the surface parcel is possible. British Columbia in Canada and Queensland in Australia have provisions to subdivide land into 3D parcels with certain limitations.[33] 3D cadastre is being implemented in Germany also. In India, some states such as Maharashtra, have attempted to introduce vertical records. The idea was to include title records for building constructions on the land. Today, because of the lack of vertical records, there is also a multiplicity of databases. For instance, property tax departments in municipal areas have their own set of records for land as revenue records do not map buildings.

Blockchain technology

Much interest has been generated in the use of blockchain technology in land administration, but very few countries have adopted it. In 2016, Georgia, in collaboration with a private company, started a pilot project to operate a land registry using blockchain technology. After the successful completion of a pilot project in 2017, a memorandum of understanding was signed between the private company and the Georgian National Agency of Public Registry (NAPR) to operate a land registry based on blockchain. Honduras started a pilot project to establish a blockchain-based land registry in 2015 in collaboration with a private company. However, this project was halted in 2017 and has not been reactivated.[34]

The Swedish mapping, cadastral and land registration authority, Lantmäteriet, has initiated an experiment using blockchain technology partnering with other actors in private and public sectors. This experiment was initiated in 2015 and has been completed in 2019, but is still not in use.[35] In a few countries like Ukraine, Brazil, Estonia, and Ghana, the adoption of this technology is being considered. In India, Andhra Pradesh is attempting to introduce blockchain technology to land transactions. While the theoretical idea of using blockchain is sound, the reality is that we have limited state capacity to understand or implement it. Implementation of blockchain-based registration requires a high amount of

capacity which includes the supporting infrastructure to run such systems, protocols to protect the system, and the human capability to create and oversee the system.

Dispute resolution

In the last few decades, there has been a proliferation of efforts aimed at introducing online dispute resolution. These platforms use technology to improve and increase access to dispute resolution services for citizens. Property disputes and housing disputes have been included in these efforts. Online dispute platforms may be government-run, court-annexed or private. For instance, the Civil Resolution Tribunal in British Columbia[36] conducts an end-to-end dispute resolution process for disputes including those related to housing and property. The Smartsettle platform in the United States is a private platform on which disputes including real estate ones can be settled.[37] Introducing online dispute resolution in forums that examine land matters has two main advantages. Online dispute resolution means that people who were previously physically away from these forums can now access them with ease. First, it will improve access to justice, and second, an online resolution has the potential to reduce the costs of litigation as parties do not need to make physical fillings or be physically present for hearings.

Involvement of the private sector

With growing urbanisation, the commercial requirement for land is increasing resulting in a demand for speed and quality in land-related services. To meet the demand for services, land administration systems need to be reformed by using new technology, better institutional infrastructure, and simplified procedures, among others. Many countries have partnered with the private sector to bring investment, technology and efficiency to the system. These are discussed in the following paragraphs.

The Ontario province in Canada has been successfully running a land registration system on the Public-Private Partnership (PPP) model. It commenced in 1992 for a 25-year period which has now been extended until 2067. This experiment has been very successful and is referred to as the gold standard in this sector. New South Wales and the southern states of Australia also operate very effective land registries using contemporary information technology infrastructure on the PPP model.[38]

In Denmark, chartered surveyors work on cadastral maps in surveying changes in the boundaries, demarcating boundaries on the ground, and mediating in case of boundary disputes among neighbours. However, changes in the cadastre are made only after the proposal for changes prepared by the chartered surveyor is approved by the Danish Geodata Agency. This agency also regulates the profession of chartered surveyors by issuing licenses under the provisions of the Chartered Surveyors Act. The system of private chartered surveyors is an excellent example

of public-private cooperation, which takes away much of the load of routine survey work from government officials ensuring quicker and better service for the public.[39]

In Switzerland, an innovative approach was adopted at the initiative of the private sector. The private sector integrated restrictions imposed by public laws with the cadastral data. They recovered their cost by providing this information to the public for a fee. Later the government stepped in to provide a legal basis for integrating Public Law Restrictions (PLR) into the cadastre by enacting the 'Act on Geoinformation' in 2007. Now as many as 17 PLR are recorded in the cadastre in Switzerland.[40]

To enable private sector participation in India, we need to examine how we can incentivise private parties to engage with the government. The administration has to be willing to engage with private parties rather than go it themselves. This will also require us to examine public procurement processes and contracting to identify if any barriers prevent private parties from engaging with the government. For instance, under the SVAMITVA scheme, drone survey services were successfully procured from private parties by state governments. Following is a study on the process involved and the lessons we can draw from this experience.

A Vision for Technology in Land Administration in India

In light of our review of global best practices on technology-based interventions and the contextual reality in India, we set out a vision for land administration in India.

Cadastral maps and record-of-rights in urban areas

In India, urban centres are growing quickly and most land transactions take place in urban areas. As mentioned earlier, a huge gap exists with respect to the availability of a record of rights in urban areas. Though state laws mandate the making and updating of record-of-rights in urban areas as well as rural areas,[41] in many cities cadastral surveys to make record-of-rights are yet to take place. In some urban areas which have been formed by reclassifying rural areas, old cadastral maps and record-of-rights do exist, but have not been updated for a variety of reasons including lack of manpower, and unsuitable formats of record-of-rights for urban areas.

The record-of-rights is an authentic source of rights over property in rural areas because of the concept of presumption of truth attached to an entry in the record of rights. The non-availability of record-of-rights in urban areas makes it difficult to verify the right holders and boundaries of an urban property with certainty. This uncertainty during transactions of urban property puts a brake on the free operation of land markets and gives rise to litigation.

While it is of utmost importance to improve record-of-rights in urban areas, the traditional approach adopted in rural areas under the DILRMP is not suitable

for urban areas. Depending only on the revenue department will prolong the process excessively as has happened in rural areas. In an urban area, information about rights in property and boundaries should be parallelly sourced from multiple agencies like the revenue department, the registrar of deeds, the Survey of India, the National Remote Sensing Centre, the urban-local body, planning authority, banking institutions, property owners, and tenants. Formats for recording information in record-of-rights should also be redesigned to make these relevant for urban areas.

With the use of suitable technology, information received from different sources can be collated expeditiously to make the first version of the cadastral map and record of rights. The remaining gaps can be plugged in gradually as more accurate information becomes available. Wherever an accurate survey of boundaries is not available, a record of rights can be made and the system of general boundaries may be followed. In this system, followed by many countries, the boundaries of a land parcel are not precisely determined in the cadastre.[42] Where ownership is ambiguous or disputed, provisional records may be made and concerned parties advised to settle their dispute by arbitration or litigation.

To ensure that such newly made record-of-rights remains updated, it should be made mandatory that the transaction deed should describe the property as per the entry in the record-of-rights. If the ownership of a seller is not recorded in the record of rights, he should be advised to get the mutation done before the property is transferred. If the map of the property proposed to be transferred is not available, the parties should be advised to get an accurate survey done through an approved surveyor and the map should then be attached with the deed. By using suitable technology, such standalone maps can be collated into a cadastral map of an area. This methodology is followed in Australia where cadastre is not made. Every land parcel is surveyed individually, and a map is attached with the title records, for future reference.[43]

Three-dimensional cadastre

Traditionally a cadastral map depicts the property in two dimensions only. HA three-dimensional 3-D visualisation of space is very useful for urban planning, assessing the energy requirement, tax assessment and making plans for rescue and evacuation in case of a disaster. With technological advancements, it is possible to represent a property in three dimensions. As mentioned earlier, many countries have started making three-dimensional cadastres, and India must do so as well.

Integration of land registry and record-of-rights

In India, two separate agencies are involved in keeping records of the legal rights of people over land. While deeds relating to the transfer of rights in property are registered with the registrar under the Registration Act, land parcel ownership records and cadastral maps are maintained by the revenue department of the

concerned state. Many European countries also have separate agencies for the registration of transactions and maintenance of cadastre.

The Netherlands entrusted the management of cadastre and land registration to a single agency as early as 1927.[44] Because of large discrepancies between the Land Registry and Cadastral maps, Hungary also created a Unified Land Registry in 1972.[45] Countries like Sweden, Ireland, Romania, Macedonia, and Lithuania, have opted for a single agency for both operations.[46] The merger of two agencies involves many intricate legal and administrative issues which are difficult to manage. However, by using technology, the two agencies can be integrated. At present two separate databases are being created for deed registration and record-of-rights. If a single database is created for both agencies or if the two databases are seamlessly linked, we can reap the benefits of the merger without doing so physically. The plot number given to a parcel of land in the record-of-rights should be the single parameter to search the database of the registry as well as the record-of-rights. An integrated search should be available on both databases through a common portal. Everyone should have access to databases of the registry as well as record-of-rights to know the status of rights on a property.

Also, details of the transfer deed should appear in the record of rights against the relevant parcel number as a remark, until the record of rights is updated. This will ensure that anyone taking a copy of the record of rights will come to know about the latest transactions including sales and mortgages even if the mutation is not sanctioned by then. This will also allow lenders to assess risk effectively while valuing properties against mortgages or loans. In the larger scheme of things, this may also help prevent disputes as transacting parties will be aware of encumbrances on the property before the transaction.

Accessibility to land records

Computerisation should have resulted in greater accessibility to land records, but unfortunately, that has not happened. It is time to change the traditional policy of restricted access to land records for the landowner and other stakeholders. The full impact of computerisation will be visible only when the data is easily accessible to multiple stakeholders like landowners, lawyers, courts, government authorities and the private sector.

A landowner should be given control over his land record just as he does over his bank account. By logging in to his account he should be able to see details of his land in any village or city in any state. He should also be allowed to update his address, phone number, e-mail address etc., by submitting appropriate documents for verification. All summons, notices etc., can be sent to him at his updated address. Through his account, landowners should be allowed to download legal copies, authorise people person to see his record, file an application of mutation, raise an objection to a wrong entry and submit a deed for registration. He should also get an automatic alert through SMS or e-mail regarding any activity initiated

by a government authority or a private person with respect to his land so that he may safeguard his interests.

A landowner should be able to submit details of his land electronically through his account to various agencies like urban local bodies, planning authorities, lending institutions, tax authorities, revenue officers etc., for availing services from them. These agencies should have access to record-of-rights to verify the data submitted by a person. The landowner should have the option to authorise professionals like architects, town planners, engineers, lawyers etc., to access his records for advice, if needed.

Recently, the Centre has declared a liberal policy regarding Geospatial Data Services.[47] Under this policy, geospatial data using public funds shall be made available to the private sector at a fair price. Similarly, data on cadastral maps and records of rights should be made available to selected private agencies for developing applications to provide land-related services to the public, government departments and other stakeholders. This should be done without compromising the data security and right to privacy of individuals.

Multi-purpose cadastre

Investment of effort, time and money in georeferencing of existing maps is justified only if these are used by various government agencies, the private sector, and the public for different purposes. This is possible by upgrading the existing cadastre into a multipurpose cadastre by adding additional layers of information to the base map. A multipurpose cadastre can be created easily if government agencies are given access to the georeferenced base map created by the revenue department, and are allowed to add layers of attributes related to the land. The private sector will also be interested in creating such multi-purpose maps because they may be able to recover their investment through users who use the data.

Recording of public law restrictions and court orders

Presently, restrictions imposed on the right of a landowner by an order of a court or any other authority is not documented in the land records. Restrictions on the use of land under laws related to town planning, environment etc., also do not appear on records. Recording of such encumbrances is necessary to facilitate efficient land markets in the country. Any order of a court affecting rights in a property, restrictions imposed by any public authority on any land, notifications regarding land acquisition, orders of any authority affecting land like a grant, allotment, cancellation of allotment, partition, etc., should be recorded in the land records. It is suggested that authorities and courts may be given limited access to the database of record-of-rights to upload details of such orders by following a prescribed procedure. Adequate safeguards against any manipulation of data should be built into the system.

Use of Technology in Dispute Resolution

Another lacuna is the limited use of technology for dispute resolution. The authors' survey of websites of revenue tribunals and anecdotal data from experts suggest that the use of technology for the disposal of land-related disputes is limited. While information about the status of cases can be viewed online in states like Karnataka, Maharashtra, and Bihar, the filing of cases and hearings, are done physically. We must consider using technology to increase the speed of these processes in their quasi-judicial forums.

Online Dispute Resolution (ODR) should be adopted to resolve disputes wherever possible.[48] Cases before revenue officers and tribunals can be handled using the ODR methodology because most cases are decided based on documentary evidence. If the use of ODR for deciding land-related disputes is adopted as a policy by state governments, it will have a major impact on the pendency of cases. In many countries, online dispute resolution platforms have been created where the end-to-end process of adjudication takes place online. This reduces the time and cost of dispute resolution and also increases access to these forums for citizens. For instance, the British Columbia Civil Resolution Tribunal (CRT) takes up cases of strata property of any amount, where the entire process of dispute resolution is online. The decisions taken by the CRT are binding and can be enforced like a court order.[49]

Public-private partnership

At present, projects for the introduction of new technology are mostly driven by the government with limited reliance on the private sector. For the successful implementation of schemes, the state must consider partnering with the private sector. A partnership with the private sector would attract investment, technology, and speedy implementation, all lacking now. There are many examples of successful implementation of large-size projects in India on the PPP model. Issuing passports in India was transformed with a successful PPP implemented by the Ministry of External Affairs. Similarly, Aadhar has been successfully implemented in partnership with private parties.

A Framework for Evaluating Technology-driven Solutions in Land Administration

Our learnings so far indicate that there are currently several technology-driven programmes under implementation in the field of land administration in India. There also appears to be a growing effort towards the adoption of new technology in more areas in this sector. It is therefore important to establish a framework for using technology in land administration. What follows is a framework in the form of a 'Six-S checklist' for evaluating technology before its adoption.

The Six-S framework checklist

This novel framework is designed as a checklist for states seeking to introduce new technology in the field of land administration. It consists of six parameters, each with a series of questions that have been designed by us, to evaluate whether a given technology is fit for a purpose. Our framework is proposed as a checklist and not a scoring mechanism. Our intent is to provide a checklist for evaluation that will guide government officials while evaluating the adoption and use of technology to address an administrative challenge. The framework checklist is to be administered as a whole even though each parameter is standalone and can be assessed independently. To create this framework, we build on our learnings from technology-driven efforts in the field of land administration in India and other countries, as well as from available literature on the use of technology in the field of public administration.

Our framework consists of six main parameters, each used to evaluate any technological solution proposed to solve a challenge in the field of land administration.

1. **Parameter 1: Suitability:** The suitability assessment is aimed at evaluating whether the proposed technological solution is appropriate for the specific purpose for which it is being considered. The questions under the suitability assessment parameter are designed to guide the government officer in three main areas (i) Identifying the precise land administration challenge and the citizen-centric outcome to be achieved, (ii) Identifying if and how these objectives will be achieved using this technology, and (iii) Identifying whether the proposed technology is appropriate in the current context of laws, rules, administrative system design, and capacity.
   For instance, a study finds that digitisation of land records may not translate into better access to formal finance, despite access being one of the socio-economic aims of land record modernisation programmes.[50] Therefore, while records may have been digitised and administrative processes integrated, they may have a limited impact on citizens. Knowing the limitations of technological interventions is essential for setting realistic goals for policies.
2. **Parameter 2: Scalability:** The scalability assessment is aimed at evaluating whether the proposed technological solution can be expanded and applied to all administrative offices in a state or region. The questions under this parameter have been designed to guide the government officer in three main areas (i) Identifying the gap between the current state of technological infrastructure in administrative offices and the infrastructure required to support the proposed technology, (ii) Identifying the gap between the current state of capacity and technical knowhow in administrative offices and the capacity and technical know-how required to operate and maintain the proposed technology, and (iii) Identifying the cost and time required to bridge these gaps for the implementation of the technological solution.

For instance, field studies have documented basic infrastructure failures such as electricity outages, server breakdowns and the lack of technical teams to fix them. The lack of computer systems in administration offices in some villages also limits the implementation of the DILRMP.[51] In some places using technology may be less effective because of limitations in infrastructure.

3. **Parameter 3: Sustainability:** The sustainability assessment is aimed at evaluating whether the proposed technological solution is viable in the long term. The questions under this parameter have been designed to guide the government officer in two main areas (i) Identifying whether the proposed technology will be able to sustain long-term goals rather than immediate objectives, (ii) Identifying whether the proposed technology has the capacity to be modified for increased dataflow and changing requirements without the need to change the technology all together, and (iii) The long term and sustained cost commitment for upkeep of the system.
   For instance, under the DILRMP, states were given three technology options for preparing cadastral maps: pure ground method using Total Stations (TS) and Differential Global Positioning Systems (DGPS); hybrid methodology using aerial photography and ground truthing by TS and DGPS; and High-Resolution Satellite Imagery (HRSI) and ground-truthing by TS and DGPS.[52] As a result, only some states have geo-referenced maps. In a recent initiative, Unique Land Parcel Identification Numbers are being issued as a step towards linking land parcels to banks and civil courts and to prevent land fraud. However, this can only be done in states that have geo-referenced cadastral maps. In states where maps are not geo-referenced, the mapping process has to be redone for it to be included within the ULPIN, rendering previous efforts ineffective. Therefore, before selecting a technology, it is important to assess the sustainability of the solution over a longer time horizon.
4. **Parameter 4: Shapeability:** The shapeability assessment is aimed at evaluating whether the proposed technological solution can be customised or modified as per local contexts. The question under this parameter has been designed to guide the government officer in three main areas: (i) Identify whether the proposed technological solution can be customised as per local requirements (ii) Identify the supporting infrastructure and capacity required for the customisation, and (iii) Identify the cost of customisation.
5. **Parameter 5: Security:** The security assessment is aimed at evaluating whether the proposed technological solution is viable in the long term. The question under this parameter has been designed to guide the government officer in three main areas: (i) Identify whether the proposed technological solution is compliant with data protection laws and rules, (ii) Identify the modifications required to meet the requirements of data protection laws and rules, and (iii) Identify the cost of such modifications and compliances.

6. **Parameter 6: Synergy:** The synergy assessment is aimed at evaluating whether the proposed technological solution can be supported by the tenement of the private sector and the local community. The question under this parameter has been designed to guide the government officer in two main areas: (i) Identify whether the proposed technological solution can be implemented using private sector engagement and expertise, and (ii) Identify whether the proposed technological solution can be implemented or supported using local community engagement.

We set out a framework checklist in Table 4.

Table 4: Our novel Six-S checklist for evaluating technology-driven solutions in land administration

Parameter	Aim	Questions for evaluating the parameter
Suitability	To determine whether the proposed technological intervention is appropriate for the particular purpose for which it is being considered.	◆ What is the land administration challenge that is sought to be addressed? ◆ What is the end citizen-centric objective the programme is aiming to achieve? ◆ How will it enable the achievement of these objectives? ◆ Does the current law recognise and sanction the use of technology? If not, what changes in the law are required for this? ◆ Is the technology application suitable for both urban and remote rural areas? ◆ What is the skill capacity that is required by all administrative offices for implementation and day to day use of this technology? ◆ Is the current level of skill capacity sufficient or Will there be capacity building required? ◆ What is the estimated cost of doing so? Are sufficient funds available to implement the technology within a reasonable time frame?
Scalability	To determine whether the proposed technology solution is expandable.	◆ What is the current level of background infrastructures such as internet connectivity, presence of computers and other hardware and software systems in administrative offices? ◆ What would be the system upgrade required to be done to support this? What is the cost of this for all administrative offices? ◆ Can the technology be applied to the evolving increased usage and larger data capacity?

Parameter	Aim	Questions for evaluating the parameter
Sustainability	To examine the long-term viability of the proposed technology solution.	◆ Will the technology enable the meeting of long-term goals and demand for services? ◆ What is the cost of updating and upgrading this software? ◆ What are the cost commitment of long-term capacity building and skill transfer implementation? ◆ Does the technology have the capacity to be modified and integrated with new technologies over time?
Shapable	To examine whether the technology can be shaped to suit local contexts	◆ Does the technology have the capacity for customisation? ◆ What is the cost of this customisation?
Security	To examine if the technology is compatible with applicable data protection and privacy frameworks	◆ Are there data protection and privacy laws in this jurisdiction applicable to this technology? ◆ Does the proposed technology solution comply with these? ◆ What is the cost of modifying the technology ◆ to comply with the data protection laws?
Synergy	To examine the potential of partnerships with the community and the private sector	◆ How can the government engage the private sector? ◆ How can the government engage the community?

Source: Authors' proposed framework

Need for post-implementation assessment

After the deployment of technology, it is important to undertake an impact assessment to examine whether or not the technology used leads to desirable outcomes identified in the Suitability Parameter assessment under the Six-S Framework. The impact assessment may be done by examining the desired objectives of the programme and examining whether these objectives have been achieved through the use of technology. This is essentially a programme audit, which must be done if sufficient time has elapsed from the introduction.

Conclusion

In modern times, the use of technology to improve land administration is inevitable. Countries around the world have harnessed the potential of technology to make land administration more efficient and accessible to people. From the computerisation of land records and registration processes to online dispute resolution, and the use of blockchain in transactions, countries are employing innovative ways to provide better land-related services. In India also efforts are on to solve problems in this sector through the increased use of technology. However, the real impact of technology will be visible only if it has been selected taking into view the specific problem and its requisite solution. Factors affecting the success of a technology-driven solution include laws and procedures to support the new technology. We have identified some challenges in land administration and then have examined how technology is being used to meet these challenges.

While technology can ease process complexity and cost, we must adopt a systematic approach to using technology in land administration in India. Further, given the regional and state variations of capacity and resources, it is important to recognise that success may vary from one state to another. We must caution against isomorphic mimicry in adopting technologies used in other countries. Further, given the increasing emphasis on the use of technology, it is important to examine whether our current strategy is translating into the tangible outcomes we desire on the ground. We conclude by stating that there is a need to constantly review the actual impact of a technology-driven solution in providing better land-related services to the people.

Editors' Comments

Having looked at the role of technology in land administration, this volume now considers the other elephant in the room: taxation. The next chapter takes a detailed look at whether and how technology can drive taxation.

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CHAPTER 6

Can Technology Drive India's Taxation?

L Badri Narayanan and Vrinda Maheshwari

"The taxpayer—that's someone who works for the federal government but doesn't have to take the civil service examination."

–Ronald Reagan, former President of the USA

SUMMARY

- The COVID-19 pandemic led to out-of-the-box ideas and models for revenue collection and taxation across the world;
- India used technology for taxation even before the pandemic;
- Post-pandemic, the new income tax portal made the filing of returns easier, resulting in a significant growth in the number of ITRs filled;
- With customs and GST evolving, it is easier to pay taxes now;
- Technological solutions come with an increasing reliance on private players.

Introduction

Despite not being traditionally considered a dynamic field, the fact is that taxation has seen enormous growth and evolution in the last many decades. From its very origin—as indirect taxes or tariffs on products to direct taxes[1]—the field has always been in a state of steady but constant flux. Tech-enabled solutions also raise the fear of job loss. This chapter will focus on the area of tax technology, which is the use of technology in taxation and will look at recent developments in India.

Tax technology is an umbrella term which refers to technological solutions in the field of taxation. Such solutions have been used by tax departments, assessees, tax consultants, corporations, and enterprises. There has been worldwide interest in incorporating new technology into taxation law. The Organisation for Economic Co-operation and Development's (OECD) report, *Tax Administration 2019: Comparative Information on OECD and Other Advanced Emerging Economies* describes this succinctly:

> *The availability of new technologies, new data sources, and increasing international cooperation are providing new opportunities for tax administrations to better manage compliance, protect their tax base and reduce administrative burdens.*[2]

The digitisation of Value Added Tax (VAT) processes in several countries in Europe is a prime example of the advantages of tax technology. For example, the UK initiated a 'Making Tax Digital' campaign in order to revamp its VAT ecosystem.[3] The campaign led to the introduction of digital VAT records and the release and rollout of new campaign-specific software which can be used to file returns. The campaign was intended to ensure a seamless transition for business owners. In Spain, for instance, the system allows for digital scanning and submission of invoices, accounting details, as well as customs documentation. Italy and Poland are in the process of launching e-invoicing with draft laws being opened up for public commentary.[4]

In direct taxation, the OECD report found a significant shift towards e-administration with more options for online filing of tax returns as well as online payments. Over forty administrations are either planning to, or rolling out, the use of Artificial Intelligence (AI) in the administration of taxes.[5] Private companies and government departments have worked together to bring about solutions and so the perception of them being mired in the past or being bureaucratic is untrue.

In fact, revenue departments around the world have been progressive. It is their willingness to embrace technology that has led enterprises to co-evolve. One of the factors that has driven the adoption of new technology has been the COVID-19 pandemic. Working remotely has necessitated out-of-the-box thinking and firms are now more used to the idea of working online. Departments have adapted to modern technology to ensure increased, or more efficient, revenue collection. For instance, when the Russian government mandated the submission of transaction-level data along with VAT returns by the assessees, the domestic VAT revenues rose by more than 12 per cent—that's a whopping US$ 4 billion.[6]

However, the pandemic has taken a toll and not all professions have lent themselves to remote work. While tax departments across the world have been proactive, overall tax collections have dropped in nearly every country. For instance, in June 2020, Brazil's federal tax collection hit a sixteen-year-low while revenue in South Africa, for the fiscal year through July 2020, made an under-recovery of US$ 4.8 billion.[7] However, countries which have enabled more advanced taxation

technology have reaped benefits and have been able to mitigate some challenges related to low tax collections. Let us look at India.

Experiments with Tax Technology

Indian tax authorities have adopted technology early. The focus of the Indian direct tax departments is: (i) expanding the taxpayer base; and (ii) ensuring that tax provisions are simplified.

Tax authorities have relied heavily on technology for the online application of tax registrations and the online payment of taxes. Processing of tax returns and even refunds does not need a physical interface.[8] The more friction-free this process is, the more the tax-paying base increases, especially for newer entrants in the workforce who may be unaware of legal and regulatory requirements of tax compliance. Authorities can also trim the fat and move to 'limited assessments' where reviews are done for specific and identified areas.

The taxpayer is at the centre of consideration. The income tax portal, released in June 2021, aimed at giving a seamless experience to taxpayers[9]—included informational dashboards or interactive query responses. The step-by-step assistance on the portal can help bring new assessees into the fold. The initiative was successful with more than 6.63 crore income tax returns (ITRs) filed for AY 2021–22 on the new e-filing portal as on 15 March 2022—the due date for companies and taxpayers that are required to file a Tax Audit Report to file ITRs.[10]

This amounts to an increase of over 16.7 lakh ITRs compared to the previous assessment period. Form 26AS can provide information on the amount of taxes paid or withheld, as well as refunds received. Refunds can be tracked through SMS alerts and automated reminders for ensuring that assessees have filed their taxes on time.[11] These are simple technological solutions which significantly aid taxpayers and definitely enable overall compliance. The earliest adoption of tax technology was in direct taxation. However, with customs and goods and services tax (GST) evolving, it is now easier to pay indirect taxes too.

The scope of the 'GST Project' cannot be overstated as it established a uniform indirect tax structure across the entire country. Its information technology (IT) platform—the Goods and Service Tax Network (GSTN)—is a boon to Indian businessmen as it provides a single-window portal for registration and filing of returns and making online payments. One of its most undervalued functions is the integration of the common GST portal with the tax administrations of both the Centre as well as States.[12]

Improving the GST ecosystem includes the introduction of e-returns, e-way bills, e-invoicing, and secure business-to-consumer QR codes. The impact on collections is clear. According to the Finance Ministry, provisional net indirect tax collections for FY 2020–21 recorded a growth of 12.3 per cent. A 108.2 per cent of revised estimates of indirect taxes for FY 2020–21 has been achieved.[13]

E-invoicing is a form of electronic billing used by trading partners—customers and their suppliers—to ensure that transactional documents can be maintained

easily, shared, and monitored. This also ensures that various trade agreement terms are complied with. India has successfully introduced e-invoicing after seeing its success in the EU and Latin America.

The success of tax technology solutions such as e-invoicing has been buttressed by the ready availability of solutions and products in India—often customised for niche needs—for instance, the automatic generation of e-way bills after a journal entry is posted, reconciliations between input tax credits, and case management software that can easily track litigation pertaining to specific tax areas.

Our tax departments have been working hard in the last few years to root out fake invoices or tax credits and rely on less labour-intensive methods. The GST department, for instance, uses advanced analytics and data-mining techniques to zoom in on problems in the system.[14]

'Project Insight', the flagship project of the Ministry of Finance, aims at widening the direct tax base by catching evaders using technology.[15] The ministry invested around ₹150 crore for procuring software and tools for the analysis of assessment data. Under 'Project Insight', two new centres will be established. The Income Tax Transaction Interaction Analysis Centre is meant to improve tax administration by using data analytics, predictive modelling, and AI to flag discrepancies in data submitted by assessees. The Compliance Management Central Processing Centre will support voluntary compliance and issue resolution.[16]

The ultimate aim of 'Project Insight' is to funnel data from various sources which will culminate in a '360 degree profile' of a taxpayer. The data will identify compliance issues and reduce fraud through the use of predictive models and push for behavioural change. This is a time in India when the proposed use of technology perhaps exceeds its capabilities. For example, one of the stated objectives is to analyse both structured and unstructured data for identifying cases where an assessee has underreported their income. The sources for such unstructured data include social media platforms like Instagram, Facebook, and Twitter.

The technology to enable such tasks is as yet at a nascent stage and is unreliable for slapping liabilities on taxpayers. There is also the issue of privacy and consent for data use. As the scope of tax technology expands, it will be crucial to make an intersectional approach and ensure data protection is a key priority. There is growing understanding that data does not exist in a vacuum and can be more beneficial if shared. Recently, the direct and the indirect tax departments of India have signed memoranda of understanding (MoUs) for information exchange and plugging revenue leaks.

An MoU was signed between the Central Board of Direct Taxes and the Central Board of Indirect Taxes in July 2020, which would allow them to exchange data on request as well as spontaneously.[17] This would be over and above the regular exchange of data already taking place.

In fact, a Data Exchange Steering Group was also established to monitor data sharing and enable process improvements.[18] The scope of information exchange agreements can expand to trade with partner nations.

India was one of the first countries to adopt the Common Reporting Standard on the Automatic Exchange of Information developed by the Group of Twenty and the OECD nations and committed to the automatic sharing of information by 2017.[19]

Naturally, the greater the data ecosystem, the more the risks associated with the safe storage and handling of data. This will be covered briefly in the next section.

The Tax Administration Reform Commission (TARC), headed by Dr Parthasarathi Shome, was set up to look at the best global practices in taxation and recommend reforms that would improve efficacy and efficiency. TARC has made multiple suggestions about the extensive use of information and communication technology to improve compliance and help forecast revenue.[20] These include (*inter alia*) the implementation of a system for online tracking of dak/grievances/applications for refund, the promotion of e-payment for the purposes of taxation, and the initiation of a data warehousing and business intelligence project (which is closely integrated with the Directorate of Intelligence and will provide inputs to the Directorate of Risk Management).

The steps taken by the Government of India are in line with the natural progression of taxation using technology. The first step is when departments enable electronic filing of returns, and the provision to submit source data online along with the returns. The next step is when this data is cross-referenced with other sources[21] in order to ensure that automated audits can be generated.

India can be said to be at this stage, with more and more improvements made every day. The acme of digitisation in tax function will be reached when the tax can be assessed not by submission of forms, but by automatic analysis of the source data. However, this requires significant advancement in many technological fields, including natural language processing (NLP), which is still a while away.

An analysis by Ernst and Young[22] finds that several countries are ahead of India in this matter, with Russia, Mexico, and parts of South America already being in the 'e-audit' stage and France starting a completely online e-assessment.

Challenges in Tax Technology

Any technological change is received with a certain reticence, and this is no different. At a base level, there is resistance to change and to moving away from established systems that have worked well for decades.

There are also very practical concerns, such as the increased cost of adoption of technological solutions. The adoption of e-invoicing, for example, means the firm has to incur costs in training personnel. There are also more indirect but critical concerns, like the fear of job loss once the systems are technology enabled.

The rollout of GST in India shows that challenges in implementation can lead to temporary chaos. With time, the issues may have reduced, but there are still hiccups. The challenges for businesses range from technological (such as the instability of the GSTN during peak periods like filing or frequently updated

digitalisation schemes) to those related to taxation law (including changes in the taxation law or amendments to the Harmonised System of Nomenclature codes).

Tax technology requires trained personnel for the collection of consistent and accurate data. Mandated process improvements are also required. According to sources,[23] over 90 per cent of companies use multiple enterprise resource planning systems in order to meet their compliance requirements, which leads to inconsistently structured or unclean data.

Evolution of Tax Teams

There will be an impact on the nature of tax teams. In the past, expertise and understanding of the law were requisite, but now it is essential that they also have technological prowess. While significant investments need to be made in software, there is an understanding that building and maintaining an effective tax function is very expensive and will have implications for building tax teams.

A fundamental question that needs to be asked is whether in-house or outsourced tax teams are better. Technology is, of course, a key driver behind outsourcing and enables the effective and efficient management of workflow and teams. Such a shift can mean that a company's internal tax teams focus more on strategic and longer-term decisions, while the everyday processes and tactical decisions are made by outsourced teams.

These tax consultants also rely on technological innovations such as robotic process automation and the use of AI in the form of NLP. This enables the use of scale when it comes to offering services, such as tax compliance, which are labour-intensive and can be easily automated.

This heralded the onset of tax-process outsourcing, where grunt work is taken care of using a mix of technological automation and human oversight. For instance, in audits or reviews of tax functions, eliminating redundancies in processes, tax process enhancement, and simplifying taxation, is possible.

In fact, an interesting outcome of the advent of tax technology has been a change in the nature of tax consultants, who will now be required to provide assistance in more complex cases of tax planning—as opposed to primarily being engaged in filing matters. The field of tax advisory—like many others—will see seismic shifts with the advent of generative AI. Various use cases are being worked on:[24] increasingly competent chatbots that can formulate complex tax advice or AI-based classifiers that can automate capital allowance classifications which can then be reviewed by humans.

The Road Ahead

Private players in tax technology play a crucial role in the development of new technology. But when it comes to a function like taxation, which is enmeshed in governmental machinery and reliant on state authority for proper execution, the

way forward would be for private players to work in close association with departments. This would enable them to better predict upcoming changes in policy to tailor solutions, while also ensuring that government departments have reliable vendors in case they need customised technology.

Revenue departments around the world will have to take pre-emptive steps by rolling out new technology or upskilling staff. This will have to be prioritised soon. The nature of tax policy in the near future will be contingent on how 'future-proof' the steps taken by government departments are.

There is also huge scope for collaboration across the ecosystem. As small and medium enterprises start the process of tax and bookkeeping automation, technology solution providers can work with them to ensure that the most relevant products are built out. There are numerous touch points in the Indian taxation system, both indirect and direct, which may be a challenge to solution providers but can also serve as a great opportunity.

An interesting outcome of such collaboration can be new and expanded career options for chartered accountants or lawyers otherwise geared for traditional roles in the field of taxation law. However, given the limited State capacity for advanced technological development, and as we move towards digitisation of taxation, there will be an increasing reliance on private players. This was seen in the formation of the GSTN, where the complexity of the project meant the enlisting of private entities like Infosys and Wipro.

Infosys designed and built the GSTN, while Wipro created the Tax Information Exchange System for inter-State business. This means that State functions are being delegated to private players and decided by the market. Even after GST was launched, private players continued to be entrenched and responsible for administration, with limited or no accountability.

With India's poor data privacy laws, the implications of State dependence on the private sector in the space of public taxation are worrying.[25] It would be prudent for the relevant government departments to work closely with the private sector in order to develop solutions that are effective but also protect citizen interests. One way forward may be the introduction, of what the OECD refers to as, 'compliance by design'.[26] It defines this to mean that taxation departments should refer to technological developments as well as the way modern companies are structured in order to 'incorporate tax compliance into the systems businesses use to manage their financial affairs'.[27] For example, revenue departments can work with software companies to integrate accounting software with tax rules to ensure the pre-filling of returns.

If secure chains of information are added, for example, e-invoicing or using secure portals like GSTN or electronic cash registers—a simpler tax administration is possible for assessors and assessees. Businesses need to read the writing on the wall and ensure their tax functions are not left behind amid the digital revolution. This would involve re-training and upskilling of their tax teams in important areas like change management and technological adoption.

Companies must turn to tax technology to enable data-driven decision-making, which would ensure they maintain margins. At the same time, the tax function can identify areas of improvement in current processes and find efficient solutions. With the increased focus on data privacy, a key area for businesses would be effective data management for online filing and compliance needs. For instance, there is a necessity for awareness of legislations like the Data Privacy Bill, 2022 and appropriate investments in data storage, servers, and data analysts.

Both governments as well as private enterprises will benefit from a more comprehensive use of technology for the collection and analysis of data and information.

Brazil introduced a real-time reporting system which is now being emulated by a number of countries in South America.[28] Corporations are starting to use web-based platforms enabled with various AI functionalities to store and process data, as opposed to Excel spreadsheets. This allows for exponentially quick data entry, manipulation, transformation and review.

As collaboration software becomes more prevalent, it is easy to image a scenario in the near future, where the revenue department gets access to accounting data of firms in real time, with taxation obligations being calculated automatically. To be successful in this endeavour, companies should ensure that their business processes are effectively tied in with their tax technology solutions of choice. This will give them a competitive edge that goes beyond merely meeting the regulatory requirements of the country.

Editors' Comments

From specific areas such as land and taxation, and examples of what has already been attempted in India, the volume now moves to something that cuts across multiple domains and has not been implemented. The next chapter presents an approach for avoiding disputes using smart contracts to contribute toward strengthening the rule of law infrastructure. More than the stated impact that comes from existing implementations, it is reflective of the promise of technology in reducing judicial burden and facilitating law enforcement in India.

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CHAPTER 7

Dispute Avoidance using Smart Contracts

Nikhil Narendran

"A promise invokes trust in my future actions, not merely in my present sincerity."[1]

–Charles Fried

SUMMARY

- It is common knowledge that enforcement of agreements in India is a time-consuming and costly affair;
- The use of tech-enabled smart contracts could help avoid disputes by using automatic enforcement;
- Among other things, a smart contract can be used for rental lease, copyright, and royalty payment agreements;
- While smart contracts are self-executing, they require third-party oracles;
- A key disadvantage of a smart contract is the absence of human discretion and agency;
- The implementation of a smart contract is expensive;
- There is no specific law in India for smart contracts.

Introduction

Trust between parties to a commercial transaction is integral to the success of the commercial relationship and the law should be able to hold people accountable for doing what they say.[2] In most common law jurisdictions, a promisee is protected against injury caused by the non-performing promisor[3] through damages

or specific performance. The parties could also pre-agree to remedies in liquidated damages or service credits for failure to achieve specified service levels.

Parties to a commercial transaction must be able to enforce their contractual rights in a meaningful, timely, and cost-effective manner for trade and the economy to progress. Nobel Prize winner, Douglass C North, in *Institutions, Institutional Change and Economic Performance (Political Economy of Institutions and Decisions)* observes[4] that one of the main reasons behind the historic stagnation and underdevelopment of the third world is the inability of societies to develop effective, low-cost enforcement of contracts. He further observes that contracts will be self-enforcing when it is in the interest of the parties to self-enforce them—in other words, when the benefits of living up to the contracts exceed the cost of measuring and enforcing the agreement.[5]

The Indian Contract Act, 1872 (Indian Contract Act), in theory, adopts this principle. The parties are not required to enter into contracts mandatorily. Having said this, once they do, they subject themselves to the terms and are required to abide by those. If they fail to do so, there could be specific reliefs, or they could be subjected to damages.[6]

Despite such theoretical assurances by way of legislation, the legal system in India has not been able to, in practice, develop and secure an environment for the enforcement of contracts.[7] It is common knowledge that the enforcement of agreements in India is a time-consuming and costly affair.[8] In the 2020 Ease of Doing Business Report by the World Bank, India scored only 41 points out of 100[9] in terms of enforcing contracts with an average of 1,445 days for resolution of disputes and the average cost of litigation being 31 per cent of the claim value. It must be noted that these numbers are based on data from Mumbai and Delhi, which are known to have efficient courts. The situation is arguably worse in other forums in India.

This led to the State promoting commercial courts and alternative dispute resolution mechanisms to secure the rule of law and increase the ease of enforcement of contracts. The Indian government enacted the Commercial Courts Act, 2015[10] and also launched a specific portal to provide information on commercial cases in dedicated commercial courts in Delhi, Mumbai, Bengaluru, and Kolkata.[11] However, even the former Chief Justice of India, N V Ramana, recently stated that the commercial courts model has not helped much in dealing with the issues of pendency of cases.[12] The judiciary has been plagued by a lack of adequate support in funding[13] and timely appointments.[14] India has around twenty-one judges per million people,[15] which is grossly inadequate.

While commercial courts, alternate dispute resolution mechanisms, and increasing judicial appointments are good strategies to reduce pendency, these are unlikely to resolve the issue. Given the gravity of the situation and its impact on the country's overall economy, we must look at other possible avenues to promote the ease of enforcement of contracts and reduce the burden on the judiciary.

In India, for most years, the number of cases disposed of is significantly lower than the number of cases filed.[16] This indicates that just the speedy disposal of

cases alone is not enough to solve the problem. It requires a parallel strategy to ensure that the number of cases is kept in check by adopting an approach of 'dispute avoidance'—reducing the occurrence of disputes in the first place. The use of technology-enabled options such as smart contracts could be one way of achieving dispute avoidance by using automatic enforcement.[17]

This chapter proposes the use of smart contracts, which will lead to fewer conflicts. This in turn will improve the rule-of-law infrastructure in the country and reduce the burden on the judicial system.[18]

Smart Contracts

Simply put, smart contracts are contracts on code, which have pre-determinable agreeable actions encoded onto them.[19] There is no uniformly accepted definition of smart contracts. Several definitions of smart contracts tie up the concept with the mandatory use of blockchain technologies.[20] However, smart contracts do not require blockchain infrastructure, though there are certain advantages to it (such as perceived immutability and reliability).

In terms of technology, a smart contract is an algorithm that records the parties' agreement and can self-enforce as the parties would have agreed on predetermined outcomes upon certain events. It is both a contract on code and text, which the parties agree upon digitally.

Nick Szabo, a computer scientist and lawyer, is often touted as one of the first to talk about smart contracts. He says 'I call these new contracts "smart" because they are far more functional than their inanimate paper-based ancestors. No use of artificial intelligence is implied. A smart contract is a set of promises specified in digital form, including protocols within which the parties perform on these promises'.[21]

It must be noted that Szabo explains smart contracts as being agnostic of blockchain technology, arguably because his article pre-dates modern blockchain technology. Several articles and papers always refer to smart contracts in conjunction with blockchain.[22] Ethereum blockchain, for that matter, is frequently used in forming smart contracts.

Szabo also propounds that such smart contracts should be designed with the following objectives:

1. **Observability:** This implies that performance should be observable by the parties to the contract and, if required, made visible to third parties.
2. **Verifiability:** It should be possible to prove to an arbitrator that the contract has been honoured or breached, the arbitrator should be able to determine so, either by audit or verification.
3. **Privity:** The knowledge of and control over the smart contract should be limited to those who are party to the agreement and should be to the exclusion of unrelated third parties who are not privy to the contract. It appears that cyber security is a crucial concept of privity as put forward by Szabo

and is, therefore, slightly different than the common law concept of privity of contract.

4. **Enforceability:** The smart contract should be enforceable while minimising the need for enforcement outside the smart contract. For this, Szabo suggests tools such as reputation, built-in incentives, 'self-enforcing' protocols, and verifiability.

Szabo also proposes that smart contracts be coded in a manner to make a breach of a contract expensive (if desired, prohibitively so).[23]

Oracles

While smart contracts are self-executing, they will be relying on third-party oracles. Third-party oracles act as a source of truth in order to determine if pre-coded actions need to be initiated—in other words, ascertain if an action needs to be enforced or not. Oracles act as a bridge between the real world and the smart contracts; so, the self-executing action or verification hinges on a real-world event.[24]

An oracle could be a time server, upon which the smart contract automatically initiates a particular action. Some other examples of oracles include CCTV cameras for the verification of visuals; servers for measuring service levels; Escrow/Nodal bank accounts for the transfer of funds; sensors for determining light, motion, proximity, and more; and public registries with record title, ownership, birth, or death.

If there is a smart contract for travel insurance to cover flight delays or cancellations, the smart contract will rely on an oracle in the form of a server of the airlines on the origin or destination airport. Upon delay, there will be a direct insurance payout to the customer.

Automated performance

Automated performance of contracts is not an entirely new concept. We can see several illustrations of this in our daily lives—a vending machine dispensing a product upon payment of a certain amount of money, for instance. Similarly, there are different forms of coded performance in stock market trade. Most stock trading websites and applications allow traders to make automated buy, sell, and hold decisions, often based on market variability. Automated performance is common in the Indian financial industry; the National Automated Clearing House mandate of the National Payment Corporation of India[25] is one such model where once a mandate is registered, payment happens as per instructions. Similarly, e-commerce marketplaces typically engage in automated transactions where the funds collected from a buyer are sent to the seller as per a product's returns/warranty policy.

However, most examples mentioned above are those of simple transactions, primarily focusing on payment mandates. In contrast, in a smart contract, there will be a series of such automated transactions, which will form the 'performance of the contract' component.

Smart Contracts: Elevating Trust by Automating Performance

A smart contract elevates trust as it automates the performance of a promise, thereby eliminating the possibility of a breach. The smart contract records specific actions that the parties need to perform.

One of the critical sectors ripe for the implementation of smart contracts is real estate as it is a sector plagued by lack of trust.[26] The sector is characterised by fly-by-night operators, severe delays in handover, and lack of trust amongst the stakeholders.[27] Typically, the residential real estate sector relies on milestone-based payment by the consumer to the developer, which is often enabled through a bank or a non-banking financial company that provides housing finance. Delays in handover in such contracts result in the payment of penalties by the developer to the customer. It is easier to automate such payments since they are based on the completion or non-completion of milestones.

As an example of a real estate transaction, in a transaction involving the rental of immovable property, the lack of trust may be due to:

1. The lessor is unsure of whether the lessee will keep the immovable property and fittings in proper condition.
2. The lessor is uncertain if the lessee will pay the rentals, maintenance fee, electricity charges, and water bill on time.
3. The lessor is uncertain if the lessee will vacate the premises on time.
4. The lessee is unsure if the property is in need of major or minor repairs.
5. The lessee is unsure if the lessor will unreasonably increase the rent.

A smart contract for lease can be coded by keeping in mind the above-mentioned issues in the following manner:

1. The lessor and lessee execute a smart contract where the lessee leases out the property to the lessor.
2. The smart contract will authorise a physical or digital master key to the property.
3. The lessor's and lessee's bank accounts are linked to the smart contract.
4. A third-party time server will act as an oracle.
5. The interest-free security deposit will be deducted from the lessee's bank account and credited to the lessor's bank account on a specified date.
6. The smart contract will trigger the transfer of rent from the lessee's bank account to the lessor's bank account on a timely basis.

7. In case of any significant property damages caused by the lessee, the lessor can demand payment from the lessee, which, if accepted by the lessee, will be transferred to the lessor.
8. After the term of the lease, unless extended by the parties, the digital key loses authorisation to unlock the property.
9. The interest-free security deposit will be transferred automatically from the lessor's bank account to the lessee's bank account after appropriate deductions claimed by the former and after uploading necessary supporting documents to the innovative contract platform.
10. In case of a dispute, alternate dispute resolution mechanisms including online mediation or pre-appointed arbitration tribunals through an online dispute resolution could kick in. Even delays in the appointment of arbitrators could be avoided if the smart contract sets timelines for the automatic appointment of agreed arbitrators within a period.

Another use case is a smart contract used by a copyright society. Calculation of royalties for the use of copyrightable work such as music is often complex, and the apportionment and payment of royalties is a challenging task. Let us suppose that the licensing and royalty payment of a musical work is coded as a smart contract. In that case, the entire audit trail concerning the use of the work, the payment of royalty, and so on, could be maintained and easily made accessible. For instance, a streaming website seeks to procure a licence to use a musical work through a smart contract each time such work is played on the website. In such cases, corresponding royalty payments can be automatically made to relevant performers, including singers, lyricists, producers, music directors, and other performance artists. The role of the copyright society as an intermediary could be minimised or even eliminated, given that music labels can enter into a smart contract for the apportionment of royalties. Similar cases can be explored for banking and finance, e-commerce, and real estate.

Validity of Smart Contracts under Indian Law

Under the Indian Contract Act, all agreements are contracts if they are made with the free consent of the parties competent to contract for a lawful consideration and a lawful object.[28] The competency here refers to the age of majority or of having a sound mind, and the capacity to contract, that is, being solvent or having authorisation as required in chartered documents of a company or a legal person. Consent is defined as 'two people agreeing upon something in the same sense'. Free consent is when such consent is obtained without coercion, undue influence, fraud, misrepresentation, or mistake.

As one would expect, being a nineteenth-century piece of legislation, the Indian Contract Act does not define or specifically recognise a smart contract. Conversantly, it is all-encompassing, and there is no bar on smart contracts or self-enforcing contracts. In fact, as per Section 10 of the Indian Contract Act,

even oral contracts are valid.[29] That said, since a self-executing smart contract will essentially be in an electronic form, the Information Technology Act, 2000 (IT Act) will also govern such contracts.

Smart Contracts under the IT Act

The IT Act was enacted to provide legal recognition for transactions carried out by means of electronic data interchange and other means of electronic communication and recognises electronic contracts.[30] Section 10A of the IT Act specifically recognises electronic contracts and says that:

> *Where in a contract formation, the communication of proposals, the acceptance of proposals, the revocation of proposals and acceptances, as the case may be, are expressed in electronic form or by means of an electronic record, such contract shall not be deemed to be unenforceable solely on the ground that such electronic form or means was used for that purpose.*

Section 10A recognises that communication, acceptance, and revocation of proposals can be done in electronic form and such contract formation cannot be negated solely on the ground that it was done electronically. It is interesting to note that Section 10A does not talk about electronic signatures or digital signatures, which are issued by certifying authorities under the IT Act, but instead recognises all forms of electronic contract formation, including (i) emails; (ii) instant messaging, such as WhatsApp; (iii) click-wrap; and (iv) shrink-wrap. Hence, any electronic contract is valid under Indian law provided it satisfies the requirements provided in the Indian Contract Act.

Since all smart contracts are electronic contracts, smart contracts are also valid under the law. That said, it must be noted that the IT Act does not apply to certain types of transactions. As per Schedule I of the IT Act, it does not apply to the power of attorneys, negotiable instruments (other than a cheque, DP, or a bill of exchange in favour or endorsed by certain regulated entities), trust deeds, and wills. Consequently, the IT Act does not apply to these documents or transactions relating to them, and electronic means of contracting, including smart contracts, cannot be used for real estate transactions or wills or trust deeds. Therefore, currently, the application of smart contracts is limited and cannot be used for enforcing a deed such as a will.

Advantages of Smart Contracts

The advantages of smart contracts fall into several categories and are described in this section.

Automation and build trust and certainty

Smart contracts automate the performance of the contract and give a minimal chance of breaking a promise. Disputes typically arise either due to differences

in the interpretation of contractual clauses or when one or more parties do not honour their part of the promise. While smart contracts cannot entirely solve the first problem, they can be of help in instances where performance can be automated if the agreement on code captures the parties' intent correctly.

In the case of the second problem, smart contracts solve the issue whenever there is a mandatory obligation to perform. For example, if a contract requires party A to make a payment to party B on the first of every month, this payment process can be automated. This eliminates the possibility of a dispute on the grounds of non-performance in almost all instances where funds are available in the account concerned. If there are no funds available, the dispute resolution process under the contract can kick in.

Currently, in traditional contracting, the parties are often unknown to each other. There is little or no information available to the other party to determine if a person will fulfil their part of the contract. This, to an extent, is solvable using reputation ledgers, but creating such a ledger at a national level is time-consuming and costly and throws up challenges concerning data privacy. Besides, such a solution is short-term as a person's behaviour and reputation may change over time and they may no longer be as reliable as they once used to be.

Reduction of the Chances of Dispute

Since smart contracts automate performance, they also significantly reduce the chances of a dispute. Let us suppose that contracts build in measures with respect to a penalty or liquidated damages to be paid in case of a failed performance. In that case, it will also improve the good behaviour of participants. It is not always possible to eliminate disputes with smart contracts. A smart contract that enables an alternative dispute resolution mechanism or an online dispute resolution mechanism will ensure that even procedural aspects relating to a dispute resolution are automated. A smart contract with a pre-agreed arbitration panel as a dispute resolution process can: (i) immediately initiate the arbitration proceedings by informing the panel of arbitrators; and (ii) send notices to the parties to the contract. This eliminates procedural delays in the dispute resolution process.

Standardisation

A good smart contract template can be used for multiple transactions and contribute to the standardisation of contracts. A sectoral regulator championing the cause of smart contracts can create a model smart contract template for use throughout the sector, which will save cost and time.

The Real Estate Regulatory Authority (RERA) could champion smart contracts in the real estate sector. In an industry plagued by delays in handover, such use could benefit both the customer and the developer.

Regulation Technology

Smart contracts can be used to enforce regulations on entities in a sector. Most licences issued by a regulator, such as the ones in telecom, are contractual in nature. The rights and obligations of a licensor (the government) and the licensee (the telecom company) can be automated through smart contracts. For instance, the current unified licence issued to telecom licensees in India can be put in a smart contract. Such a smart contract should enhance: (i) reporting and compliance obligations; (ii) the ability of the regulator to pull information directly from licensees for verifying compliances; and (iii) the ability of the regulator to enforce penalties on the licensee.

Smart contracts can also be used to enforce municipal or city-level enforcement actions, especially where there is no adjudication requirement. All instances of jumping traffic lights, whether such activity is deliberate or not, are an offence, and CCTV cameras can be used for automatic enforcement. They could even minimise the chance of petty corruption.

Limiting the Role of Intermediaries

One critical function of a modern intermediary is to create trust to bring two unknown parties to a contract. In the case of digital transactions, such as e-commerce transactions involving the purchase of a product on a marketplace, the intermediary helps create a reputation register and often mediates any potential disputes. The intermediary ensures that while the buyer of goods pays the purchase price in order to safeguard the seller, it also holds it in escrow till the buyer receives the good and is satisfied with it before it releases the payment. Such intermediation models are aplenty on the internet, including the ones for hotel bookings, travel, and cab aggregation. Such intermediaries have also acquired significant power over the markets and have created competition law and consumer protection issues.

A carefully executed smart contract can, to a large extent, limit the intermediaries' role or create a new class of intermediaries with reduced functionalities.

Disadvantages of Smart Contracts

While highlighting the advantages of smart contracts, it is important to also note their potential disadvantages, and they are listed in this section.

Lack of Human Discretion and Agency

When we automate performance, we also take away human autonomy and discretion, which are essential in commercial transactions. For instance, it is possible that the circumstances that led to the formation of a contract change and the parties need to terminate the agreement. Therefore, a smart contract must incorporate clauses that give the parties the right to deviate from the existing contract

for genuine reasons. Right of termination at will or for a cause must be included and, in such cases, if commercials necessitate, provide for payment of liquidated damages for a non-cause termination.

Similarly, contracts will often have clauses where the parties agree to decide the future course of action after a while. These clauses use the term 'may' instead of 'shall' or 'should' or 'will'. Here is a sample clause:

> *The parties may decide to extend the term of the contract for a period of 6 months. The parties may agree upon revised commercials for such extended period.*

This grants parties the discretion to change aspects based on temporal conditions. Such 'may' clauses do not always provide certainty but are essential in the context of commercial transactions.

In contrast, a 'shall' or a 'will' clause provides more certainty and will read as follows:

> *The parties shall extend the term of the contract for a period of 6 months. The parties will agree upon revised commercials for such extended period.*

For clauses that mandate performance using the term 'shall', it is possible to automate performance whereas it is critical to give agency to the user for a 'may' clause. The importance of human discretion is not limited to commercial contracts; even the use cases suggested earlier for automatic enforcement of minor offences should be subject to human oversight and scrutiny—either from the judiciary or the enforcement agency. Given the importance of human discretion, the tendency to implement artificial intelligence overzealously in smart contracts should be resisted, as a meeting of minds is essential for a contract. It is interesting that even Szabo speaks against the use of artificial intelligence.

Cost

Like most new technologies, smart contracts are expensive to implement. The gas fee on Ethereum—in the range of US$ 7,500 to US$ 45,000[31] —is prohibitively expensive for mass adoption. While alternatives such as Polygon and Avalanche are available,[32] they will still be expensive for a market like India.

Lack of Application in the Non-Measurable Criteria of Performance

Smart contracts rely on measurable criteria to perform self-executing actions. The measurable criteria could be data from a third-party server relating to the time and date or the completion of another action. Smart contracts require such information to perform these self-executing functions. By way of an example, an outsourcing smart contract could measure the service levels of performance of a service provider and could automatically trigger the payment of service credits/liquidated damages from the service provider to the customer, if the service levels dip below an agreed limit.

Having said that, there are several instances where it is not possible for the smart contract to rely on reliable data to perform this function. In personal contracts, where customer discretion will have a bearing on the performance of a contract, smart contracts will find it difficult to self-enforce. An easy hack in such cases would be to agree on a minimum period within which a deliverable could be returned for non-payment. In such situations, it is also important to include clauses that give users the discretion to enforce rights.

Other complex scenarios involve physical verification or audit that cannot be automated in a smart contract. For instance, in lease agreements, a lessor will be required to refund the security deposit payable to the lessee upon surveying that the premises are in good condition. To ascertain this, the lessor will need to visit the premises and conduct a physical inspection before agreeing to the payment being released.

While some of these functions could be automated using cameras and sensors, full automation of these aspects of a commercial contract still needs to be worked out.

Need for Amendments

Like most contracts, smart contracts may need to be amended in cognisance of new developments that may impact commercial relationships. These could be triggered by, among other things, a change of law or regulations, economic conditions, or *force majeure*. A smart contract should be designed to account for such changes.

If a smart employment contract provides for a one-month notice period before the termination of an employment relationship but a change in the law mandates a notice period of two months, automatic enforcement may lead to a violation of the law. One possible alternative is to tie such smart contracts to a reliable oracle capturing changes in the statutorily-prescribed notice period. Currently, no such reliable resources exist that could be plugged into the smart contract ecosystem. Therefore, the only possible solution seems to give the parties a right to initiate the amendment of the contract by digitally creating an amendment request that the other party could then accept.

Lack of Specific Recognition

There are no laws in India that recognise smart contracts. While the smart contract does not need specific recognition given the position under the Indian Contract and the IT Acts, it is bound to create confusion for both courts and lawyers. Like most new technologies, it could be challenged before the courts as being unenforceable, and there is a practical risk of such challenges surfacing in the initial years.

Given that the whole process of smart contracting requires the actual text of the contract to be agreed upon and then put into code, the actual code, on

enforcement, will need to be translated efficiently. Any loss or mistake in translation will impact the rights and obligations of the parties.

Need for Supervision

Like most technology products, smart contracts need constant verification and supervision to ensure that they achieve the purpose they are meant to serve. It is also essential that there is supervision to ensure that smart contracts benefit all stakeholders and that smart contracts constantly evolve both technologically and legally. Such supervision may be from the sectoral regulators or self-regulatory originations with robust governance structures. Similar to the human supervision models for implementing artificial intelligence, appropriate human-in-the-loop or human-over-the-loop models may be developed while ensuring privacy and confidentiality. Any unjust result should be brought to light and rectified for future smart contracts and amended for the subsisting ones. This process itself could be quite complicated, therefore the governance process should be transparent.

Digital Challenges

Smart contracts will also face challenges that any digital form of contract formation faces. Some such challenges that are relevant to smart contracts are cyber security, data protection, and access rights when arrangements are in the public blockchain. It is possible to create secure smart contracts that ensure cyber security and protect data. Given the universal nature of these issues and the solutions available, this chapter does not delve into these issues specifically. Instead, this chapter focuses on two specific issues thrown up by the Indian regulatory regime. Despite the IT Act being in force for over two decades, there are several practical challenges remaining—such as stamping, registration, and the lack of options with respect to electronic signatures.

Stamping and Registration Requirements

The Indian Stamp Act, 1899[33] and various state legislations require every instrument executed in India to be stamped under the applicable stamp duty. Some legislations, such as the Karnataka Stamp Act, 1957,[34] also apply to electronic documents. However, there is no seamless electronic stamping solution available for electronic contracts.

In the absence of stamping, a court of law could refuse to enforce a contract[35] and direct the parties to stamp the document along with penalties.[36] The government authorities also have the power to impound unstamped records and levy penalties under the Indian Stamp Act, 1899 for improperly stamped documents.[37]

Similarly, the Indian Registration Act, 1908 requires certain documents to be compulsorily registered. This includes Wills and real estate contracts of certain

nature. Unless the process of registration of these documents is also fully digitised, it will impact the adoption of smart contracting to improve enforcement. This will require not just the amendment of the Indian Registration Act, 1908 but also investment in creating a technology platform to enable the digital registration of documents.

Electronic Signatures

Electronic signatures under the IT Act are either: (i) digital signatures with asymmetric crypto function;[38] or (ii) other authentication technologies mentioned under Schedule II of the IT Act. This is prescriptive and limits the ability of the parties to adopt any form of electronic signing method. While Section 10A of the IT Act ensures that any electronic means of contract formation is allowed, the presumption of validity accorded to an electronic signature under the IT Act read with the Indian Evidence Act, 1872[39] is not given to other means of electronic signatures.

Smart Contracts and Human Discretion

As discussed above, discretion is an essential element in commercial agreements. The parties should be able to deviate from agreed terms or terminate contracts under certain circumstances. While it is standard practice for a customer to levy a service credit penalty on a service provider who failed to perform the service, the customer may not enforce such penalties. This is because service levels are not meant to enrich the customer at the service provider's cost. They are a way to disincentivise the service provider from causing a failure. Given this, several enterprise customers choose not to apply the service credits. Instead, they use the credits to engage with the service provider to increase the quality of service and performance. Further, since it is impossible to legislate all eventualities in a contract, parties tend to leave scope for future deliberations. The clauses using the term 'may' are examples of this line of thought.

It is vital that smart contracts allow for: (i) discretion; (ii) deviations; (iii) future legislations after mutual deliberations; and (iv) flexibility to take care of unforeseen circumstances. A hybrid model may be most suited for most commercial transactions instead of a 100 per cent automated smart contract. In such a model, clauses with definitive obligations, such as those using the terms 'must', 'will', 'shall', and 'are', should be enforced automatically. In contrast, clauses which allow for flexibility, such as those using 'may', should give an option to the parties to provide for consent separately.

Essentials of a Good Smart Contract

Apart from satisfying the requirements under the Indian Contract and the IT Acts, some of the critical aspects of a good smart contract are:

1. **Verifiability:** Each action of the smart contract must be recorded and verifiable. It should be possible to retrace the actions and produce evidence as and when required. For instance, if the smart contract initiates a payment from one party to the other, the following details may be captured in an audit-logged and time-stamped manner: (i) the reason for the initiation of the payment, which could be an automated payment under an obligation under the smart contract or further, to initiation of payment by one party's instance; (ii) record of the payment with the banks involved, communicating an applicable reference ID which proves that the payment indeed happened.
2. **Reliable oracles:** Smart contracts should be based on reliable oracles to ensure that automated performance is based on reliable metrics. These reliable oracles could be, among other things, servers for relying on timely payments or cameras for relying on images.
3. **Human discretion:** Smart contracts should provide for instances where human discretion could be exercised. As discussed above, it is likely that parties may prefer not to enforce a particular right in the interest of a commercial relationship. For instance, despite the lessee not paying the rent, the lessor need not exercise her right to initiate arbitration or eviction because of certain circumstances. Similarly, a service recipient need not always enforce their right to receive service credits or liquidated damages from a service provider in the interest of building a long-term working relationship.
4. **Supervision:** Standard and templated smart contracts will require supervision to meet the goals they are meant to achieve. Such supervision must be done with robust governance mechanisms in place. For instance, if smart contracts are implemented in the real estate sector at the initiation of the RERA, the RERA must supervise and monitor how such smart contracts are enforced and whether such smart contracts are causing any harm to the stakeholders. Supervision must also be done to ensure that automation does not lead to denying any fundamental rights of the stakeholders involved. Supervision must also include reviewing the existing smart contracts at regular intervals to ensure that they are updated, keeping in mind commercial and sectoral realities and changes in the law.

Proposed Changes in the Regulatory Regime

Often, enforcement of wills is challenged on the grounds of the soundness of mind of the testators and undue influence/coercion on the testators. Since wills are made behind closed doors, legal challenges and defences of wills are time consuming. This problem could be solved by using video cameras and digital signature technologies, which could be used to record and authenticate the entire process of the creation of a will. Even enforcement of wills could also be entirely automated if digital ledgers are created for properties. This also requires digitisation of real-estate records and other movable properties. Smart contracts

will save a lot of time and cost, reduce friction, and increase trust. Increasingly, wills deal with not just real assets but also digital assets. If digital platforms enable the transfer of digital assets by will, it could also be automated using smart contracting technology. It is essential that the IT Act is amended to remove wills from the negative list from Schedule I for this to happen. Further, taking a technology-neutral approach to electronic signatures under the Information Technology Act will also create an enabling framework for all digital transactions, including smart contracts. While doing so, creating a seamless mechanism to stamp and register digital contracts in the country is essential for making the entire journey of stamping documents digital.

Conclusion

In this chapter, we have examined both the advantages and the disadvantages of using a smart contract. While smart contracts are a good alternative for dispute avoidance strategy, they will need reliable oracles and ecosystems. First and foremost, there is a need for alternatives to blockchain applications in India, given the prohibitive cost. There are currently open specifications that factor in policy on smart code contracts such, as the Beckn protocol, which enables similar open ecosystems that can be used for smart contracts.[40] Further, it will need institutional support from regulators or industry bodies to be widely adopted.

It must be noted that unlike in the West, where the markets and the competition always drive technology, India has followed a different path in solving problems unique to the country. Aadhaar and the e-KYC models using Aadhaar have helped reduce the costs and time required to conduct KYC.[41] Similarly, the united payment interface has enabled low-cost money transfer possible amongst people with bank accounts and mobile phones. Other examples in India include the GeM Sahay portal for helping financer vendors and the proposed open network for digital commerce for enabling e-commerce. Interestingly, GeM Sahay also has smart contracts in its implementation.[42]

Given such initiatives, as a next step, India could consider taking a similar approach to smart contracts by creating a Bharat Smart Contract model with lawyers, policymakers, and technologists. For starters, it may be used in regulated sectors such as banking, insurance, and telecom, where the applicable regulator, such as the Reserve Bank India, Insurance Regulatory and Development Authority of India, or the Telecom Regulatory Authority of India, could be involved in identifying areas for implementation. Subsequently, it may be implemented in other sectors such as real estate, or for enforcing the wills, which will require some amendments to existing regulations such as the IT Act and the Indian Registration Act, 1908.

If India were to provide a low-cost alternative to existing platforms and a suitable governance mechanism, smart contracts could work well to improve the ease of doing business and trust and reduce the load on the judicial system, enhancing the rule of law infrastructure in the country.

Editors' Comments

This chapter highlights the promises and identifies potential issues with the application of technology in the Indian context. The next chapter takes the reader on a different track and provides a glimpse of that oft-appearing word in the world of the criminal justice system: forensics. It provides an overview of forensic technology, essentially digital forensics, and narrates how it can play an important role in the criminal justice system as well as national security—a topic which we elaborate further in a subsequent chapter.

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85B. Presumption as to electronic records and electronic signatures. — (1) In any proceedings involving a secure electronic record, the Court shall presume unless contrary is proved, that the secure electronic record has not been altered since the specific point of time to which the secure status relates. (2) In any proceedings, involving secure digital signature, the Court shall presume unless the contrary is proved that— (a) the secure electronic signature is affixed by subscriber with the intention of signing or approving the electronic record; (b) except in the case of a secure electronic record or a secure electronic signature, nothing in this section shall create any presumption, relating to authenticity and integrity of the electronic record or any electronic signature.

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CHAPTER 8

Forensic Science and the Making of a Safer Planet

Dr JR Gaur, Prachi Kathane, Shakti Prakash and Anshu Singh

"The great and constant need of those who investigate homicide and practise forensic pathology or criminal law is a warm humanism."

–Ramsey Clark, American lawyer

SUMMARY

- Since 2009, cyber/digital forensics, a leading branch of forensics, has seen exponential growth;
- Scientific breakthroughs in emerging branches of forensic sciences such as digital forensics, CCTV forensics, drone forensics, and multimedia forensics are a boon;
- All law enforcement officials, along with the public, should have a basic understanding of digital forensics;
- Every branch of forensic science has a role to play in national security;
- AI has the potential to be a permanent part of the criminal justice ecosystem.

Introduction

The word 'forensic' owes its etymology to the Latin word '*forensis*', which means a forum or meeting place, or that which relates to the courts of law. Forensic science can be broadly defined as the application of science and technology to police

work. In other words, the use of scientific tools and science, in the investigation of crime and the administration of justice, is called forensic science. Criminals today use scientific methods for committing crimes. So, just as a diamond cuts a diamond, these criminals can only be apprehended with the use of science and technology and not traditional methods. The justice department is increasingly using forensics today. People feel safe and secure when a crime is detected and criminals are punished, but forensics also plays a pivotal role in the prevention of crime. Potential criminals are afraid they can be caught by means of forensic science. We have all seen forensic scientists on TV shows, but how do they work? What is the science behind their work? What is the role of forensic science in the administration of justice? How does forensic science aid security? This chapter answers these questions.

Forensic science goes all the way back to ancient civilisations. A Roman physician, Antistius, for instance, performed what is believed to be the world's first autopsy in 44 BCE.[1] The body was of the Roman emperor, Julius Caesar. Since then, forensic science has never looked back. Forensic science is defined as a 'scientific discipline which works towards the identification, recognition, individualisation and evaluation of physical evidence using principles and methods of natural sciences for the purpose of administration of criminal justice'.[2]

Forensics was in the spotlight in the late nineteenth century, thanks to Sir Arthur Conan Doyle's famous fictional detective, Sherlock Holmes. Doyle popularised crime detection using science, which put forensics in the spotlight.

Embracing all branches of science, forensics has extended to medicine, chemistry, physics, toxicology, accounting, ballistics, psychology, fingerprint forensics, and document examination. It is used in biology and serology, cyber forensics, mobile forensics, linguistics, odontology, entomology, pathology, podiatry, geology, and marine forensics as well. Handwriting and signature examination, and biological and serological evidence examination are carried out in forensics. Forensic science also plays a major role in identifying victims during natural disasters. It helps in the dissemination of justice through social change, anonymity, technical knowledge, and evidence.

Nowadays, every country has fully functional forensic laboratories which aid crime investigations. Since 2009, cyber/digital forensics, a leading branch of forensics, has seen exponential growth. It helps in examining large amounts of data in a time-bound manner and seeks digital evidence, including its collection, analysis, and preservation. Various hardware and software tools and techniques like the Sleuth Kit and Autopsy, EnCase Enterprise, Digital Evidence and Forensics Toolkit, ProDiscover Basic,[3] and MultiAgent Digital Investigation Toolkit,[4] among others, are used for the examination of digital evidence, thus, easing work and minimising the time spent on deduction. Intelligence-led crime-scene processing helps improve security by studying the criminal environment and developing a strategy for security problems and helps investigation of crime scenes.[5]

With advancements in technologies, computer forensics will progress and provide new and advanced techniques to combat crimes.

Crime Prevention and Forensic Science

There is usually a pattern to organised crimes. They are not randomly distributed and therefore, it is difficult to prevent them. The onus of preventing crime lies on every person involved in its occurrence. The elements which can deter a criminal include a sturdy criminal justice system, a tough police force, and competent forensic science professionals. Prevention is better than cure and this is true for crime and justice[6] as well.

Delivering justice is not the sole objective of the criminal justice system; its goal is also to protect, reform, and rehabilitate.[7] Incapacitation, specific deterrence, general deterrence, restorative justice, and disruption[8] help prevent crime. There are several direct and indirect[9] factors associated with criminality, such as poor schooling, broken homes, antisocial parenting, socio-economic deprivation, drug habit, deviant peer groups, and poor social skills. Measures taken to control these factors can help prevent crime. The risk associated with a criminal can be identified by examining the crime scene thoroughly. Often, the *modus operandi* is suggestive of the nature of the criminal and the associated risks. Behaviour can often be predicted by studying the pattern of crime, the weapon used, the location of the crime, and details from the scene of the crime.[10]

The goal of crime prevention should be to neutralise and eliminate factors that contribute to the commission of crime. For instance, pre-trial investigation plays a critical role in this process.

Forensic science plays an important role in the adjudication of justice and in preventing mishaps at an early stage so that the burden on the criminal justice system can be reduced.[11] Consequently, effective crime fighting requires not only quick investigation and detection but also the identification and punishment of perpetrators and the implementation of preventive measures.[12] The belief that one can deceive investigators by concealing or tampering with evidence is a myth because analysis of evidence and interpretation by a forensic professional can solve a crime. Training the forensic team will have an impact on the crime rate.[13]

Crime prevention that focuses on offenders, their targets, and situational factors contributes to the deterrence of crime.[14] Reducing crime rates is critical to national security and can be achieved by unbiased leadership, impartial justice delivery systems for every individual, education, and professional, motivated, and energised bureaucracy.[15] The digitisation of conventional detection methods helps reduce crime. Scientific breakthroughs in emerging branches of forensic sciences such as digital forensics, Closed-Circuit Television (CCTV) forensics, drone forensics, and multimedia forensics are a boon.[16]

In traditional policing, there is a physical presence of police personnel on the field. Nowadays, evidence-based policing involves statistical and geospatial analysis of crime. This helps to detect, prevent and mitigate crime and involves the use of CCTV surveillance. CCTVs are used to instil fear in the public and thereby reduce crime. The psychological effect of surveillance is the most important step in crime reduction and prevention. The alarm buzzer installed in a CCTV could

deter a person from misdemeanours.[17] As cameras can provide evidence, they make it easier to track criminals. The ultimate task in a court of law is proving the crime, failing which, criminals go unpunished, and this may even encourage more crime.

Security surveillance changed crime detection and tracking evidence became more precise and dependable, offering strong evidence in a court of law. Surveillance may, in fact, reduce crime to a negligible level.[18] Drones revolutionised remote surveillance and offer an aerial, and often, new perspective of potential threats and crime scene analysis. In recent years, when lockdown was imposed across the world, drones were used for crowd mobilisation, deterrence, and information dissemination.[19]

However, technological advances can be directly proportional to increased crime rates due to ignorance in handling the devices.[20] The increased ease in the use of devices also increases the likelihood of becoming a victim of cybercrime. All law enforcement officials, along with the public, should have a basic understanding of digital forensics to ensure that better evidence is garnered from electronic devices.[21] The awareness about cybercrimes and precautions to be taken can help an individual from falling prey to digital crimes. Since forensic science is an application of various scientific tools and techniques, we can always make use of it for the prevention of crime.[22]

Branches of Forensic Science

This section gives an overview of various branches associated with forensic science.

Forensic Anthropology

The science of anthropology has been furnishing evidence to courts for centuries but without the qualifying word 'forensic'. Forensic anthropology is a recent addition to distinguish it from physical anthropology or from other branches of anthropology.[23] The work relating to this speciality has increased so much that it needed a separate name.

The word 'forensic' means 'pertaining to a court or law'. Anthropology means the science that deals with mankind, its evolution, and changes in man and his activities over time. It has many branches like social, biological, DNA profiling, medical, and archaeological and physical anthropology.[24] However, the main branch which helps in the dissemination of justice is physical anthropology.

Physical anthropology is concerned with the physical aspects of the human body, the body's characteristics, developments, and changes that take place continuously not only in a lifetime but even after death.[25] The body's characteristics, continuous development, and changes are the resources that provide the forensic anthropologist with the evidentiary clues to assist courts in deciding anthropological problems in criminal and civil cases. It also helps identify lost persons, including those who lose their memory.[26]

Forensic Entomology

Forensic entomology is the application of knowledge relating to arthropods in the dissemination of justice. It mostly involves evidence related to insects which provide clues in criminal or civil situations. The utility of forensic entomology has been known for centuries.[27]

Forensic entomology is one of the oldest branches of forensics and was used as early as the thirteenth century. However, it took shape as a discipline only in the 1970s. The knowledge about the necrophagous carrion action of insects on dead bodies and rotting flesh was utilised to determine the time of death by medico-legal experts and it had become a respected part of forensic pathology. There are extended branches to forensic entomology as well.[28]

Forensic Photography

It is a matter of normal procedure that a scene of crime should be photographed. Photographs do not add significantly to the cost of investigation and trial but they do increase the conviction rate. Photographs from a scene of crime help because the presence of judges, juries, and lawyers at the scene of crime is rare. Photographs from the scene of crime help the court visualise the scene in the courtroom.[29] Photographs are superior to verbal or non-verbal descriptions and a video or a graphic film of the crime scene can often be quite educational. An investigating officer can overlook certain details from a crime scene. Good photographs, especially a video of the crime scene, make these details available to him long afterwards.[30] The investigating officer may be influenced subconsciously by the account of a person with a bias and may examine the scene with a preconceived notion.[31] Facts can lead to different conclusions and a video of the scene can help in the verification of different versions.

Human eyes may miss incriminating details like washed bloodstains or a crime scene that has been disturbed.[32] Photographs provide a permanent record, verifiable at later stages of the investigation. Tyre marks, foot marks, skid marks, and footwear marks are found on highways and busy roads. The marks cannot be picked up easily.[33] This kind of evidences/pieces of evidence needs special attention and shall be given priority during its collection.

Recent Advances in Photography[34]

Listed below are a few recent advances in technology:

1. **Colour photography:** Colour photography is now used routinely. It is useful in photographing injuries and discolouration of the skin, especially in cases involving rapes and other similar offences. It is also useful to demonstrate colour differences in other forms of evidence. Police forces use digital cameras for colour photography as it is inexpensive, and objects are recorded in their natural colours.[35]

2. **Videography:** Video cameras are very useful and should be used in all important cases. They are used to record riots and detect insurance frauds where the claimant feigns grievous hurt. It is useful in the detection of drug deals, betting and gambling offences, and drunken driving.[36]
3. **Aerial photography:** Aerial photography has been used to photograph outdoor scenes of crime. It allows for a better appreciation of the positions of the objects involved in the crime and is indispensable where large areas are involved—for example, air, ship, and train disasters.[37]

Forensic Fingerprint

The very first major discovery in the scientific examination of crime was the identification of culprits using fingerprints. The judiciary and the public took a while to accept the scientific value of fingerprints,[38] but it is now commonly used as evidence across the world.

Other than the fact that fingerprints can be classified and are often found as evidence at scenes of crimes, their use as evidence is important because they are unique, permanent, universal, inimitable, and persistent.

Forensic Physics

Forensic physics has traditionally involved the measurement of density (soil, paint, tool marks, and glass examination), the refractive indices of materials, and birefringence for fibre analysis.

A criminal arrives at, stays at, and then escapes a crime scene. He leaves trace marks in the form of imprints and impressions—together referred to as 'marks'—of feet, shoes, tyres, claws, and the like all over the area. The evidence frequently establishes a convincing link between the culprit and the crime.[39] As a result, it must be thoroughly understood, gathered, analysed, and presented in court.

The marks help criminal justice systems in many ways for prevailing the justice. They help determine the number of culprits who were present at the site, provided the crime scene is not disturbed by visitors. Track marks/tool marks are helpful to track criminals even down to their houses, especially in the countryside, since there are fewer motorable roads. Moreover, thieves usually choose untrodden paths, such as fields, gardens, and stream beds and leave trace marks on paths taken both before and after the incident.[40]

Forensic Document Examination

A document is any object, material, or anything that has a symbol, a figure, or writing on it which has meaning. It may be a piece of paper, a wall, a wooden block, glass, a metal sheet, skin, cloth, or tissue paper.

Documents play a crucial role in the life of an individual. We read, write, and sign documents for personal and official use. It may be a letter, a receipt, a

cheque, or any other document.[41] If we place full stops on writing or accepting documents, the working of society may be adversely affected.

Criminals have been exploiting the potential of the falsification of documents. Thousands of forgeries and frauds are perpetrated every year with new methods. The falsification of financial documents is a large criminal activity in every country and is on the rise. It is estimated that crores have been lost every year to financial frauds.

The art or craft of forgery requires patience, penmanship, practice, intelligence, and the courage to face the consequences. Detection of forgery is difficult because while it may be possible to detect a fake document, identifying its author is difficult.[42] Scientific detection of forgery is possible in a fairly large number of cases, but courts are wary of accepting the findings of experts as conclusive and sufficient. Courts want corroboratory evidence in all cases.

The art of handwriting identification is highly specialised and needs experience, study, and patience. The rule of thumb is to never submit documents to unqualified, self-styled, or dishonest 'experts'. Handwriting identification is based upon certain principles and the detailed evaluation and study of both class and individual handwriting characteristics. In fact, it has developed its own terminology.

The examination of a document, in its totality, needs a variety of equipment. However, for most situations, especially handwriting evaluation, a high-caliber magnifying lens with inbuilt illumination is sufficient.[43] An assortment of cameras and their accessories capable of taking photographs up to 1:1 size is required. A Digital Single Lens Reflex camera with changeable lenses meets most requirements adequately. A good source of light, variable intensity, and manoeuvrability to throw the light at various angles are indispensable necessities.[44] Most government laboratories use Video Spectral Comparator for examining questioned documents.

Forensic Toxicology

A poison is a substance, which on being absorbed into the body produces a lethal effect. In fact, any substance when taken in excess quantity can be lethal, like common table salt. However, in forensic toxicology, substances which are harmful even in minuscule amounts are called poisons.

Poisons are commonly used in homicides, accidents, and suicides. They are occasionally used to destroy animals and vegetation.[45] The detection and identification of poisons is an essential element of forensic science.

Most toxins are easily available and are given surreptitiously to the victim after gaining their trust. They are often easy to administer through food and beverage. The symptoms of poisoning may resemble those of an illness, leading the victim and their loved ones to believe that they are unwell.

The analysis is further hampered by the wide range of poisons accessible, as well as the increase in the number of synthetic medicines that are utilised as poisons.

Some drugs have chemical and physiological properties that are quite similar to one another.[46] Their analysis requires more refined, scientific techniques and an experienced analyst. The most frequent method of administration of poison is through food. The poison is mixed in sweetmeats, cooked food, or a drink. It may even be substituted for medicine. The victim may be made to inhale a poisonous gas or vapours from a poisonous liquid, or the poison may be injected into the body.

Several sensitive techniques are being used in toxicological work, like high-performance liquid chromatography. This instrument separates the chemicals dissolved in a sample mixture, allowing for qualitative and quantitative examination of the components that are present in the sample and the quantity of each component present. Instruments like gas chromatography-mass spectrometer and high-performance thin layer chromatograph are used for the analysis of drugs and narcotic samples.[47]

Cyber Forensics

Cyber/computer crimes are known by many different names, including cybercrime, net crime, or electronic crime. They all involve computers and also the network in most crimes. Computer crimes include identity theft, hacking, and financial fraud. Many traditional crimes like theft, blackmail, forgery, embezzlement, fraud, and money laundering, among others, are conducted through the internet. Computer crime is an illegal activity involving computers. A computer can be an object of crime, an instrument of crime, or a repository of incriminating evidence.[48]

The criminal can exploit the potential of the computer for committing fraud, counterfeiting money, committing bank fraud, laundering money, duplicating signatures, generating fake documents, spying, and theft of intellectual property, among others.

The use of the internet in cybercrime is its fundamental distinguishing feature. Cybercrime can be committed against countries, corporations, or individuals with criminal intent for personal gain at the cost of the victim, who may suffer mentally, physically, or financially.

Cybercriminals employ the latest communication modes like SMS, MMS, Facebook, chat rooms, e-mails and Electronic Fund Transfer. Hacking and information piracy have threatened the security and financial health of countries. Pornography, child grooming, and copyright infringements are other crimes of major concern. Spam messages or e-mails are primarily a nuisance factor.[49]

Computer crimes are classified as:

1. **Internet crimes:** These are crimes which use the internet and include: (i) logic and time bombs; (ii) e-mail bombing; (iii) introducing viruses, Trojan horses, or worms; (iv) child pornography and paedophilia; (v) hacking and hijacking data from credit/debit cards; (vi) piracy (of art, literature, films, music, etc.); (vii) identity theft, password and code theft, information and

secret data theft, development theft, and research data theft; (viii) blocking of service; (ix) spoofs and spams (unsolicited trash e-mails); (x) spreading false propaganda and rumours, defamation, and character assassination; (xi) disruption of services, financial systems, air traffic control, and communication systems; (xii) promotion of terrorism, stalking, threatening, and blackmailing; and (xiii) money laundering, tax evasion, betting, spot-fixing, and drug trafficking.

2. **Computer crimes/cybercrimes:** These include crimes that involve the use of the internet along with a computer.
3. **Information piracy:** The security implications of electronic penetration are significant. Electronic eavesdropping has the potential to cause significant personal, societal, political, and economic harm.[50] This can be accomplished via a scanner, computer electromagnetic signals, a network, or through the internet. Every year, a huge amount of information is stolen.
4. **Theft of information services:** This is done by cloning a mobile phone, counterfeiting SIM cards, and gaining illegal access to telephone boards.
5. **Organised crime:** The internet and computers are used to encourage drug trafficking and child pornography and for publishing obscene books and videos.
6. **Copyright infringement:** Infringement of copyright is one of the most serious computer crimes. Entertainment programmes are often duplicated and sold in the market, causing heavy losses to the copyright holder.
7. **Theft:** Theft of equipment, accessories, and proprietary items is common. An entire computer or its parts (or even software) may be stolen. Such crimes are on the surge.
8. **Wiretapping:** Bankers and automatic teller machines (ATMs) are targets of such crimes. The swindler is more likely to target ATMs where the wires may be accessed without being noticed easily. Through wiretapping, the required data of debit or credit cards used at ATMs can be captured and copied for abuse.[51] Large amounts of money can be debited from the victim's account with the stolen data before the crime is discovered.
9. **Viruses:** A virus is a malicious programme that is inserted into a computer and is like a secret command where the software is programmed to replicate itself—much like an infectious microbe—to either slow down the computer or destroy the data or functioning of a computer.[52]
10. **Logic bombs:** A logic bomb is a secret software programme which is introduced into a computer to destroy the data or the functioning of the computer. The logic bomb may be time or data output targeted.[53]
11. **Spy software:** Passwords and other important 'entry' credentials to a computing device are discovered using spy software. The admission is achieved by a seemingly innocuous thing, like a 'welcome' email. The message explains how to use the programme and permits eavesdropping.[54]
12. **Money Laundering:** This is done by credit cards, super smart cards, or electronic fund transfers through any machine that accepts deposits. The

modern computer wizard facilitates changing dirty black money into clean white dollars and pounds and also stores them in secret Swiss bank accounts in operations that mimic *hawala* transactions (money transfer without money movement). The computer, in fact, is the *hawala* agent as it can send money across the world with alacrity.[55]

13. **Electronic fund transfer:** Transactions using electronic money are becoming more widespread. The electronic transfer of funds from one bank to another, or from one branch to another, or the payment of the value for products acquired is increasingly commonplace. Electronic fund transfer is done via computers, ATMs, and cards (credit/debit smart/super smart/optical memory), among others. Internet crimes associated with these modes of transfer of money are the diversion of money from the rightful to the fraudulent payee and the misuse of data. Credit cards are copied, stolen, and used to make transactions. White cards are used in place of originals, wires are tapped, and data is stolen to operate ATMs. Withdrawals and deposits are manipulated to other accounts, while telemarketing funds are transferred from the victims' accounts without providing the promised goods.[56]
14. **Hacking:** Hackers are intruders who gain access to computers belonging to individuals or organisations. Their *modus operandi* is simple—they steal credentials and get access to a computer's security system. They gain access to classified material and utilise it for mischief, profit, data destruction, paid internet time, and manipulation of debit/credit accounts or limits.[57]
15. **Software piracy:** Copyright holders in the USA lose US$ 15 billion a year as a result of this grave crime, and the losses are growing every year. Pirated film and music CDs are dirt cheap in comparison to genuine software. Software piracy is a roaring business with unlimited scope. The good news is that there are some special programmes being developed to counter the menace.[58]

Investigation of cybercrime wherein the computer has been stolen, destroyed, or burned follows the same procedures as other kinds of property crime and poses no additional challenges. Other computer crimes include tampering with software, either on the computer or on the internet or a network. Both crimes need extensive computer skills and analysing such a crime requires computer expertise.

Basics of Investigation

Location, collection, preservation, and dispatch of evidence to the forensic expert is called practical police work and is carried out by law enforcement agencies or private investigators. The success or failure of investigations and trials depend upon these processes. They generally follow the routine crime investigative patterns, but because of the highly complex technology and the minute nature of the

devices, it needs special treatment and extra care in terms of handling the evidence to ensure that the evidence is not altered, deleted, destroyed, contaminated, mutilated, or substituted.[59] It is essential that the investigating officer understands the basic principles and follows protocol to get the maximum and correct information for a successful probe. The basic principles are as follows:

1. Computer technology is intensive and needs careful handling. Neither should you nor anyone else fool around with it.[60] The wealth of information it carries can get altered, lost, contaminated, or substituted. Remember, the seized computer should remain 'as is, as was'.
2. While collecting, packing, transporting, or storing the computer, ensure that it does not fall or rattle in the container. Pack it in a hard container with proper padding.
3. The identity (*vis-à-vis* the crime), authenticity, integrity, and the chain of custody of the evidence seized must beyond reasonable doubt be established through documentation and properly secured packaged evidence. This goes a long way in maintaining the identity of the seized computer or other evidence.
4. All actions—seizing, processing, and storing—must be properly recorded for later verification.
5. Computers have unsaved data in their files. Ensure that the data is saved before shutting the computer down. The data on the screen of the monitor may be photographed.[61]

Forensic Science and Security

The security of a state depends upon the prevention, investigation, and detection of crime and the effective delivery of justice. If one is dependent on traditional methods for solving crimes and delivering justice, a good conviction rate cannot be expected. Sometimes, potential criminals cannot be caught due to lack of evidence as the oral witnesses resile in court from their statements given before the police. They could have turned hostile because of threats or material gain. Thus, oral evidence does not remain reliable during the trial, and acquittals mean the public loses faith in the police, prosecution, judiciary, and government. This fosters a sense of insecurity among the people and to prevent that, we need to have full-proof methods of crime investigation, detection, and retribution for offenders. Forensic science provides infallible methods of crime detection, investigation and the effective administration of justice. Today, science offers us multiple techniques and technologies which have generated public faith in the criminal justice system through forensic science.

Today, tools like video spectral comparators are being used in forensic science laboratories and institutions for the forensic examination of documents like forged signatures, cheques, passports, licenses, cards, and currency. An electrostatic detection apparatus is used to identify the indentations on a paper; a

stereomicroscope is used to examine trace evidence, comparison microscopes are used to compare cartridges and bullets, while fingerprint detection kits and polylights are used for the identification and development of fingerprints from a crime scene. Instruments like Fourier transform infrared spectrometer and energy dispersive x-ray fluorescence spectroscopy are used for the identification of unknown materials and their compositions in fields like biology, geology, and chemistry. A 3D crime scene scanner, for instance, helps in crime scene reconstruction and preservation—allowing for permissible evidence in court.[62]

As indicated earlier, forensics play a major role in the security of the nation by helping in the identification of crimes and criminals, decoding criminal minds, and gathering information and evidence related to crime using their expertise and knowledge.

Cyber Forensics and Artificial Intelligence in the Field of Security

Our lives today are controlled by computer hardware and software, either directly or indirectly. Similarly, the working of the criminal justice system, including that of the police, is also dependent, in several ways, on cyber forensics and artificial intelligence (AI).

What is AI? John Mc Carthy,[63] called the 'father of AI' in the mid-fifties, defined AI as the 'science and engineering of making intelligent machines'. AI is the ability of a machine to perceive and respond to its environment independently and perform tasks that would typically require human intelligence and a decision-making process but without direct human intervention. AI has the potential to be a permanent part of our criminal justice ecosystem and provide investigative assistance to criminal justice professionals to ensure a safer society. Human intelligence comes through learning from experience. It is this experience which is used in making machines that have AI.

AI has a deep impact on our lives today—from homes and cars, to finance and medical care—AI is changing the way we live. AI is used in agriculture, industry, education, communication, governance, service sector, manufacturing sector, finance, transportation, and medicine.

Role of AI in Policing

AI helps police officers in solving crimes. It is useful in crime prevention, predictive policing, and public safety or security. This is how AI is used in policing:

1. **Facial recognition:** This technology is being used in identifying criminals on the run. Missing persons can be identified on the basis of image data. CCTV footage is used in solving crimes and AI helps by matching faces with more accuracy than humans. AI is able to identify a single face from a crowd. For instance, in China, the police used AI to nab a criminal at a packed sports event.

2. **CCTV cameras:** AI can also identify objects and complex events like car accidents. It can identify weapons which may be a threat to people. AI can also identify stolen vehicles.
3. **Predictive policing:** AI has the ability to predict crimes and even the location of the crimes. Predictive policing is still controversial and there is as yet a trust deficit about it. Algorithms can analyse crime rates and can develop a map of crime hotspots. This can help police target sensitive areas for extra patrolling and surveillance.
4. **Robots:** Robots can communicate data from the streets for human analysis at police headquarters, be used for bomb disposal and detonation without putting human life at risk, and enter dangerous locations where there is a potential risk to police officers can identify humans therein.
5. **Non-violent crimes:** Non-violent crimes: AI is capable of spotting anomalies in patterns. This leads to the detection of non-violent crimes like fraud and money laundering and is, therefore, popular with banks. AI can also spot counterfeit currency notes which cannot be detected by the naked human eye.

Artificial Intelligence helps keep people safe in crowded places like prisons. A number of major pieces of equipment used in forensic science benefit from the use of AI. Similarly, AI aids the analysis of DNA and helps in gunshot detection. Overall, it can facilitate scientific deterrence of crime. When used with appropriate data techniques such as AI, forensic science is able to curb cross-border crimes like illegal migration, infiltration, human trafficking, and smuggling of narcotics, explosives, and precious metals. There are long-range night vision devices and satellite technology for monitoring the movement of miscreants. Hence, forensic science has been and will be able to maintain both internal and external security of countries and can play a pivotal role in maintaining peace and harmony in society.

The potential threats of chemical, biological, radiological, and nuclear detection and investigation can also be tackled by forensics. Every organisation today is partially or totally dependent upon information technology. This has led to both improvements as well as associated risks. However, with the use of technology, the internal security of a country is strengthened and external threats and risks are minimised. Information Technology aids in detecting frauds by combining structured and unstructured data and thereby creating risk models, using advanced data analytics and machine learning.

Discussion and Conclusion

Forensic science is the application of scientific methods and techniques for the purposes of justice. It is a tree consisting of branches such as forensic chemistry, forensic physics, forensic biology, anthropology, odontology, marine forensics, computer forensics, and many others—all of which have immense contributions.

Every branch of forensic science has a role to play under the umbrella term 'national security'— which covers military and non-military dimensions such as countering terrorism, minimising crime, environmental security, and cyber security, among others. In the system of criminal investigation methodologies, forensic crime prevention plays a crucial role. It involves the use of scientific tools and techniques for extracting information which helps solve a crime.

Cybercrime is on the rise and poses a threat to both the digital world and national security. The use of digital forensics can make us forestall a crime from taking place. To oppose a criminal attack, physical, electronic, and procedural measures are taken into consideration. These measures are intended to deter criminal activity. However, intrusion detection systems also play a role in the prevention of crime. With the advent of technology, we are trying to adapt and keep ourselves safe. However, there are always two sides to a coin and this too has advantages and disadvantages. There is always scope for research in all areas of security and investigation to better the world we live in.

Editors' Comments

While forensic science and technology have an important role in the criminal justice system and national security, behavioural science is another area to determine guilt or innocence. The next chapter argues that forensic science and behavioural science are two sides of the same coin since the former scrutinises forensic clues at the scene of the crime, while the latter seeks to elicit stored crime scene information from the mind-body realm of the living. It also highlights several technologies that can be used in high-stakes law and justice matters.

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CHAPTER 9

Technologies to Determine Guilt or Innocence

Douglas Daniel D'Sa and Arun Kumar Pullela

"Man is an animal with primary instincts of survival. Consequently, his ingenuity has developed first and his soul afterwards. The progress of science is far ahead of man's ethical behaviour."

–Charlie Chaplin

SUMMARY

- Forensic science and behavioural science are two sides of the same coin;
- One scrutinises forensic clues at the scene of crime, the other seeks to elicit stored crime scene information from the mind-body realm of the living.;
- Advances in behavioural science technologies have led to the creation of machines that detect cognitive and emotional states;
- The use of BS Technologies/psychophysiological adjuncts have seen greater use/acceptance in high-profile criminal cases;
- The law must constantly evolve to keep pace in a world driven by technological advancements.

Introduction

In the past, guilt was determined either by catching the suspect directly in the act, by the testimony of one or more witnesses, or through the coercion of a confession. Now, technology can help determine innocence or guilt with increased accuracy. Electroencephalograph (EEG) and electrocardiogram (ECG) are tests

that measure neural activity in the brain and rhythmic and electrical activity in the heart, respectively. These tests have been developed into machines that can measure 'neurophysiological' changes. Similarly, technology can also quantify the relationship between psyche and physiology (referred to as 'psychophysiology')—such as the galvanic skin response, which identifies changes in sweat glands to measure the intensity of the emotional state of the individual. And finally, 'electrophysiology' is a branch which involves running electrical charges through the brain. Current, technologies measure P300 waves which are generated within 300ms when the individual encounters a stimulus they have experimental knowledge of without their conscious effort. This research chapter explores how each of these non-invasive technologies work, describing their strengths and weaknesses, and states if their use is extensive or controversial. This chapter, thus, provides a comprehensive overview of the differing kinds of behavioural science (BS) technologies that can be used to assist law-enforcing agencies in suspect interrogation.

While this book seeks to examine the different kinds of emerging technologies across varying fields, this chapter aims to summarise the latest BS technologies used by law enforcement to conduct investigations, examine evidence and establish veracity. Forensic science (FS) and BS are two sides of the same coin; while one scrutinises forensic clues at the scene of a crime, the other seeks to elicit stored crime scene information from the mind-body realm of the living; to this end, technologies are used as adjuncts to generate physical correlates of evidence. Keeping this important distinction in mind, this chapter aims to draw attention to BS and the study of emerging technologies that can help in extracting the preserved crime scene even after lapses of time.

BS and How it Differs from FS

A case that can vividly depict the distinction between BS and FS is the Sheena Bora murder case, where, in 2015, Indrani Mukherjee was arrested for the murder of her daughter.[1] FS investigations led to the exhumation of a body burned beyond recognition; it was then confirmed that Bora had been strangulated to death.[2] However, recent developments in Jammu and Kashmir suggest that Bora is alive—something that a witness is willing to testify to.[3] This case highlights the fact that it is easier to manipulate forensic evidence because the dead cannot voice protest. Forensic evidence serves a corroboratory purpose but a lack/dearth of clues, especially in instances of murder, can result in detectives hitting a brick wall.

BS tackles this issue by studying and eliciting the stored crime scene present in the mind of the accused, witnesses, and the victim(s). The field of BS has developed 'non-invasive' technologies that allow for truth to be ascertained. These technologies attempt to elicit 'experiential knowledge' present in an individual's mind, which indicates their involvement/presence in the act. Therefore, this experiential knowledge can only be found in the victim, the assailant/perpetrator, and the

bystander. These technologies attempt to measure changes in the body upon successful probing of information specific to the scene of crime—a measured capture indicating the presence of experiential knowledge within the brain. Extracting this information from the brain must be pursued by trained professionals who follow proper procedure and can later provide their expert opinion in court.

The Art of Eliciting

The art of eliciting utilises different tools and techniques, such as 'face saving', clarification through paraphrasing, and feedback markers (like *mmhmm, hmm,* and *yea*) to extract pivotal information relevant/related to the crime.[4] Probing questions are formulated from case facts that are not known to the public—information available only to the perpetrator, the victim, and the Investigating Officer (IO). The IO collects information from multiple sources and is able to piece them together to develop an understanding of the whole/entire incident. The IO helps formulate the questions to be asked alongside the forensic interviewer but he himself will not be present during the interview process when/where the technologies/psychophysiological adjuncts are used, neither will the results of the test be communicated to him. It is the forensic interviewer—oftentimes a psychologist—who will handle the administration of these tests and provide his expert interpretation of the results in court. By utilising the following interrogation techniques which have been designed for use alongside non-invasive technologies, the interviewer is able to ascertain whether the interrogatee is innocent or is proactively engaging in deceit.

The first interrogation technique designed to detect deceit was the control question technique (CQT), which involved the usage of control questions (general questions designed to elicit a lie to observe physiological changes that would come to form the baseline) and relevant questions (questions which would address the key issue at hand).[5] The physiological responses recorded through an electrogram would determine the individual's culpability. If the response formed was greater in the relevant question, then the individual would be judged as telling a lie, and *vice versa*, the individual would be considered as telling the truth if the response was greater in the control question.[6] The basic presumption here is that the individual will focus greater attention on the question that they are likely to fail. Amusingly, the baseline of the technique also invites its biggest criticism as physiological responses may get triggered in both innocent and guilty participants due to the high-pressure setting of an interrogation.[7] Another criticism is that CQT can be manipulated and misused in the hands of ill-qualified operators and result in faulty administrations.[8]

To address the shortcomings situated in the operator's style of questioning/interrogating, a new test was developed—the guilty knowledge test (GKT)—the objective being the detection of culpable knowledge and not the detection of deceit. The GKT is a multiple-choice based question (MCQ) in which one of the options contains crucial information present from the scene of crime while also

providing several other alternatives which are indistinguishable to an innocent suspect.[9] It aims to elicit information specific to the crime—which only the perpetrator would be privy to—with the presumption being that a guilty individual's emotional reaction and, thereby, his response, would be different than that of an innocent who lacks this specific knowledge.[10]

The third type of interrogation techniques that has been seeing increasing relevance includes three categories of questions—irrelevants, targets, and probes. Prior to the conduction of this test, it is crucial for the interviewer to develop a holistic understanding of the intricacies of the case by conducting a pretest with the interviewee—by reading the case file and further, by being debriefed by the IO—for it is on this basis of this understanding that he will be able to prepare the three forms/types of questions. Plausible yet factually incorrect information not related to the crime is utilised as irrelevant stimuli to establish a base concerning the interviewee's response to unknown and irrelevant information.[11] Target questions relating to public information relevant to the crime being investigated are utilised to elicit a standard response from the interviewee's brain. The recorded responses from this line of questioning serve to provide a baseline for comparison against specific details of a crime which are elicited through probe questions. Probe questions relate to specific details of a crime found during investigation that only the perpetrator can know—this aspect is similar to the GKT.[12] The detainee is made aware of both the target stimuli and probes but is not told which is which prior to the conduction of a test.[13] This interrogation technique involves rapidly alternating between all three forms of questions—with the goal being to identify/establish the presence of specific details of crime through probe questions by juxtaposing them against irrelevant and target questions. Within India, this style of interrogation has been developed to the maximum extent possible by Dr SL Vaya—who is a forensic expert who has provided consulting in numerous cases at the Central Bureau of Investigation (CBI) and other law enforcement agencies for the past forty years.[14] This style of interrogation now includes clubbing pre-interviews of the suspect—when necessary—with a mental status examination, psychometrics, projective and objective personality tests, neuropsychological assessments, and other speciality measures.[15]

Non-Invasive Technologies

Guillaume Leonce Duprat defines lying a 'psycho-sociological act of suggestion, by which one tends more or less intensely to introduce into the mind of another a belief, positive or negative, which is not in harmony with that which the author supposes to be the truth'.[16] This definition illuminates a crucial point to be considered—that during deceit, the author's actions are intentionally incongruent with the truth. Each of the technologies that will be discussed in this section rests their basis on this belief/claim/link and attempts to measure physiological changes that arise out of the disharmonious actions or statements, and it is our professional viewpoint that if the processes and steps underlying each technology

are carried out correctly then the consequent test result is exceedingly accurate. That being said, it is imperative to keep in mind that these technologies act as adjuncts, meaning the test results they produce in themselves cannot convict nor exonerate the individual and that they serve only as corollary pieces of evidence that support/bolster the narrative crafted by the lawyer.

The first adjunct that was used as a machine to judge the veracity of an individual's statement was the polygraph, which was built by Officer John Larson of Berkley in 1921.[17] His hypothesis asserted that changes in systolic blood pressure, i.e., blood pressure (BP) pumped during a heartbeat, would betray the individual's deceit.[18] In his prototype BP would be measured by a 'blood pressure cuff' and was assisted with a pneumograph, which measured respiration.[19] The polygraph has been used extensively by law enforcement agencies—with the largest consumer of polygraphs being the USA. Over 1–4 million American citizens have been interrogated by the polygraph–be it for investigations or employee screenings in the 1980s.[20]

Since then, however, newer biometric sensors have evolved that greatly increase the efficacy of BS tests. These new technologies measure physiological changes including electrodermal activity, pupil dilation, fluctuations in voice, and the generation of P300 waves within the brain. The sympathetic nervous system is akin to an alarm system for the human body and it regulates several crucial body functions such as breathing, heart rate, blood pressure, pupil dilation, and sweating—all of which can be influenced by the emotional state of the individual. Modern technologies aim to build devices and sensors that can measure these involuntary responses that are not consciously under the control of the interrogatee and by cleverly pairing the resulting tests with successful probing questions the interrogator can, to a high degree, ascertain the detainee's involvement within the questioned act. Some such technologies have been discussed below.

Galvanic Skin Response

Sweat is a naturally occurring phenomenon auto-regulated by the sympathetic nervous system. While its primary purpose is thermoregulation, its dispersement can also indicate emotional intent and influence.[21] The galvanic skin response (GSR)—using sweat as a physiological parameter—aims/seeks to measure emotional arousal and stress within an individual. For the GSR signal to be generated, two sensors or electrodes are required to make direct contact with the interviewee's hands.[22] These electrical characteristics in a human being's skin are in constant variation and are referred to as GSR or electrodermal activity (EDA).[23] EDA is asserted to be the most sensitive of all available psychophysiological parameters being utilised to detect deceit—as electrodermal responses are elicited easily through changes in stimulus.[24] Furthermore, since perspiration materialises into a liquid sweat, it is both felt easily by the examinee and is easily observable by the examiner—which could further serve to cause tension and perhaps, result in a confession, by those brittle.

Technologies utilising GSR have been used for screening purposes at airports and other highly sensitive locations and are combined with the guilty knowledge test (GKT) to screen for criminal intent to engage in an act of terror.[25] Furthermore, it has been added as an additional parameter in the polygraph, which greatly improves its efficacy. However, while GSR has been used as a means to measure someone's involvement—it is not without faults, as frequent criticism has been the influence of fear, anxiety, and other threatening stimuli that can act as confounding variables.[26]

Voice Analysis and Voice Analysis Tools

Similar to how arousal results in the stiffening of muscles, when our vocal muscles strain due to stress, fear, or anxiety, they reverberate at a different rate than the usual rate of 8–12Hz.[27] Studies have further determined that when a subject is aroused or enthusiastic, his pitch displays more variants and reverberates at higher intensities.[28] Deceptive speech is, therefore, expected to be more mentally strenuous, and leads to minor changes in pitch (voice) which are known as 'micro-tremors'.[29] The auditory capacities of the human ear are limited and incapable of distinguishing micro-tremors and minuscule variations in tone that come to betray emotional expression. So, tools that are capable of measuring and analysing the modulation, enunciation, and micro-expressions using different algorithms with increased accuracy have been developed.[30]

What may sound normal to the ear reveals underlying expressions caused by variations in cognitive load when assessed under voice analysis software. These indicators, which are particular to cognitive exertion, may be assessed verbally. Cognitively burdened speakers take longer to reply (response latency) and use more non-fluencies (like *um* and *uh*). Vocal Stress Analysis (VSA) technology claims to be capable of identifying and analysing these 'micro-tremors'. VSA can further be categorised into energy-based systems (that measure changes in energy of the spectrum envelope and express them in wave form) and frequency-based systems (that measure frequency changes and their distribution within different frequency bands).[31] The efficiency of the VSA can be maximised by taking a pre-test interview to gain familiarisation with the individual and the case at hand and to then carefully formulate questions that will induce a high level of stress. VSA uses three forms of questioning during the interview: (i) irrelevants, which are known truths that will cause minimal stress; (ii) a control, which is a known lie; and (iii) a relevant, which is the issue being investigated.[32] For gaining accurate results, standardised protocol dictates that the interrogation be conducted in a sound-proof room, free of all distractions and noise. Voice samples obtained from interviews not conducted within the proper settings exhibit background noise or overlapping sounds which render the sample useless as the VSA will not be able to properly process the data.

Advances in VSA technology have led to the creation of machines that claim to be able to detect a variety of different cognitive and emotional states- in addition

to being able to detect deception. Layered voice analysis (LVA) is based on a proprietary collection of speech characteristics established via research to correspond with main human emotions, which may be utilised in a variety of combinations to identify dishonest intentions in real-world circumstances. By utilising over 8,000 mathematical algorithms and pairing them with more than 129 vocal frequencies, the analysis consists of counting the number of 'thorns' as well as a rough statistic on the number and duration of 'plateaus' created by a series of sequences.[33] The computer then generates a range of estimations based on this counting, which are believed to be connected to the speaker's emotional state. The system will present 'lying' alerts on the screen, which are potentially caused due to lower fundamental frequency which resulted in statistically longer plateaus, or due to hesitation on the speaker's end. Dr SL Vaya has utilised LVA several times to interrogate suspects of the 2011 Delhi High Court bomb blast, the 2008 Aarushi–Hemraj double murder, the 2006 Nithari serial killing, the 2006 Malegao bomb blast, and several others.[34] By depending on ad hoc measurements that simply cannot supply any useful information, technology drives 'voice analysis' to the realm of absurdity. However, it is important to note that deceptions may not always be identified in the voice as lying does not always produce stress—exceptions being sociopathic individuals and the use of altering chemicals. Similarly, another drawback of VSA technology is that the test results are not foolproof and rely more on the ability of the examiner to convince the interrogatee of his inability to fool the machine.[35] Furthermore, data analysed from previously conducted studies do not suggest a very high degree of reliable and consistent correlation between the detection of deceit through speech.

Pupil Dilation

Pupil responses are often regarded as markers of brain processes relating to perception, attention, and decision-making, and as a biomarker for human memory function and cognition in general. Pupil dilations have commonly been reported within individuals anticipating turmoil and conflict transition- which represents the duration of conflicting-emotional states- on being presented with ambiguous visual signals.[36] Studies conducted in the past have demonstrated the impact of visual stimuli on the pupil—with both pleasurable and painful imagery eliciting significant pupil dilations.[37] Lying is a conscious activity that requires greater effort than telling the truth, leading to an increased cognitive demand that further results in the lying individual's pupils dilating. However, it is crucial for the interviewer to compensate/accommodate/calculate for those individuals having no motivation to lie by first establishing a baseline to identify deceit.[38] Any deviation from that norm might indicate deceit, as an extension pupil dilation can indicate deceit. The pupil size has been identified as a potential biomarker for examining and influencing memory processing. On this basis, numerous technologies are being created which are able to detect the pupil's changes during interviews and interrogations. A limitation of this technology is that they are designed to be used

as a pre-screening tool and for periodic evaluations more so than for event-specific lines of questioning.[39] They can, however, be clubbed with other psychophysiological technologies—such as the polygraph—to increase the efficacy of these tests and the reliability of their results.[40] The pairing of an additional ocular component to other automatic neural functions such as the measuring of breathing, pulse, GSR etc. further helps the interviewer or interrogator to be surer of the results obtained since it is simply not possible for an individual to simultaneously control all the autonomic nervous systems in the body.

Electroencephalography (EEG)

Richard Caton, Adolf Beck, and Hans Berger are hailed as the three co-founders of EEG—a method of recording brain electrical activity through the placing of electrodes on the scalp.[41] EEG was extensively crucial in furthering our understanding of the brain both in the fields of research and medicine back in the nineteenth century.[42] However, it was Dr Lawrence A Farwell who first used an EEG to determine the presence or absence of experiential information stored within the brain—successfully developing and patenting his model in 1995.[43] The electrical signals were termed P300 as they were neural oscillations of event-related brain potential that were generated and peaked between 300 milliseconds to 800 milliseconds after the recognition of a stimulus.[44] Subsequent research later conducted by Lawrence Farwell and Sharon Smith revealed that within this paradigm—which he termed/coined as *Brain Fingerprinting*—the initial peak was followed by a delayed/late negative peak (late negative potential). This they combinedly referred to as P300 MERMER, where MERMER stands for Memory and Encoding Related Multifaceted Electroencephalographic Responses.[45]

Visual stimuli contain features/details present from the scene of the crime as probes, and since the nature of this information is unavailable to the public, only the IO, the victim, and the perpetrator would have knowledge of it. Therefore, if the suspect is innocent, the P300 MERMER waves will not generate as the stimulus present to him is novel. It would, however, trigger the generation of P300 MERMER waves if he had prior knowledge of the scene of the crime—which would confirm the suspect's involvement. This emission of MERMER waves is an automatic response that cannot be suppressed by an individual as it is generated under a fraction of a second (300 milliseconds). This technology was groundbreaking and several studies conducted by Lawrence Farwell and Sharon Smith on FBI and CIA agents demonstrate that MERMER enjoyed a statistical confidence of 99 per cent on all studies conducted at that point in time.[46] Lawrence Farwell's technology successfully proved its merit in several high-profile cases—in confirming and condemning J B Grinder's actions as a serial killer in 1999,[47] and in exonerating Terry Harrington, who had been wrongfully serving a twenty-four year prison sentence for a murder he did not commit.[48]

Within India, the development of EEGs was initiated by the Central Bureau of Intelligence, which requested the Directorate of Forensic Science (DFS), Gujarat that a technology akin to Farwell's Brain Fingerprinting be brought to India. Several experts were contacted, including Dr S L Vaya, with her expertise in probing and psychological profiling, and Prof C R Mukundan, a professor of psychology at the National Institute of Mental Health and Neurosciences (NIMHANS). Through their combined efforts, the brain electrical oscillation signature (BEOS) was developed in India.[49] This relationship was further solidified by the signing of a memorandum of understanding between the Director of the DFS, Gandhinagar and the Director of the NIMHANS to set up a brain lab in April 2003.[50] The difference between BEOS and Farwell's brain fingerprinting is the inclusion of auditory stimuli as an additional feature within BEOS. Both visual and auditory probes were presented through a visual and auditory stimulus package and it utilised a fast Fourier transform algorithm to conduct a spectral analysis and brain map.[51]

The use of EEGs in assessing suspect's involvement in crime has seen greater use/acceptance in high-profile cases with references being made from the CBI Mumbai, Chennai, Kerala, and Tamil Nadu. However, in each of these cases, they were viewed as additional corroboratory pieces of evidence that helped augment the existing argument.[52]

After conducting intensive research and working with these technologies, personally, we are of the opinion that newer technologies that track the generation of P300 waves within the brain alongside ocular technologies are superior to others such as voice analysis technologies and galvanic skin response. However, we strongly affirm that the pairing of these technologies will produce more favourable and reliable results. While these non-invasive technologies have seen greater usage from law enforcement agencies, a more immediate important avenue/question to consider is their acceptance as corollary evidence by courts of law. The next section will attempt to explore its acceptance in other countries such as the US, the UK, Israel, the EU, as well as in India.

Validity of the Results as Scientific Evidence in Courts

The law must be constantly evolving to keep up-to-date in a world heavily driven by technological advancements. Lawmakers have historically addressed this in two ways—by developing laws too stringent (or overregulation, which leads to the hampering of technological development) and by attempting to cover the gaps retrospectively (which happens only after problems arise and often lacks desired comprehensiveness). An example of the former is the Unmanned Aircraft Systems Rules, 2021, which resulted in overregulation of the manufacture and utilisation of drones within India, and which was eventually replaced by the more liberal Drone Rules, 2021 after great public outcry.[53] The enforcement of the General Data Protection Regulation in 2018 within the EU was a counter to the repeated violations of consumer data brought on by big data and data analysis by large

corporations and is an example of the latter approach.[54] The question is whether these non-invasive technologies have experienced overregulation—deeming them unfit for use in court—or whether their consequent results are being accepted as scientific evidence in court. To answer this, court rulings and other landmark judgements within the USA, Australia, Israel, and some EU-member States will be analysed to develop an international overview before delving into the current state of affairs within India.

The USA

The USA, being the frontrunner in innovative and ground-breaking technology, was the first nation to invent a psychophysiological machine attempting at assessing deceit with the invention of the first lie detector in 1921.[55] Despite the USA being the site for much development/progress of psychophysiological technologies, their admissibility in court as scientific evidence capable of condemning or exonerating the defendant is a completely separate matter. The first instance of the submission of an expert's testimony/opinion on a novel psychophysiological test as scientific evidence in court occurred in *Frye v. United States (1923)* at the Supreme Court of the District of Columbia.[56] The scientific principle being discussed was the systolic blood pressure deception (SBPD) test, where a change in blood pressure was attributed to the individual's attempt at deceit.[57] By outlining a test of admissibility with the following two cumulative conditions, the Court set future precedence for the use of any new scientific principle as scientific evidence court: (i) the test must be scientifically valid; and (ii) the scientific principle (in this case, SBPD) must be generally accepted by professionals within the relevant scientific community—this standard thereafter coming to be called the 'Frye standard'.[58] With regard to the ruling of the case, the judge adjudicated the use of SBPD as inadmissible due to it not being prevalent enough within the scientific community.

However, in *Daubert v. Merrel Dow Pharmaceuticals (1993)*, the Supreme Court ruled that the Frye standard was inadequate and called for the issuance of a new set of requirements/conditions stipulating the admission of scientific evidence that thereafter came to be known as the 'Daubert standard'.[59] The new factors to be considered and met to grant admissibility are the following:

1. Is the theory/technique scientific and has it been tested?
2. Has it been peer-reviewed and published?
3. Is the potential error rate within limits?
4. Has this theory/technique proliferated and received general acceptance within that specific scientific community?[60]

While most states have largely moved over to the 'Daubert standard', some states, including Washington, California, Illinois, and Pennsylvania, still adhere to the Frye standard.[61] When talking specifically about the polygraph or other psychophysiological tests, it is important to note that they cannot be administered unless

it is with consent or under the supervision of a court order. The use of polygraphs as a tool to extract confessions was largely disseminated by lawyers, law enforcement, and even employers, however, its reliability and accuracy with which it could detect deceit was heavily contested—with different federal courts adopting different stances. Most of them excluded polygraphs as scientific evidence and yet, some, such as New Mexico, made it generally admissible.[62] To address this lack of scientific consensus, the President of the Supreme Court, In *United States v. Schaffer (1998)* adjudicated that each individual jurisdiction was free to decide whether polygraphs—this applying/being extendable to other psychophysiological adjuncts—fulfil the Daubert criteria and can be admitted as scientific evidence or not.[63] This has granted some breathing space for new psychophysiological technologies to emerge. Some such techniques are Eyedetect and iCognative. Based on the aforementioned, we could therefore classify the USA as a psychophysiological adjunct-friendly nation.

Countries in Opposition

The next group of countries deny the admissibility of psychophysiological technologies' testimonies as scientific evidence. Despite their increasing use in law enforcement for criminal investigations and private corporations as a tool for screening, polygraphic results as scientific evidence are not generally admissible in Australian courts.[64] While the High Court of Australia has not taken an official stance against its use, inferior courts have, with Section 6 of the Lie Detectors Act, 1983, forbidden the submission of any test result or expert opinion as scientific evidence in court.[65]

Some European countries, such as Germany, Switzerland, the UK, and the Netherlands, for instance, have outrightly rejected the admission of polygraphs and other psychophysiological adjuncts as scientific evidence in court.[66] However, it is important to bear in mind that a lot of European countries' judicial systems are modelled after 'bench trials', where it is the judge or the court that plays detective and decides which facts are presented/submitted before the court.[67] The results of a polygraph are considered as 'potential evidence' and are, therefore, presented to the inquisitor, who then decides whether it is to be presented in court or not.[68] This happens in Norway, Sweden, and the Court of Assizes in Belgium. Nevertheless, the general trend within Europe calls for the denial of the use of polygraphs and other psychophysiological adjuncts as scientific evidence due to it violating the accused individual's right to remain silent.[69]

Israel's ethos towards defence and security is largely a product of its geopolitical reality—which was the impetus for Israel becoming the world's most advanced military, specialising in a whole host of defensive technologies.[70] Israel is also the leading developer for ground-breaking and innovative BS (psychophysiological) technologies utilising voice analysis and galvanic skin response.[71,72] Despite the widespread prevalence and acceptance of these technologies to pre-screen candidates for police position, the use of polygraphs is inadmissible in criminal court.[73]

Similarly, their use in civil court cases was disallowed by the High Court of Israel in *Menora Insurance v. Jacob Sdovnik,*[74] with the sole exception being divorce proceedings in the State Rabbinical Court.[75]

What we have witnessed within this sub-section is a blatant disregard of psychophysiological adjuncts test results as admissible scientific evidence by the courts of Europe, Israel, and Australia. Yet, as is evident in this section, private corporations and law enforcement have increasingly been using them (the polygraph) to prescreen their employees. Emerging technologies have been increasingly proving their merit, yet, their lack of acceptance or open-mindedness towards the psychophysiological gifts of the twenty-first century is disheartening. The following section will assess whether the Indian atmosphere is any more conducive in this regard— is the Indian legislation more accepting of the science that backs these emerging technologies?

India

Historically, when the local police encountered a recondite case and were unable to make progress due to insufficient evidence or information or a lack of resources, they ended up referring/transferring the case to the CBI, which then called upon the services of forensic experts. These forensic experts have, over the past couple of decades, utilised psychophysiological technologies as adjuncts in a myriad of cases—some of the high profile ones being the murder of Madhumita Shukla,[76] the Stamp Paper Scam of 2003,[77] the Nithari serial murders of 2006,[78] and the infamous Aarushi–Hemraj double murder case.[79] What becomes pellucid upon analysing each of these cases is the use of psychophysiological technologies as adjuncts that assist law enforcement in conducting interrogation of suspects and asserting guilt/innocence. BS technologies allow the investigators to elicit crime scene information stored from within the mind-body realm of the individual being interrogated.

During the same period of time, however, there existed a certain dearth of legal opinion/understanding/legislation of both the technologies and whether the test results of these technologies were reliable and admissible in judicial proceedings—provided the results were interpreted by a forensic expert to the Court. To counter this lack of awareness, the National Resource Centre for Forensic Psychology (NRC) was set up by Dr S L Vaya under the aegis of the DFS, Gujarat, with the objective of conducting research on and upgrading emerging technologies and techniques having investigative purposes—such as brain electrical oscillation signature profiling (a specific form working on the principles of EEG) and lie detection, alongside others techniques such as narcoanalysis, which is an invasive technique and is, therefore, outside the scope of this chapter. As part of its training curriculum, the NRC organised workshops between 2005 and 2006 for judicial officers, police officers, forensic experts, and other mental health personnel across the country to demonstrate the effectiveness of these technologies. Over ninety-seven judicial officers participated in four separate batches where

Table 1: Batches of judicial officers who attended the NRC's training programme on scientific aid to interrogation

Batch	Number of Participants	Duration	Period
Batch I	17	2 days	8/12/2005 – 9/12/2005
Batch II	25	2 days	3/03/2005 – 4/03/2005
Batch III	26	2 days	1/09/2006 – 2/09/2006
Batch IV	29	2 days	1/12/2006 – 2/12/2006

Source: https://www.researchgate.net/publication/311228034_NRC_final_report

they were exposed to each of the above-mentioned technologies over two days; and according to the feedback received, they were well impressed with the practical demonstrations, satisfied with the training material, and suggested refresher courses of longer durations. A full list of the judicial officers who participated in these trainings can be found in the original source material—however, a short summary of the four training batches has been presented in Table 1.

Furthermore, a separate program titled ‹The Role of Forensic Science in Criminal Justice'—with a special session on 'Forensic Psychology and Scientific Aids to Interrogation'—was carried out by the NRC with multiple batches of training occurring between 2005 and 2007 for judicial officers of varying levels/categories—as is evident in Table 2.

Table 2: Training programme held for judicial officers

Category	Number of Participants	Duration (Days)	Period
Fast Track Court Judges	25	1	29/05/2005
Fast Track Court Judges	34	1	03/07/2005
Fast Track Court Judges	30	1	07/08/2005
Fast Track Court Judges	20	1	17/09/2005
Assistant Sessions Judges	38	Visit Only	17/12/2005
Civil Judges and JMFC*	35	2	04/07/2005 – 05/07/2005
Civil Judges and JMFC*	38	2	20/12/2005 – 21/12/2005
Civil Judges and JMFC*	48	2	26/12/2005 – 27/12/2005
Civil Judges and JMFC*	32	3	04/04/2006 – 07/04/2006
Civil Judges and JMFC*	24	3	26/09/2006 – 28/09/2006
Presiding Officers	40	3	08/08/2007 – 10/08/2007
Civil Judges/Senior Civil Judges	55	3	16/08/2007 – 18/08/2007

Source: https://www.researchgate.net/publication/311228034_NRC_final_report
*New Recruits

These training programs carried out by the NRC were pivotal in helping the judicial ecosystem develop a stronger and fuller understanding of scientific aids to interrogation—as these very same judicial officers would return back to their local jurisdictions and would be more willing/accommodating to consider the results of these technologies as corroboratory evidence if they ever showed up within their courtroom. There was still, however, a lack of consensus on whether the results of these technologies could in actuality be submitted as evidence within the court—this tryst/strife between humanity and technology was only resolved in *Selvi & Ors. v. State of Karnataka (2010).*[80]

The appeal from Selvi & Co. was in contention against the use of invasive and non-invasive technologies—including the polygraph and the EEG—on suspects and witnesses without their consent. The Supreme Court had to deliberate on whether these technologies were constitutionally valid and whether they were in direct contrast to an individual's right against self-incrimination as enshrined in Article 20(3) of the Indian Constitution and reaffirmed in Section 161(2) of the 1973 Code of Criminal Procedure. The Supreme Court, after listening to all the arguments adjudicated the following stipulations:

1. The court held that scientific tests of this nature could only be executed after taking the subject's consent or would be tantamount to an invasion of personal liberty.
2. However, the test results themselves could not be admitted as evidence capable of indicting the suspect/detainee as the subject does not consciously exercise control over his/her responses during administration.
3. Yet, the information or materials subsequently discovered after the administration of these tests can be used to incriminate the individual in accordance with Section 27 of the Evidence Act, 1872.

Therefore, when classifying India's stance on the admissibility of scientific evidence in court, on a spectrum of rigidity (as displayed by the Netherlands and Germany) and ductility (as showcased by the USA), India would fall in the middle of both extremes.

Conclusion

This chapter first began by distinguishing BS from the more well-known FS—highlighting their difference through an emphasis on the 'living status' of the individual in question. Following this, an explanation of the different kinds of interrogative techniques was mentioned as they are imperative in eliciting information from the interrogatee. Furthermore, an introduction to the science backing the new technologies was provided—these being the galvanic skin response, pupil dilation, voice analysis, and electroencephalography. Their benefits were highlighted alongside some criticisms with the goal being to spread awareness amongst the general population reading this chapter.

The second half of the chapter focused on the legality of these technologies and assessed whether the test results of these technologies serve as sufficient evidence to be submittable in court. This section began by showcasing different nations' stances towards these psychophysiological adjuncts—starting from the USA, which is more accepting of psychophysiological technology, to several others that are not—before arriving upon the legal stance in India. The Supreme Court ruling in *Selvi & Ors. v. Karnataka* settled the dust by stating that these technologies can only be used after taking the consent of the individual, and cannot be submitted as evidence capable of convicting the individual. Yet, new information subsequently discovered from the interrogation can still be used to incriminate the individual. The Hathras gang rape case provides a good opportunity to observe the applicability of BS technologies and their accompanying results as submissions in court. In 2020, four men brutally gang-raped and burned a nineteen-year-old girl who was then ‹forcefully cremated' against the wishes of the family.[81] She accused the four men of gang-raping and strangling her and before passing on, she named one of them as the main accused.[82] Her ‹dying declaration', according to Section 32(1) of the Indian Evidence Act, 1872 should be enough to convict her aggressors, however, the main accused claimed that the victim's family was aware of their relationship, killed her, and pinned the blame on him—hoping to capitalise on the fact that the body had already been cremated and the victim could no longer defend herself.[83] To gain more information and despite the law not fully recognising them—a polygraph and an EEG were ordered to extract any information possible.[84] While the jury (not literally) is still out and the trial continues in the Allahabad High Court[85] this case will certainly prove monumental and demonstrate the efficacy of BS technologies.

As stated earlier, we strongly believe in the synergisation of physiological technologies to produce vastly superior and reliable results. Ocular technologies, such as Eye detect, when coupled with polygraphs, will produce incontrovertible results, as it is physically impossible for any individual to control each and every autonomic response—especially when this is coupled with P300 technologies, the responses of which occur within 300–800 milliseconds. More research is required to demonstrate this effectiveness following which this pairing can be standardised throughout the country to effectively assist in the discernment of truth further expediting the processing of the numerous/countless/huge backlog of pending criminal cases across/within India. Thus, this chapter, in keeping with the remainder of the volume, has attempted to provide a succinct overview of the emerging technology within the field of BS and further demonstrates its credibility as an adjunct that can assist law enforcement.

Editors' Comments

The ongoing, second part of the book dealing with the 'A' of assistance through technology ends with the next chapter—a discussion of emerging technologies that can be deployed strategically and thus, have implications for national security, a critical area for the justice system in any country.

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CHAPTER 10

Emerging Technologies and India's National Security

Harsh V Pant and Kartik Bommakanti

"Nothing is more important to national security and the making and conduct of good policy than timely, accurate, and relevant intelligence."

– Dennis Blair, Former United States Director of National Intelligence

SUMMARY:

- The range of emerging technologies in the sphere of the military is wide;
- The application of three specific areas — cyber, AI and quantum technology (QT) — is uneven across the three services of the Indian Armed Forces;
- The Navy is the most advanced in the use of AI, with the Air Force and Army in the second and third positions;
- The least advanced area of investment and application in the Indian Armed Forces is QT;
- The application of cyber technology is still evolving but in comparison to the other two technology domains has received wider attention.

Introduction

The following analysis attempts to uncover the extent to which emerging technologies are integrated across the three service branches of India's armed services. While the range of emerging technologies in the sphere of the military is wide, we look at only three specific areas – cyber, Artificial Intelligence (AI) and

Quantum Technology (QT). The application of these technologies is still limited and uneven across the three services. All the service branches of the Indian military are aware of the importance of emerging technologies, but they have some distance to travel. Among these emerging technologies, the application of cyber technology and cyberspace is the most evolved. There is greater awareness within the services about this emerging technology than a decade ago. AI, however, has been in existence in some form, from semi-autonomous to fully autonomous systems. In military parlance, there are Autonomous Weapons Systems (AWS) and Lethal Autonomous Weapons Systems (LAWS), which cover unmanned weaponised platforms. The subsequent analysis includes an assessment of both AWS and LAWS. QT, which is the third emerging technology that can be applied to the military, is still at a nascent stage. It would be premature to make a concrete evaluation of the progress of QT's impact on the Indian military. Although India is a late entrant in the development and application of the three emerging technologies we will be examining in this analysis, it is nevertheless making slow, but steady progress to address the deficit in the areas of cyber, AI and quantum technologies. All three technologies intersect and indeed all three-armed services are working to incubate Research and Development (R&D) and the application of these three technologies.

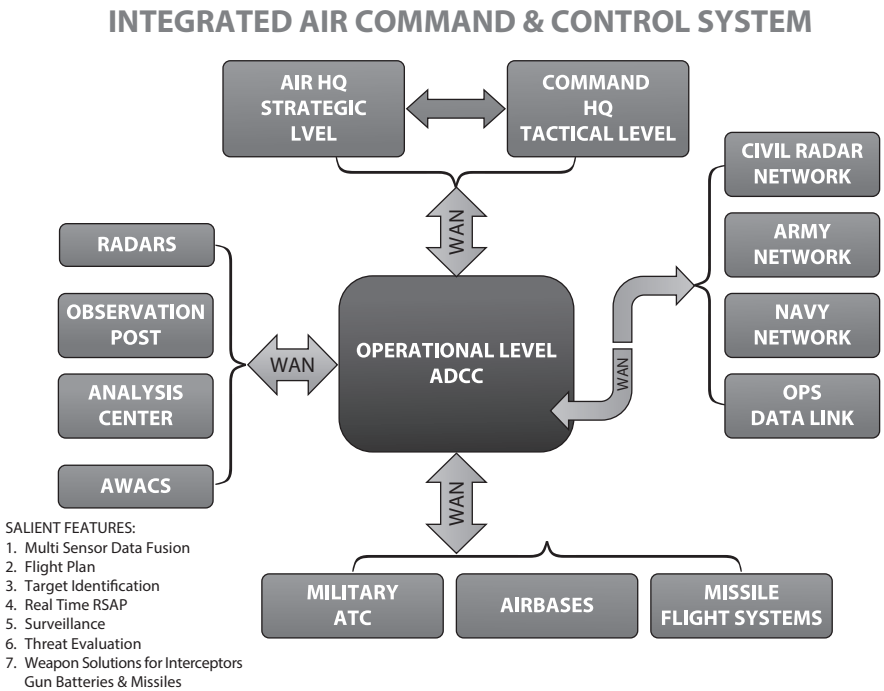

Figure 1: Structure relevant to the Indian Air Force's application of emerging technologies[1]
Source: "India's Integrated Air Command Air Command & Control System (IACCS), Indrastra, September 28, 2015."

The first section explains the role of cyber technology across the three services. The second part surveys the scope of AI in the Indian military. Thereafter, the authors analyse the extent to which QT has been integrated into the three services. The fourth section looks at existing Indian regulations and laws affecting the implementation of these technologies in the armed services. The final section assesses the extent to which other countries have adopted these technologies. The conclusion lays out some challenges facing India's armed forces in integrating these emerging technologies.

I. Cyber technology in the Indian Armed Forces

The application of cyber technology is still evolving but in comparison to the other two technology domains, has received the most attention. Cyberspace is used as a medium for communication, while cyber technology is used in defence security. The Indian armed forces are digitising, albeit gradually.

Let us begin with the Indian Navy (IN), which has integrated Software Defined Radios (SDRs) under the Indian government's indigenisation drive. SDRs contain properties that are defined by software such as modulation, signal bandwidth, carrier frequency and network access.[2] Contemporary SDRs are also designed to execute cryptographic functions, source coding for voice, video and data and forward error correction coding.

In collaboration with the Defence Research Development Organisation (DRDO), Center for the Development of Advanced Computing and Weapons and Electronic Systems Engineering Establishment (WESEE) and Bharat Electronics Limited (BEL), the Navy has developed Software Defined Radios (SDRs) for applications such as SDR Naval Combat (NC), SDR Tactical (Tac), SDR Manpack (MP) and SDR Hand Held (HH) for secure wireless communications for fixed and mobile naval forces.[3] The state-owned BEL also secured a substantial contract in 2019 to deliver SDRs.[4] Communication-based on the hardware of legacy systems has almost been replaced with software-based multi-band, multi-functional and multi-mission platforms.[5] These SDR-derived improvements will significantly enhance communications and situational awareness for the IN.[6] WESEE has attained a 'Capability Maturity Model Integration (CMMI) Level 3 Rating for software development and maintenance projects.'[7] CMMI emerged as a process development instrument to improve process and behavioural conduct assisting organisations in increasing productivity and efficiency by reducing risks in software, product and service development.[8] The US Department of Defence (DoD) played a key role in developing CMMI, which is commonly required across all DoD and US government software development contracts.[9] Indeed, WESEE is the Indian defence organisation's secure appraisal for '…CMMI V2.0 Level 3 for Development and Supplier Agreement Management.'[10]

The IN has its own intranet or encrypted cyber communication network known as the Naval Unified Domain (NUD).[11] The NUD is primarily an internal cyber network of the IN. The network operates only highly regulated or

controlled data allowing easy segregation and analysis.[12] The IN is at the forefront of SDR development, has optimal satellite coverage in the area of responsibility, and has encryption systems that are far superior to the World Wide Web.[13] It is also spearheading development in quantum networks, quantum cryptography, laser communications, and ultra-high-capacity wireless networks, even if these initiatives may take a decade or so to flourish.[14] This makes it the first service to get off the mark in developing a network-centric force or one that is geared to undertaking Network Centric Warfare (NCW).

The IN, as former Chief of Defence Staff (CDS) General Bipin Rawat conceded, is ahead of the other two services in integrating cyber and other emerging technologies. Most specifically the IN's cyber warfare capabilities were fairly advanced compared to the Indian Army (IA) and the Indian Air Force (IAF).[15] Indeed, the Navy has been quick to prioritise the application of cyber technology to meet its communications and decision support requirements. It has also invested in improving the security of its cyber networks to prevent hostile cyber intrusion at the level of command, across platforms, communications between command headquarters, and at base installations.[16]

In the IAF, the cyber capabilities of the service are second only to the IN. The service has grasped the importance of cyber capabilities to service its communications and operational requirements. The IAF too has an internal cyber security and cyber warfare group like the IN and IA. The service has started instituting measures to digitise requirements for peacetime and wartime postures. It has been incorporating digital technologies and recognises the cyber security requirements that come with it.[17] The service's more obsolete monitoring, surveillance and communications are being replaced with more advanced digitised communications networks.

The Air Force Network (AFNET) developed by Bharat Electronics Limited (BEL) is a key part of the IAF's cyber systems and formed the first segment in the service's Integrated Air Command and Control System (IACCS) when it was launched in 2010. Indeed, the IACCS rides on the AFNET. The latter is a high bandwidth 500 MBPS digitised encrypted communication network, which replaced the IAF's old troposcatter communication technology and is integral to the service's NCW strategy.[18] The IAF's digitised communications and data transfer is dependent on the AFNET. The AFNET integrates Satellite Communications (SATCOMs), Wide Area Network (WAN) and Internet Protocol (IP). The IAF's static and mobile assets and installations are linked via the WAN – a secured communications network. The open architecture of the AFNET is also integrated with a state-of-the-art Human Machine Interface (HMI). Live visuals can be instantly accessed by decision-makers through Unmanned Aerial Vehicles (UAVs) and Imagery Intelligence (IMINT) from centralised facilities or installations located at substantial distances.[19] Through AFNET, the IACCS will execute all operations integrating ground-based and air-borne sensors, Command and Control (C&C) nodes, and Air Defence (AD) Weapons systems.[20]

Like the IN, the IAF has invested in SDRs to enable secure encrypted two-way communication. The SDRs are both imported and sourced from the domestic market. It has encouraged domestic industry, as part of a roadmap that started in 2015 and extends to 2025, to develop SDRs indigenously. It has sought technologies, especially cyber, to help improve aircraft communication and networks across combat zones. The communication requirements are geared to meet the bandwidth needs of the service as well as generate high data rates covering voice data, imagery, and video transmission. The IAF plans to secure as part of the roadmap a high-security network with potent encryption and decryption capability.[21] The current IAF Chief VR Chaudhari also noted recently that the IAF was working with the Defence Research and Development Organisation (DRDO), academia and industry to develop 'niche' capabilities in the cyber and AI domains.[22]

For its part, the IA has several initiatives to integrate cyber technology and prepare its cyber warfare capabilities. Nevertheless, the IA still trails the other two services. The Corps of Signals (CoS) and the Directorate General of Information Systems (DGIS) form the institutional foundation of the IA's cyber capabilities. They are responsible for providing tactical and operational level resources for Network Centric Warfare (NCW) and other military missions and operations. Although NCW is an overlapping function that both perform, CoS is primarily responsible for basic and advanced training (See Table 2).

Table-2: Indian Army – Key training and R&D establishments for emerging technologies[23, 24]

Role and functions	Corps of Signals (CoS)	Role and functions	Directorate General of Information Systems (DGIS)
Responsible for initial training for new recruits. Also oversees upgrade and conversion training for downstream categories and trades. Undertakes also communications intercepts. Responsible for ensuring building and enabling capabilities for Network-Centric Warfare (NCW).	1 Signals Training Centre Headquarters, New Delhi	Tasked to develop Operational Information System (OIS), Geographic Information System and Management Information System (MIS). Responsible for building capacities for NCW.	Headquarters, New Delhi
Role and functions still lack clarity.	2 Signals Training Centre, Panaji Goa		

Role and functions	Corps of Signals (CoS)	Role and functions	Directorate General of Information Systems (DGIS)
Advanced technical training in computer engineering and technology, combat communications, communications engineering, and cryptology. Also conducting R&D in QT and AI through its Centres of Excellence (CoE).	Military College of Telecommunications Engineering (MCTE), Mhow, Madhya Pradesh.		

Both the CoS and DGIS also ensure connectivity between different command centres of the IA. The Military College of Telecommunications Engineering (MCTE) imparts training in cyber warfare '… through a state-of-the-art cyber range and cyber labs.'[25] Several of the IA's cyber-related communications and information systems are being integrated. At the apex, the service headquarters (HQ) of the IA and Command HQ of the service are almost digitally linked. The upper command centres that are being integrated include the Tactical Communications System (TCS), Command Information and Decision Support System (CIDSS), the Battlefield Surveillance System (BSS) and the Battle Management System (BMS). The CIDSS was made operational in 2011 following extensive user trial tests. There are 58 nodes connecting the entire cyber system of the IA consisting of application software, prime mover, hardware, and shelters.[26] However, at the tactical and operational level, cyber-based or digitised connectivity remains an unrealised goal.

The BMS segment of cyber connectivity and application ceased because the Defence Production Board (DPB) did not want to pursue it in 2018. The DPB is responsible for the conception and development of all futuristic technologies applicable to warfare and IA missions.[27] The termination of the BMS was a blow to the efforts of advocates for a digitised fighting force.[28] All the battalion and combat group level units of the IA were supposed to be integrated under the BMS. The IA leadership did not deem it necessary to test and field the BMS because they believed it to be prohibitively expensive.

The total cost of the BMS is estimated at INR 3000 crore, which at the time of writing, will not be spent by the IA.[29] Beyond what the IA deemed exorbitant cost, the BMS was to equip every soldier with a handheld computer, while miniaturised tactical computers were to be integrated into the HQ of every battlegroup, Infantry Combat Vehicles (IFVs) and battle tanks.[30] The aim was to generate a

common operational picture by integrating other information sources such as the Geographic Information System (GIS) and the Global Positioning System (GPS).[31]

The BMS, which has missed its 2012 deadline, integrates lightweight equipment and long-range communications through portable satellites, which are transmitted to the platoon level, and ergonomics. Sensor integration is crucial to the realisation of the BMS. The purpose of the BMS is to create a taut 'Sensor to Shooter' capability. It is also conceptualised to enable a range of tasks covering decision support functions and operational awareness at the level of battalions and combat groups.

The BMS also connects every single soldier and combat platform, and links the uppermost echelons of the battalion and regimental commander to the Tactical Command, Control, Communications and Information (TAC31) System through the CIDSS, providing a common and centralised operational picture (See Table-1).

Table 2: Structure Relevant to the Indian Army's Application of Emerging Technologies[32]

Army Tactical Command, Control, Communications and Information (Tac C³I)			
Command Information and Decision Support System (CIDSS)			
Battlefield Surveillance System (BSS)	Battlefield Management System (BMS)	Artillery Command, Control and Communications System (ACCS)	Air Defence Control and Reporting System (ADC&RS)

Source: PC Katoch, "Informationising of the Indian Army: Need for Internal Reform", CLAWS Journal, Winter 2010, pp. 9-18.

TAC31 was and may still be tasked to integrate the different ranks in the army for mobility and transfer of high data rates.[33] The IA, however, is entrapped in the era of communications, which was voice-centric rather than data-centric. The BMS has the potential to improve high bandwidth long-range communications, if and when, it is fielded. Its networks will be conducive for rapid deployment, which is self-configuring, customisable, combines constant rolling coverage, and is interoperable. The BMS when realised will also need all-point or network topology.[34]

The IA has made progress in pursuing automation through a cloud network. The service is acquiring SDRs for secure bi-directional communication and has

issued tenders to purchase and field SDRs. However, the service's attempts to integrate SDRs need to meet the requirements of man portability are minimised, so that the mobility of infantry is not affected.[35]

In a nutshell, cyber technology has advanced applications across all the services relative to the other two emerging technology areas – AI and QT. The IA, however, faces the greatest resource constraints in adopting and integrating cyber technology largely due to resource constraints and partially due to poor planning.

II. Artificial Intelligence in the Indian Armed Services

All three services are still in the early stages of using AI technology. AI enables efficiency which otherwise would be cumbersome when undertaken manually. Although AI is often interchangeably used with Machine Learning (ML) and Deep Learning (DL), however, there are differences.[36] ML is only a subset of AI and is largely founded on developing systems that learn and improve their performance derived from data consumption.[37] All ML is AI-based, but not all AI is ML.[38] DL is in fact a subset of ML, but even more data intensive to make highly accurate predictions and it is generally directed to perform complex tasks.[39] The core element of AI technology is that it helps exceed human performance and make accurate predictions derived from a large mass of data and AI helps automate very complex as well as simple tasks.[40] AI whether in the form of ML or DL has a whole host of military applications and functions ranging from decision-making to intelligence collection. They have the same problems that impede their use of cyber technology. An understanding of the applicability of AI is nascent and evolving. Semi-autonomous weapons have already been used by the IN. For instance, the IN has been using drones or Unmanned Aerial Vehicles (UAVs). However, the UAVs currently in service are geared primarily for Intelligence Surveillance and Reconnaissance (ISR) missions.[41] The IN uses Searcher II UAVs and is yet to acquire combat UAVs. Currently, the service has several areas where AI is used such as Tactical Data Link (TDL) system, Maritime Domain Awareness (MDA) and Combat Management System (CMS).[42] TDL is crucial for the IN as it seeks to become a Blue Water force, integral to the IN's 2015-2030 Indian Naval Indigenisation Plan (INIP).[43]

Apart from exploiting the massive advances in communication technology, investment in AI will be necessary to establish a credible TDL system to connect and generate interoperability among all IN vessels at sea.[44] The intention, at least for the IN, is to generate more awareness through AI. The IN is aware that fusing sensor data enables greater accuracy about the naval combat environment.[45] Onshore units can also use AI, which the IN is potentially exploring in the domains of logistics, human resources (HR), dockyard management and training.46 These domains are manpower intensive and the application of AI will bring greater efficiency.[47]

Indian Naval Service (INS) Valsura has sought to leverage the use of AI by consulting technology companies such as IBM, Google, Infosys and TCS.[48] Currently, the IN is integrating the use of Automated Technology such as the Integrated Platform Management System (IPMS) for its new-generation warships.[49] IPMS will be used across the IN's new generation platforms for control and monitoring propulsion, power generation and distribution, auxiliaries, damage control, steering and stabilisation.[50] Automated 'Intelligence' is not only being embedded in the central processor but also in equipment across the IN's vessels.[51] AI and ML, as former IN officers concede, are unlikely to serve as substitutes for humans, but they can certainly enhance the performance of IN personnel.[52] Areas that are considered critical to missions will find increased focus under the IN. Indeed, there is an appreciation for both the strengths and weaknesses of AI and ML.

In the area of training and assimilating AI and ML technology, the IN is working towards creating a Centre for Excellence (CoE) at INS Valsura. An AI and Big Data Analysis (BDA) Lab was set up in 2020 in the same location.[53] The service has also set up an AI core group that will monitor AI initiatives and whether they adhere to prescribed timelines.54 Beyond these initiatives, the IN has signed a Memorandum of Understanding (MoU) with the Defence Public Sector Unit (DPSU) Bharat Electronics Limited (BEL). Under the terms of the MoU the IN and the BEL will set up a Technology Incubation Forum (TIF) for the development of emerging technologies such as Artificial Intelligence (AI), Quantum Computing and Robotics.[55] The mandate is wider and as the Ministry of Defence (MoD) observed, "The broad charter of the TIF includes technology development in the domain of weapons and sensors, information technology and emerging technologies such as artificial intelligence and machine learning, quantum computing, autonomous platforms/robotics, image processing and cognitive radio."[56] This collaboration is being pursued under Prime Minister Narendra Modi government's flagship Atma Nirbhar initiative and is intended to be a collaborative effort between private enterprises, start-ups and academia.[57] Consequently, the GoI decided to abandon the purchase of 30 Predator drones which are LAWS at a cost of USD 3 billion from the American manufacturer General Atomics and instead develop the capability domestically.[58] AI is also being developed to enhance the performance of the Combat Management System (CMS) of the Indigenous Aircraft Carrier (IAC) that helps detect and engage threats.[59] It will significantly improve the 'sensor to shooter' loop of the IAC.[60]

The IAF too has a history of using AI in its semi-autonomous form. There are an estimated five squadrons of UAVs operational under the IAF[61], though the exact numbers are classified information.[62] These UAVs comprise a combination of Heron and Searcher II UAVs and like the IN are primarily dedicated to ISR missions.[63] The IAF also has an interest in acquiring Unmanned Combat Aerial Vehicles (UCAVs) such as the Israeli Harpy and Harop capable of tracking, identifying and destroying targets and executing the destruction of radar emitters as part of missions related to the Suppression of Enemy Air Defences (SEAD).[64] The IAF has yet to deploy these LAWS.

The IAF has recognised the application of AI in several areas. As the then Chief of Air Staff (CAS) Rakesh Kumar Singh Bhadauria observed, "the IAF is looking at AI application in the areas of threat monitoring, training, data and intelligence fusion and decision support."[65] The IN is pursuing the last three areas of AI application. Automation is being seriously explored, but there is scepticism borne out of a lack of evidence about what algorithms can accomplish. Algorithms undergird AI's capacity to execute complex missions and Bhadauria asked, how would the AI face unpredictable combat environments and expressed his uncertainty over whether machines could be 'taught' to implement air combat strategies.[66]

The IA has been somewhat laggard in embracing AI. Internally, the IA set-up the Army Technology Board (ATB), which was formerly under the Headquarters of Army Training Command (ARTRAC), which is now under the Perspective Planning (PP) Directorate at the IA Headquarters in New Delhi.[67] The ATB has a close interactive relationship with the Indian Institutes of Technology (IITs) and Indian Institute of Sciences (IISc) in addition to several other Research and Development (R&D) organisations, to bring new technologies including AI, to meet the IA's requirements.[68] The IA's Military College of Telecommunications Engineering (MCTE) has an AI Centre for Excellence (CoE) in Mhow.[69] There are specific initiatives underway to apply AI in the Army. The thrust areas for AI development and application for the IA according to the recently retired Chief of Army Staff (COAS) M M Naravane are: Situational awareness, fusion of sensors, faster decision-making, and autonomous weapons systems. He also asserted the importance of reorienting and introducing changes in combat doctrine, organisation and structure of the IA if it is to effectively leverage AI.70

It can therefore be observed that the Navy is the most advanced in the adoption of AI technologies with the IAF following in second position and the IA a distant third. This pattern becomes evident even in the case of QT, though it is the least developed area among the three emerging technologies surveyed in this analysis.

Quantum Technology in the Indian Armed Forces

QT is an area founded on the principles of quantum mechanics which analyses natural phenomena at the atomic, subatomic and other elementary particles.[71] Quantum technology uses quantum superposition that enables rapid information, highly secure encrypted communications, advanced computing, cryptography and simulation.[72] All these QT applications have relevance to modern warfare and to the armed services. However, the least advanced area of investment and application in the Indian Armed Forces is QT. This is not surprising given that its application to warfare is only emerging even in the most advanced technological states. While the Indian armed services recognise QT's importance at least on paper, this section is very brief in its assessment of QT by virtue of its incipience. The Government of India (GoI) for the first time in the Union Budget 2020-21 made an INR 8,000-crore allocation for the R&D of QT over a five-year period.[73]

The areas of investment and application according to the mission are: "…quantum computers and computing, quantum communication, quantum key distribution, encryption, crypt analysis, quantum devices, quantum sensing, quantum materials, quantum clock and so on."[74] Part of the spin-offs generated by this R&D investment under the GoI's QT mission may help the armed services. Some of the areas that will benefit the armed services include cyber security, quantum sensing and aerospace engineering. The DRDO has already demonstrated a Quantum Key Distribution (QKD) link in collaboration with the Indian Institute of Technology (IIT), Delhi over 100 kilometres. QKD is vital to data security in the cyber domain. If the integrity and confidentiality of a message sent via the digital or cyber medium are to be preserved, QKD becomes very important.

For its part, the IN is working internally on developing quantum sensors. Quantum sensors are vital to the detection of submarines, which the IN is keen on securing.[75] There is work underway both in the public and private sectors to develop this niche technology, which the IN is seeking to leverage for its missions.[76] The IAF recognises the importance of QT, but there is no specific evidence of the initiatives being pursued by the service. Former COAS Air Chief Marshal Bhadauria observed in 2020: "…technology such as big data analytics, AI and quantum computing have the potential to be both enablers and disruptors in the strategic battlespace of the near future."[77]

The IA is pursuing its own initiatives and incubating research in these areas. At Mhow where MCTE is located and also hosts the IA's AI CoE, the service has established a quantum laboratory with the support of the Delhi-based National Security Council Secretariat (NSCS).[78] The lab is expected to focus on Quantum Key Distribution, Quantum Communication, Quantum Computing and Post-Quantum Cryptography.[79] The co-location of Cyber, AI and Quantum Technology R&D incubated in a single organisation in the form of the MCTE, mirrors the effort of the IN's WESEE, which is the IN's premier technology developer for naval missions.

With time, QT will be leveraged by the Indian armed services for specific missions and tailored to their needs. As of now, the focus of the three branches of the military is still limited as far as QT is concerned. It has not gained the kind of technological maturity that cyber technology, and to a lesser extent AI, needs. Nevertheless, given the promising prospects of QT and its intersection or applicability with cyber security, there is likely to be significant investment. This is equally true for AI and cyber technology. Beyond the state and application of these emerging technologies by the three Indian armed services, we now need to turn to the legal and regulatory environment that is relevant to these technologies.

The Impact of Indian Laws and Regulation on Emerging Technologies

A carefully framed regulatory structure is crucial to address challenges emanating from emerging technologies and this section does some relevant stock-taking as well as suggestion-making.

Cyber Security and Technology

The Information Technology Act was introduced in the year 2000 to deal with cyber interventions and was then revised in 2008. Similarly, the National Policy on Electronics was issued in 2012 and the National Cybersecurity Policy (NCSP) in 2013. Yet, till a few years ago, there were no well-coordinated and focused efforts towards cybersecurity, barring the founding of the Computer Emergency Response Team – India (CERT-IN) and similar organisations at the state level and defence forces. Sections 1(2) and 75 of the IT Act 2000 state that IT-related Indian laws are applicable within and outside India "if cause and action fall within the country's territorial jurisdiction".[80] The IT Act 2000 seeks to empower cyber commerce and enhance cyber activities and covers only limited aspects of cybercrime.[81] It is therefore imperative that India gets a Cyber Security Act to address forensics and cybercrime, as well as participating in and responding to cyber warfare and defence in the event of an attack. Further, as indicated earlier, invoking Article 352 for declaring an emergency needs to be done only in extreme and limited contexts. Therefore, such an act should have provisions for the government to act in relevant domains during a cyber war, without affecting other aspects of national life that are not relevant to a cyber-attack. The Act should be able to deter IT infrastructure from attacks and conduct offensive operations against India's adversaries. This can only happen through an Integrated National Cyber Strategy.

The National Cybersecurity Policy (NCSP) 2013, does not mention the creation and application of cyber power, or the role, organisational ability, and training of the Indian Armed Forces to execute cyber-enabled operations and cyber war. The National Security Council Secretariat (NSCS) coordinates and oversees cyber security issues, including cyber diplomacy. The National Cyber Security Coordinator has been entrusted with the responsibility of coordinating and synergising cyber security efforts. A Defence Cyber Agency (DCyA) exists, whose mandate is to train and equip the armed forces. India needs an Integrated National Strategy to strengthen cyber military capabilities.

A report in the public domain stresses the need for a cyber doctrine that has been developed by both civilians and the armed forces. This would prevent espionage in its own networks. The armed forces must have resources for cyber forensics and investigation of cybercrimes. Leaders must be conversant with the IT Act 2000 as amended in 2008. They should also be aware of the organisation for Internet Governance, ICANN, Tallinn Manuals and UN laws/deliberations on cyber war and cyber interventions. Section 69 of the IT Act empowers government officials to undertake interception, monitoring and decryption of any information in computer resources.[82] However, these rules do not cover situations related to cyber war and defence thereof and hence the rules need to be amended.[83]

Is there a need for a Data Protection Law? It will be a challenge for any government to use Article 352 for military action in the cyber domain.[84] The government may be able to use this provision of the Constitution only in the event of simultaneous cyber and physical wars. Thus, it will reinforce national interests if

Article 352 is required to be invoked in events of cyber-attacks and all appropriate measures are taken without declaring an emergency.

However, the government may consider a formal response to cyberattacks with or without the use of Article 352.[85] In case of such an emergency, Article 51A (on Fundamental Duties) can be invoked. Since 2005, several attempts have been made for a resource register to facilitate the implementation of Article 51A. This project needs revival. The proposed Cybersecurity Act could help India sign the Convention of Cybercrime (Budapest Convention) to contain cybercrime at the international level. It is therefore necessary that the government retain the power to protect cyber forces without having to explain itself. Section 197 of the Code of Criminal Procedure 1973 also needs to be strengthened.

Artificial Intelligence

As of now, there are no laws specifically for AI, BD and ML. There is an absence of a legal definition of AI in India. In 2018 the government published two AI roadmaps -- the Report of Task Force on Artificial Intelligence by the AI Task Force constituted by the Ministry of Commerce and Industry and the National Strategy for Artificial Intelligence by Niti Aayog.[86] According to the 'Global Legal Insights Report', the government's priority is towards the promotion of AI and its applications across various sectors.

In his paper on the AI Revolution in India, SS Vempati argues that India must view machine intelligence as a critical element of its national security strategy.[87] AI is being seen as a critical part of foreign policy between the United States and Japan.[88] India must similarly pursue AI proposals. The Indian government has to develop a national strategy that captures trends in emerging technology, which may have a long-term strategic impact. India will have to proceed in earnest to evaluate the Defence Advanced Research Projects Agency (DARPA) model of defence research. This has been pursued in cooperation with the private sector and academia in order to create dual-use technologies that are sufficiently large in scope to develop civilian technology applications.[89]

Specifically, the Cyber Grand Challenge model of DARPA will need examination for successful incentives to be generated for academia and the private sector.[90] Surveillance laws in India will need revisiting with the advent of AI-driven technologies such as facial recognition, UAS, and self-driving cars, as they generate new avenues of surveillance for the state and have consequences for the right to freedom of expression and assembly.[91] Sector-wise protections can complement and expand on the baseline protections expressed and stipulated in national privacy legislation.[92]

Commenting on the NITI Aayog paper, one report also assesses that the current Indian Intellectual Property (IP) regime is 'unattractive' and does not create adequate incentives for research and adoption of AI.[93] Section 3(k) of the Patents Act permits exemptions for algorithms from patenting, while the Computer Related Inventions (CRI) Guidelines are controversial for the extent to which patenting

of software is possible in the absence of a hardware component.[94] There is a veritable absence in the paper of substantive answers to queries on whether patenting algorithms should be allowed, and if yes, to what extent it should be permitted. Furthermore, there needs to be standardisation in CRI Guidelines or the Patent Act that draws distinctions between AI algorithms and non-AI algorithms.[95]

As one expert put it, "It is important for the Indian government to develop an intellectual property framework that encourages innovation. AI systems are trained by reading, viewing, and listening to copies of human-created works. AI designs conflict with tenets of copyright law in India. They pose the latest challenge to copyright law. If I was asked whether a copy made to train the AI algorithm is a 'copy' under the copyright law, and consequently whether such a copy is an infringement, my answer in the light of current law as it stands, is a big yes, and in some cases even data theft within the meaning of Section 43(a) read with Section 66 of the IT Act, 2000."[96]

Having surveyed some of the regulatory and legal issues surrounding emerging technologies in the Indian context, let us now turn to what some other countries have done with R&D, laws and regulations.

The Impact of Emerging Technologies on Other Countries

Having analysed India in detail, this section now aims to consider other countries to draw a comparison and leave the readers with some food for thought through insights that can be derived from the same.

China

The Chinese military's focus is on research, development, and making AI operational for the military. This is aided by laws and initiatives such as the National Security Law (2015), National Intelligence Law (2017), the New Generation Artificial Intelligence Development Plan, and Civil-Military Fusion. These initiatives have ensured complete compliance and coordination between all Chinese entities. China in the past concentrated its efforts on controlling access to the internet via the Great Firewall.[97] Since July 2015 Beijing has implemented a series of laws and draft laws on internet controls and state access to private data. The Cybersecurity Law's Article 37 necessitates that network operators in key sectors preserve data that is accumulated or produced by the network operator in the country.[98] Additionally, the law necessitates business information and data on Chinese citizens accumulated within China to be stored on domestic servers and not transferred abroad without permission.[99] The law covers a ban on exporting any economic, technological, or scientific data that would generate a national security threat or undermine the public interest.[100] The Cyberspace Administration of China (CAC) released the first National Cybersecurity Strategy (The Strategy), reaffirming China's main positions and proposals relating to cyberspace development and security, and providing guidance for China's work on cybersecurity.[101]

The Strategy aims to build China into a cyber power simultaneously ensuring a secure, open and well-ordered cyberspace amid the protection of its sovereignty.[102] Undergirding the strategy is the view that cybersecurity is 'the nation's new territory for sovereignty' and serves as the basis for exercising and systematically managing cyber control.[103]

Russia

Located at the Russian Quantum Center, Russia has made investments in quantum computing. But its commitment to resources is not nearly as much as other countries and especially trails China and the US.[104] This in part correlates with the general reduction in Russian scientific research capacity since the 1990s.[105] President Vladimir Putin is believed to have increased expenditure on R&D by as much as 1 per cent of Russia's Gross Domestic Product (GDP), with R187bn (US$3bn) allocated for fundamental scientific R&D in 2018.[106] Nonetheless, the latest advances and breakthroughs in quantum information science have not come about due to Russian researchers. For instance, US concerns are about an increasing 'quantum gap' with China, and not with Russia.[107] A decree was released by the President of the Russian Federation on the Development of Artificial Intelligence in the country. The national strategy lays out 5 and 10-year benchmarks for augmenting the country's AI expertise, educational programmes, datasets, infrastructure, and legal regulatory system.[108] Evidence suggests that Russia will continue to pursue its 2008 defence modernisation agenda, calling for 30 per cent of the country's military equipment to be robot-enabled by 2025.[109] In a quest to enhance development, Moscow announced in December 2019 that it planned an investment of USD 790 million over five years in quantum research adopting a five-year Russian Quantum Technologies Roadmap.[110] Not all these initiatives are military-related and information is scant in open sources about how Russia could potentially apply them to its military.[111]

Brazil

First National Cybersecurity Strategy, 2018, also called 'E-Ciber' is Brazil's first systematic effort to develop an overall view of cybersecurity incorporating diverse areas and Brazilian society as a whole.[112] The strategy attempts to build a culture of cybersecurity to communicate the government's role in the years to come.[113] A National Cybersecurity Law is likely to follow. The Brazilian government thinks of cybersecurity as a piece of the overall picture dealing with information and communications security and encompassing cyber defence, physical as well as data security.[114] The first appearance and recognition of cyberspace as a strategic arena for national security was enunciated in the 2005 National Defence Policy, subsequently materialising into the National Defence Strategy of 2008. This started the steep militarisation of cybersecurity and defence during the ensuing decade.[115] Since then, substantial sums of money have been allocated under the

annual budget to the Ministry of Defence (MoD) for the quick establishment of a Military System for Cyber Defence including, but not limited to, the Centre for Cyber Defence (CDCiber) and the Brazilian Cyber Defence Command (ComDCiber).[116] The 2014 Cyber Defence Military Doctrine, for example, defines cyber defence as 'the set of offensive, defensive and exploratory actions to protect national information systems, gather data for national intelligence purposes and to compromise information systems of opponents.[117] The conflation of content regulation with cybersecurity may potentially produce outcomes that create greater confusion about the 'roles and responsibilities of the GSI (cybersecurity), Armed Forces (cyber defence), and Federal Police (cybercrime).'[118] Even though the three should continue to ensure better coordination in incident response, greater confusion will not only increase the three cleavages highlighted by E-Ciber but also prove to be risky in developing the National Cybersecurity Law. The launch of a new AI strategy by Brazil aims to balance the ethical application of emerging technology while simultaneously boosting research and innovation in the sector.[119] After considerable public deliberation and engagement between December 2019 and March 2020, the strategy laid out six objectives. These include: 1) Developing ethical principles that guide the responsible use of AI, 2) Removing barriers to innovation, 3) Improving collaboration between government, the private sector and researchers, 4) Developing AI skills, 5) Promoting investment in technologies, and 6) Advance Brazilian tech overseas."[120]

Conclusion

The Indian armed forces are gearing up to incorporate emerging technologies. However, there are challenges confronting the IN, particularly the lack of organic talent in AI that can credibly identify the areas of application.[121] There is still a deficit in data science talent and skill in the IN, but that is equally true for the other two services. This lacuna is only gradually being addressed with the IN signing an MoU with civilian institutions such as the Indraprastha Institute of Technology, which has introduced Master's level courses in data science.[122] AI-related initiatives for the Navy have to emerge from within the service, rather than from professionals outside it.[123] In the case of the IA, the ATB has not had much success in incubating AI-based research, despite considerable interest and enthusiasm expressed by academia in the IITs and the Indian Institute of Science to contribute to defence-related research.[124] The Corps of Signals of the IA is generally considered the prime repository of expertise in computer science and since it is closely allied to the field of AI, it must serve as the apex and lead entity in conducting AI-related research.[125] Other organisations such as the IA Directorate General of Information System (DGIS) have a large cohort of non-specialist officers who are deputed to the DGIS for limited tenures with little or no expertise. The IAF for its part is yet to establish a comparable internal R&D institution like the IN's CoE at INS Valsura, the IA's Center for Artificial Intelligence (CAI) or the Quantum Lab located at the MCTE in Mhow. The IN is in the vanguard in

applying emerging technologies to service its combat requirements. Neither the IA nor the IAF comes remotely close to matching IN's WESEE in R&D. More broadly, Indian laws in the cyber and IT domains will need to be updated and provisions introduced to cater to the emergence of AI and quantum technologies. India can and should also consider adopting legislation and know-how of other countries.

Editors' Comments

The second part of the volume ends here. As the reader would recognise, it attempted to give an overall sense of entire domains relevant to law-governance-justice, viz., law-making, national security, contract enforcement, as well as specific verticals such as land administration and taxation. It also attempted to expose the reader to broad disciplines relevant to law and justice as well as proactive deterrents such as forensic and behavioural science. It then is the right juncture to move to the third A, i.e., Analytics, which encompasses how data and its uses, through various kinds of modelling and analyses, can be put to use for a more effective law and justice ecosystem.

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ANALYTICS

CHAPTER 11

MCA21: A Data Wizard That Needs Revamp

Mohit Yadav and Gaurav Pathak

"Without big data, you are blind and deaf and in the middle of a freeway."

–Geoffrey Moore, American author and organisational theorist

SUMMARY

- In 2006, the Government of India introduced a system of digital record-keeping of documents of companies and named it MCA21;
- The repository of data available on the MCA21 portal finds tremendous usage across various sectors;
- The use of the data is not limited to government and large financial institutions. Journalists have used MCA data to investigate companies;
- The next step after the digitisation of paper records is their sharing and optimum utilisation;
- The data industry is also seeking separate access to the MCA21 database.

Introduction

The advent of an entity called 'company' and its separate legal personality[1] can be said to be one of the hallmarks of modern legal systems. The earliest companies were established using the Royal Charter and were mainly merchant guilds.[2] It was only in 1844 that the Joint Stock Company Act was enacted in Britain,[3] and the era of modern-day companies started. This law allowed

for the registration of companies and mandated several compliances by them. Similarly, under the British Raj, the Joint Stock Companies Act was passed in India in 1857. Thereafter, the Companies Act of 1866 came into being, which was replaced by the Companies Act of 1913.[4] Independent India has had two statutes: the Companies Act of 1956 and the existing Companies Act of 2013. Across these legislations spanning three centuries and continents, the aspect of record-keeping is uniform.

It was in 2006 that the Government of India (GoI) introduced a system of digital recordkeeping of documents of companies and named it MCA21. In the age of information technology, this digital record can be harnessed for various benefits. In Section I of this chapter, we look at the background of MCA21 and explore its initial work. Over a period of time, the GoI learnt a few lessons and the philosophy of open data also came into the picture. The same resulted in the Data Policy of the Government of India, which is discussed in Section II. Section III of this chapter explores the existing use of data being made available by MCA21 and how beneficial it is to several industries. Section IV highlights problems with the MCA21 interface as well as underlying problems of design. Section V will cover the range of possibilities that can be realised using MCA21 data. Section VI points out the requirement of having a legal framework for current data-based operations, and Section VII highlights the need for changes in the law to use MCA21 to its full extent. The overall summary of the chapter is presented in Section VIII.

I. Background to MCA21

The GoI came up with the National e-Governance Plan in 2006 with 27 Mission Mode Projects.[5] The purpose of this plan was to implement the 'Simple, Moral, Accountable, Responsive and Transparent' (SMART) framework recommended in the 10th Five-Year Plan[6] and bring government services to the doorstep of every citizen through the electronic medium.[7] MCA21 was one of the 27 flagship missions under the e-Governance Plan[8]and even the name MCA21 was chosen to reflect the Ministry of Corporate Affairs's objective to provide "quality services to its stakeholders in the 21st century".

The project commenced with the remarkable ambition of digitising millions of existing records stored physically with various Company Registrars, followed by the automation of entire back-office operations.[9] Another objective of the programme was to make MCA interoperable with the National e-Governance Services Delivery Gateway thereby granting business access to various government services through one unified platform.[10]

On 16 September 2006, the Union government, under Section 610 of the then Companies Act 1956, notified Rules which made electronic filing of various forms under the Companies Act mandatory.[11] The work on this Mission started in 2005 and within 50 weeks of commencement of work, the first company was incorporated using the online portal in 2006. It took another 28 weeks for the

Table 1: Comparison of timelines before and after the MCA21 portal launch

Type of Service	Before MCA21 (days)	After MCA21 (days)
Name Approval	7	1-2
Company Incorporation	15	1-3
Change of Name	15	3
Charge Creation/Modification	10-15	Instantaneous
Certified Copy	10	2
Annual Return	60	Instantaneous
Balance Sheet	60	Instantaneous
Change in Director	60	Instantaneous
Change in Registered Office	60	1-3
Increase in Authorised Capital	60	1-3
Inspection of Public Documents	Physical Inspection at the regional RoC branch	Online

service to be rolled out with full functionalities and the digitisation of more than 45 million pages.[12]

In fact, the mere digitisation of forms substantially reduced the time involved in carrying out various compliances under the Companies Act. Table 1 below is a comparison of the timeline involved in various tasks before and after the launching of the MCA21 portal.[13]

II. Data Policy of the Government of India

Getting access to authenticated government data in India was a herculean task. Sources were rarely available. The often-used and most reliable method was answers to questions by ministers in Parliament. However, on many occasions, ministers chose to say that data collection was underway and would be furnished in the form of a paper before the House. Unfortunately, there was no mechanism to track if the paper was tabled. In 2005, the enactment of the revolutionary Right to Information (RTI) Act[14] allowed citizens access to information and governmental records as a matter of right.[15] However, not all institutions were following the mandate of the RTI Act and the quality of data shared voluntarily was low. On many occasions, public information officers were not forthcoming in their replies. Eventually, obtaining information through RTI became a challenge in itself and continues to be so.[16]

The paradigm shift in the philosophy of data sharing came with the announcement of the National Data Sharing Accessibility Policy in 2012.[17] The Policy under the aegis of the Ministry of Science and Technology recognises that "data collected or developed through public investments when made publicly available

and maintained over time, their potential value could be more fully realized". The Policy relies on the United Nations Declaration on Environment and Development (Rio de Janeiro, June 1992), and the RTI Act 2005 as the bedrock to enable accessible sharing of government data. As per the Policy, such sharing must be based on "Openness, Flexibility. Transparency, Legal Conformity, Protection of Intellectual Property, formal Responsibility, Professionalism, Standards, Interoperability, Quality, Security, Efficiency, Accountability, Sustainability and Privacy". It recognised the fact that a huge amount of data generated through public funds is not accessible to the public. The Policy clarified that "The National Data Sharing and Accessibility Policy (NDSAP) is designed to apply to all sharable non-sensitive data available either in digital or analogue forms but generated using public funds by various Ministries / Departments /Subordinate offices/organizations/agencies of Government of India".

In pursuance of the said policy, the Indian government established the Open Government Data Portal in a joint venture with the US government.[18] The portal hosts information proactively shared by various government departments, including datasets shared by the Ministry of Corporate Affairs. However, the dataset available on the portal is limited and is not updated frequently,[19] making the entire exercise futile.

III. Present Use of MCA21

The repository of data available on the MCA21 portal finds tremendous usage across various sectors. The bulk of MCA data lies in the public document section. The high interest in the usage of MCA data can be gauged from the fact during FY 2014-15, various stakeholders accessed more than 1.4 million company filings behind a paywall. The project was not even a decade old at the time. In subsequent annual reports, MCA did not share this statistic but it seems likely that the number would have increased in leaps and bounds.

The MCA portal data is currently used in two ways[20]: "One is the micro-dataset at the entity level, i.e., of each company and two, the macro-dataset that aggregates insights across various companies and LLPs. At the macro level, the data has been used by the Central Statistical Organization for calculating National Income Statistics and for the estimation of Gross Domestic Production by the National Sample Service Office.[21] It helps governments monitor the corporate sector that contributes to one-third of the gross domestic capital formation".[22] Further, it is also used for making critical lending decisions by financial institutions[23] and has been used by the MCA in collaboration with other regulators such as the Central Board of Direct Taxes, the Securities and Exchange Board of India, the Reserve Bank of India, etc. to prevent corporate frauds at scale[24] and monitor companies' compliance with their CSR obligations[25]. The data has also been proposed to be used by the Financial Intelligence Unit for regulatory compliance.[26]

The use of the data is not limited to government and large financial institutions. Journalists have used MCA data to investigate companies[27]. The private sector has also used the MCA repository to bring disruption to multiple industries. *Probe42* and *Saverisk* help banking and financial institutions make risk assessments on potential and existing borrowers. Prime Database and Tofler provide an extensive layer of search over MCA data which enables the user to perform deep and extensive market research. Dun & Bradstreet India makes use of MCA data for creating credit assessment reports. *Paper.vc* and *VCCEdge* use MCA data for comprehensive business reporting. *Altinfo* help lawyers and auditors take a deep dive into companies for their clients saving time and providing actionable info on ongoing transactions.

IV. Existing problems of MCA21

(a) The MCA21 framework has been operating since 2006 and has undergone many changes in the last 15 years. However, some inherent problems continue to plague the system and often affect its reliability. The Report of the Committee for Formulation of Data Dissemination Policy of the Ministry of Corporate Affairs[28] states that "each Indian company is provided with a unique corporate identification number (CIN) and foreign company a unique foreign company registration number (FCRN)". However, this is not entirely correct. Each company is indeed provided with an identification number, but, unfortunately, the number is not unique or permanent. For a simpler understanding, let us equate CIN with Aadhaar. A person might change their name, address, phone number, email or even gender, but their Aadhaar number will remain the same. CIN as a concept has a similar background, but the CIN number of a Company can be changed under the following circumstances:

- Conversion of type of company from one type to another. For example, the conversion of a private company to a public company;
- Change of registered office address from one state to another; and
- Listing or delisting of a company.

(b) Although MCA21 was made as part of a mission mode project, its underlying technology has not been solid and error-free. The MCA21 website goes down for an entire month, often at the time of annual filings. This not only results in inconvenience but causes actual losses to businesses, chartered accountants, and the entire data analytics industry. The plaguing issue has also caught the attention of the press[29], and the question of whether MCA21 is currently down features regularly on Twitter[30] and isitdownritghtnow?[31] Unfortunately, two of India's biggest technology companies, i.e., Tata Consultancy Services (TCS) and Infosys have had their turn at managing the MCA21 system, but the downtime problem continues to exist.

Another problem with the MCA21 system is that on many occasions, it does not register the completion of payment, even as the money has been deducted from the bank account of the subscriber.

(c) The Report of the Committee for Formulation of Data Dissemination Policy of the Ministry of Corporate Affairs[32] states "Corporate sector information is of immense use to the researchers specializing in the fields of economics, statistics, management, sociology, finance etc." The National Data Sharing and Accessibility Policy[33] also states that non-sensitive data "could be used by the public for scientific, economic and developmental purposes." However, despite these well-oriented and structured goals, a vast amount of bulk data continues to remain within the MCA21 system and is not being shared. This dichotomy in practice and theory is one of the major reasons why the data trove of MCA21 is underutilised, and immediate remedial steps need to be taken to ensure adequate sharing of data.

A major boost to the idea of open data and data sharing has been the Application Programming Interface programmes. These allow a dataset to get connected to an interface and help in easily making available the required data, which can also be based on certain parameters and conditions. In addition to the Policy on Open Standards for e-Governance[34] and Technical Standards on Interoperability Framework for e-Governance[35], the GoI has also notified the Policy on Open APIs for the Government of India.[36] As per its Preamble, the policy aims to "encourage the formal use of Open APIs in Government organizations."[37] API Setu, which is a platform that is a direct result of the Policy on Open APIs for the Government of India has integrated with the MCA21 system and offers MCA Company Details APIs. However, a cursory look at the platform will make one realise that the API platform is a half-baked one, without any substantial results. Often, the results obtained through API Setu are inaccurate and contain errors. On the aspect of design, API Setu uses a basic framework, but its Terms of Service page is empty.[38] Therefore, to make API Setu a tool of practical use, it needs to be expanded and solidified.

The Report of the Committee for Formulation of Data Dissemination Policy of the Ministry of Corporate Affairs[39], which came out in 2013, noted, "information available under VPD [View Public Documents] is essentially the documents as filed by the company, and therefore these are individual company-related information presented in a 'non-machine readable' format'". In more than eight years that have gone by, this dataset continues to remain in a non-machine-readable format. In the words of the Committee itself, "the objective of NDSAP is to facilitate the access of the public to Government of India owned shareable data and information in both human-readable and machine-readable formats through a network all over the country in a proactive and periodically updatable manner, within the framework of various related policies, Acts and rules of Government of India, thereby permitting a wider accessibility and use of public data and information." However, the lack of any progress in this regard is

one of the most crucial drawbacks of the MCA21 system. As soon as the data is put into the machine-readable format, it will open up the possibilities of micro-data analysis through machines and also macro analysis of data. For example, a Natural Language Processing operation on the letters of resignation of auditors from a Company will reveal that most of these resignations are due to "personal reasons". The use of the cryptic term "personal reasons", without further explanation makes the filling up of form ADT-3 a completely futile bureaucratic exercise. A careful analysis of more data points and forms will surely reveal other processes that can be streamlined or altered to ensure optimum results and transparency. Putting such data into a machine-readable format will ensure faster processing and better analysis; thereby aiding corporate governance and enforcement in the country.

The data present in MCA21 is crucial to analyse lending and charges present in a Company. If the same is made easily available, the public can gauge the health of financial institutions such as banks and non-banking financial institutions. Granular access to data in this regard would mean that the public gets to see if the loans given out by a particular institution are too concentrated (maybe to the same group of companies, or the same sector), or if there is something wrong with the financial health of the entity. Using present-day tools, this data can be used to predict the failure of financial institutions such as the PMC Bank and other cooperative banks that are on the verge of collapsing. Comprehensive access to data in a machine-readable format supports public activism and awareness in a big way, and MCA21 should at least provide such mechanisms for the greater good.

At present, MCA21 treats institutional users, researchers and individual users at the same level. That is, all of them have to pay a fee of ₹50 for LLP and ₹100 for a company for access to a company's/LLP's documents for three hours. Even though MCA21 has introduced API access, it is rendered rather meaningless due to the limitations mentioned above. MCA21 has now entered its version 3 with several new capabilities of SPICe+ (Simplified Proforma for Incorporating a Company) and AGILE-PRO-S (Application for Goods and Services Tax Identification Number, Employees State Insurance Corporation registration plus Employees Provident Fund Organisation registration, Profession Tax Registration (in Maharashtra) and Opening of Bank Account(AGILE-PRO-S)) forms added to its arsenal. At the same time, MCA21 should consider providing API-based uninterrupted access to entities that need MCA21 data regularly. In return, MCA21 can charge a high fee for this service, which in turn will open a new revenue stream for the government. For this, a mechanism such as "guidelines for obtaining data from MCA-21 by researchers for research proposals shortlisted under the funding research and studies, workshops and conferences etc. component of scheme "Corporate Data Management" of the Ministry Of Corporate Affairs"[40] should be incorporated. As per the guidelines,[41] the cost for individual and institutional researchers is summarised in table 2:

Table 2: Cost for individual and institutional researchers

S. No.	Number of companies (year-wise) for which data is required	Cost (in ₹) for individual researchers	Cost (in ₹) for institutional researchers
1.	0-5000	5,000	10,000
2.	5001-10000	10,000	20,000
3.	10001-15000	15,000	30,000
4.	15001-20000	20,000	40,000
5.	20001-25000	25,000	50,000
6.	25001 or more	50,000	1,00,000

V. Exploring possibilities

Data is the crucial component of "evidence-based planning of socio-economic development processes".[42] Until now, the bulk of the MCA data has existed in silos behind paywalls,l unavailable for public scrutiny in a machine-readable format. This is in contrast with the UK's approach where the Companies House portal (UK's equivalent of MCA21) provides bulk data in a machine-readable format along with API options at no charge to stakeholders.[43] Also, unlike in India, there has been no distinction made for sensitive and non-sensitive data and even bulk financials of companies are available at no charge.[44] The comparison with the UK is important considering that the Indian Companies Law has English origins as discussed earlier and even the Supreme Court of India takes into consideration the decisions of English courts while interpreting matters relating to companies law in India.[45] Until India catches up in providing access to this repository in a machine-readable format and at affordable pricing, the true value of this data will not be unlocked.

In the meantime, the government has shown initiative where various intra-governmental departments have signed a memorandum of understanding or MoU with the MCA for access to the bulk data. Until now, these MoUs have been signed with the sole purpose of finding defaulters or enhancing governmental supervision over companies but considering almost all interaction with the Ministry is paid, including the filing of regulatory-mandated information, it is disheartening that no such arrangements are made to enhance the experience of the end user. Real-time cross-linking with other governmental databases in a manner that not only increases oversight but also satisfies users is the right way to go forward.

Drawing on the above, to start with, direct linkage with GST and income tax filings can be used as a method to generate pre-filled financial statements, ensuring that the same information is provided to various government departments; in case a change needs to be made, the same will be intimated to all of them at one

go. This will help prevent financial leakages and take care of at least one annual mandatory compliance, i.e., filing of financial statements.[46]

Similarly, MCA charges filings[47] in themselves should be sufficient and there should not be any additional need to file the same information with the Central Registry of Securitisation Asset Reconstruction and Security Interest (CERSAI). Various compliance overlaps require companies to file the same information with various government departments as each department is maintaining its own set of records and there is no linkage with another. The real-time cross-linking can ensure that this additional regulatory burden on companies is taken care of. Real-time linkages can also help proactive monitoring of assets for banks and financial institutions ensuring that companies with massive debt and poor management are not able to siphon off the exchequer money by lending from state-owned banks.[48]

The Ministry's digitisation programme in the form of MCA21 is indeed commendable but it has not kept up with the technology landscape. Recently, the MCA introduced MCA data analytics and machine learning.[49] The same can also be used to proactively not only penalise companies that do not comply with their regulatory compliances but also ensure that they are pre-emptively warned of the same. In addition to the above, the same system can also be used to get actionable intelligence information to help companies take control of their compliances. Currently, MCA uses the Straight Through Process (STP) when a form filed is approved without any manual interruption and only if it is randomly inspected by the registrar at a later stage does any discrepancy in the form get resolved. Now, in this instance, the rectification only takes place as and when a manual intervention takes place. Instead, if the Ministry makes use of well-thought-out algorithms and employs machine learning to identify deviations then the scrutiny of information submitted with MCA can be even more pervasive. An example of the same can be, say a company's latest annual return states that it has 100 shares (Form MGT-7). Post filing of annual returns, the company issues 50 new shares and the same has been intimated to the Ministry through the filing of return of allotment (Form PAS-3). Now, this PAS-3 should provide that the total number of shares in the company is 150 shares, but, instead, it states that the total number of shares (paid up) in the company is 140 shares, then as of date, this form will be accepted by MCA as it is under the STP process making the information available with Ministry unreliable but on the other hand if well thought out processes are put in place where prior to acceptance of form such discrepancy can be flagged then it will make the overall process much more reliable.

Another unlooked segment of MCA is the limited liability partnerships (LLPs), which also come under the MCA21 portal. LLPs brought under this regime still undergo rather limited compliances but their inclusion has brought considerable transparency. Similarly, other legal entities such as trusts, societies, partnerships, proprietorships, etc. can be brought under one umbrella. This can substantially cut down on the complex web of structure created to evade taxes

or avoid disclosing actual ownership. Even the Ministry has recognised this problem and it has, for this reason, introduced Form BEN-2[50] which mandates companies to provide the names of individuals who exercise control over them. However, companies are still able to exploit loopholes in the existing rule framework to avoid disclosing the identity of the actual controlling person, and if the MCA can bring all such organisations under one roof (assuming legislative changes are made), then all such hurdles in form of litigation and law-making will be removed on their own.

VI. The Need for a Legal Framework

Changes were made to the Companies Act, 1956 in 2006 vide Companies (Amendment) Act, 2006 to introduce the concept of e-filing through MCA21. Section 610-B[51] gave the Government the power to make rules for uploading and verification of documents and the necessary system required regarding fees and other administrative aspects. The provision also allowed the Government to frame a scheme, which was to be published in the Gazette. In addition, the newly inserted Section 610-D allowed the Government to "provide such value-added services through the electronic form and levy such fees as may be prescribed".[52]

As mandated by Section 610-B of the Companies Act, 1956, the Government published the "Scheme for Filing of Statutory Documents and other Transactions by Companies in Electronic Mode"[53] in 2006. As per Clause 4, the Scheme was applied retrospectively to legitimise the transactions on MCA21 before the Scheme was notified. Around the same time, the Government also notified The Companies (Electronic Filing and Authentication of Documents) Rules, 2006. Rule 5(1) of The Companies (Electronic Filing and Authentication of Documents) Rules, 2006 stated, "The Central Government shall set up and maintain a secure electronic registry in which all the documents filed electronically shall be stored. The electronic registry so set up shall enable public access and inspection of such documents as are required to be in the public domain under the Act on payment of the fees as prescribed under the Act or the rules made thereunder." In the regime of the Companies Act, 1956 itself, the Government also notified Extensible Business Reporting Language) Rules, 2011 which mandated certain classes of companies to file their balance sheet, profit and loss account and other documents in the Extensible Business Reporting Language (XBRL) format.

From the above, it is clear that the Government during the era of the Companies Act, 1956 used the following legislative tools to govern the aspect of E-filing and MCA

i. Statute (Amendments in Companies Act, 1956)
ii. Rules (Delegated Legislation)
iii. Scheme

The Companies Act, 2013 repealed the Companies Act, 1956. Section 465 of the Companies Act, 2013 is a repeal of certain enactments and saving clauses, i.e. it tells us what earlier provisions have been repealed and are no longer applicable, and also what actions taken under the earlier provisions would continue to hold good and not be affected by the changes. As per Section 465(2)(a), "anything done or any action taken or purported to have been done or taken, including any rule, notification, inspection, order or notice made or issued or any appointment or declaration made or any operation undertaken or any direction given or any proceeding taken or any penalty, punishment, forfeiture or fine imposed under the repealed enactments shall, insofar as it is not inconsistent with the provisions of this Act, be deemed to have been done or taken under the corresponding provisions of this Act;". Section 465(2)(b), utilises the sub-section 2(a) of the same provisions and states, "subject to the provisions of clause (a), any order, rule, notification, regulation, appointment, conveyance, mortgage, deed, document or agreement made, fee directed, resolution passed, direction given, proceeding taken, instrument executed or issued, or thing done under or in pursuance of any repealed enactment shall, if in force at the commencement of this Act, continue to be in force, and shall have effect as if made, directed, passed, given, taken, executed, issued or done under or in pursuance of this Act;".

Careful consideration of the above statutory text points out the fact that although "rule, notification, inspection, order or notice" are covered by the savings clause, a scheme is not. Therefore, it can be said that the scheme is no longer in operation. At the same time, it can be contended that the scheme was published as a Statutory Order and is covered within the savings clause. Nevertheless, a cursory look at the scheme shows that it is a mere explanatory document laying out a roadmap and not a delegated legislation granting any rights.

Chapter 24 of the Companies Act, 2013 pertains to "Registration Offices and Fees", i.e., the Registration of Companies, and accordingly, the MCA21 regime is within its ambit. The Companies Act, 2013 gives the government the power to make rules relating to "filing of applications, documents, inspection, etc., in electronic form".[54] In furtherance to the same, the government has also notified Companies (Filing of Documents and Forms in Extensible Business Reporting Language) Rules, 2015. The Rules mandate the following class of companies to file their financial statement in electronic form:

i. Companies listed with stock exchanges in India and their Indian subsidiaries;
ii. Companies having paid up capital of ₹5 crore or above;
iii. Companies having a turnover of ₹100 crore or above; and
iv. All companies are required to prepare their financial statements in accordance with Companies (Indian Accounting Standards) Rules 2015.

Importantly, the Rules[55] cover only the aspect of filing and do not cover the ambit of inspection. Remarkably, the Companies (Filing of Documents and Forms in

Extensible Business Reporting Language) Rules, 2015 are the only Rules notified under Section 398 of the Companies Act, 2013. Companies Act, 2013 also covers "inspection, production and evidence of documents kept by Registrar"[56], but no Rules have been made under the same. The MCA website, which contains the list of existing Rules, does not mention the Companies (Electronic Filing and Authentication of Documents) Rules 2006. Accordingly, it appears that there is no statutory or delegated framework for inspecting and availing documents through MCA21. Therefore, the entire aspect of utilising MCA21 data lacks solid legal backing.

We suggest that the Parliament should notify comprehensive rules for inspecting documents of a company, as well as cover the aspect of utilising the data obtained therefrom. Such rules should not be mere explanatory documentation like the Scheme for Filing of Statutory Documents and other Transactions by Companies in Electronic Mode[57] but should be drafted in the form of legislation granting rights. For greater clarity, it is important to go through Section 399(1)(a) of the Companies Act, 2013, which states, "(1) Save as otherwise provided elsewhere in this Act, any person may—

(a) inspect by electronic means any documents kept by the Registrar in accordance with the rules made, being documents filed or registered by him in pursuance of this Act, or making a record of any fact required or authorised to be recorded or registered in pursuance of this Act, on payment for each inspection of such fees as may be prescribed;"

Therefore, even to give the required clarity to the existing MCA21 operations, the Parliament needs to take urgent action by framing appropriate rules.

VII. Legislative Changes for Exploiting Possibilities

Regarding easier access to MCA21 data through automated means, API access is necessary. Although initiatives such as API Setu do exist, their lacunae have already been pointed out in the preceding section. The Companies Act 2013 allows the government to provide value-added services through electronic forms and levy fees for the same.[58] We also suggest that the government should frame rules under Section 469 of the Companies Act 2013 read with Section 401 of Companies Act 2013, to lay out the framework for value-added services. This framework would be a suitable legislative enactment of the basic principles enumerated in the 'Guidelines for obtaining data from MCA-21 by researchers for research proposals shortlisted under the funding research and studies, workshops and conferences etc. component of scheme "Corporate Data Management" of the Ministry Of Corporate Affairs'.[59] The reason for the same is that the Guidelines by themselves are mere soft laws, without statutory backing. There is neither any penalty for their violation nor any grievance redressal mechanism. They have not been published in the Gazette and are mere documents, which can be changed or

removed without a legislative process. These proposed Rules should lay out the API mechanism as well as other related procedures and methods to avail data from the MCA21 system.

The Report of the Committee for Formulation of Data Dissemination Policy of the Ministry of Corporate Affairs[60] identifies the following categories of data:

i. Negative list: non-shareable data
ii. Restricted data: accessible only through a prescribed process of registration and authorisation
iii. Sensitive data: As defined in various laws
iv. Shareable data: Data that is neither sensitive nor restricted.

It is correct that some of the data relating to a company might be crucial and should not end up in the hands of competitors. However, the principle of sensitive data needs a relook. The "guidelines for obtaining data from MCA-21 by researchers for research proposals shortlisted under the funding research and studies, workshops and conferences etc. component of scheme "Corporate Data Management" of the Ministry Of Corporate Affairs"[61] identify the following data as sensitive:

- "Data that comes into existence through enforcement functions of MCA: Data generated as part of internal analysis using MCAs internal tools and techniques for profiling as part of Enforcement functions, Risk Analysis, Investigations and Intelligence gathering etc., shall be considered as Sensitive.
- Data pertaining to the configuration/technology of MCA's IT systems/ CDM: Data pertaining to the configuration of IT systems shall be considered Sensitive.
- Forensic Data which is available in MCA's IT system: Various forensic data such as signatures etc. shall be considered Sensitive.
- Data provided to MCA by other government organisations with whom MCA has executed any MoU or NDA: Any data shared with MCA by any other government organisation/department by virtue of a MoU or NDA shall be considered sensitive data.
- Third-party granular transactional data: Third-party data supplied by various other regulators shall be treated as sensitive.
- Information/data received under International Treaty/Agreements shall also be classified as Sensitive data."

While one can get access to sensitive data after going through several procedures and signing a non-disclosure agreement with the MCA, the whole idea of keeping the category of sensitive data broad defeats logic. Data sharing and data processing are complementary to each other and together can enhance their efficiency. It is clear that not all enforcement-related data will be sensitive. In any case, if the

MCA releases the data generated by its internal tools, not only will the industry benefit from the same, but it can also help utilise it better, and perhaps the same will also result in an open audit of the MCA tools.

Similarly, data provided by another government organisation under an MOU or an NDA has been claimed to be sensitive. In this aspect, it should be considered that data provided by another organisation, if not barred by an NDA, should be made shareable. In effect, the data being shared by another governmental organisation is also a public record and the public has the right to access the same unless barred by law. Accordingly, the restriction should only be present in the case of an NDA. The same principle should also be used for data obtained from regulators and third countries, i.e., data should be shareable by default and barred from access when expressly said to be so.

The categorisation of data such as "Company reports, Alerts/Validation Rules /Provision reports available on CDM" in the restrictive category is a fruitless exercise. Presently, the guidelines[62] stipulate a "prescribed process of registration/ authorization by MCA" to enable access to a restricted category of data. It is nowhere suggested that there will be an opportunity for an official to deny access to this data. Therefore, this type of data should be put in the shareable category, in which each user should be mandated to have an account on MCA21.

The Draft India Data and Accessibility Policy,[63] which was released in February 2022, mandates government-to-government data sharing by saying-

> "All government ministries/departments shall identify all existing data assets and create detailed, searchable data inventories with clear metadata and data dictionaries.
>
> Approved inventories will be federated into a government-wide searchable database for government-to-government data sharing. This will minimize duplication of data processing efforts and enable better delivery of citizen-centric services."

The Report of the Committee for Formulation of Data Dissemination Policy of the Ministry of Corporate Affairs[64] states, "Data will remain the property of the Ministry/Department, etc., which collected them and shall reside in their facility for sharing and providing access to the public. The legal framework of National Data Sharing and Accessibility Policy shall be aligned with various Acts and rules covering the data." The same principle had been earlier enunciated in the National Data Sharing and Accessibility Policy[65] that was published in 2012. However, the operation of data sharing between governmental organisations needs to have the backing of legal provisions. Presently, there is no provision within the Companies Act 2013 that allows the government to transfer data between various institutions. It is correct that the MCA21 data is the property of the central government and it has complete control over the database. Nevertheless, there needs to be a proper framework for data sharing as also tangentially highlighted in The National Data Sharing and Accessibility Policy. The noble objective of creating "detailed, searchable data inventories" across different ministries and platforms will only be possible when there is a law to facilitate the same.

VIII. Conclusion

The next step after digitisation of paper records is their sharing and optimum utilisation. The GoI is sitting on a treasure trove of MCA21 data, to which only it has the key. Wider access to MCA21 data has numerous benefits in policymaking, public participation, critical lending decisions and developing a bigger data analytics industry. It is time that the government introduces a liberalised regime into the realm of non-personal data, especially data on companies. At the same time, there is an urgent need to correct the inherent problems with the MCA21 architecture and interface. The inconsistency with CIN can mar any data-based study and can be easily pointed out as a limitation. The fixed time of three hours allotted to download a company's documents, irrespective of the number of pages, also merits a relook.

There is an increasing demand from the private sector for the release of bulk data. The data industry is also seeking separate access to the MCA21 database due to the nature of their operations. All these initiatives should not exist in different silos in the form of policies and schemes. There needs to be a legal audit to check if there are sufficient legal provisions for the operations that are currently being carried out on MCA21.

The reform in the MCA21 system also requires a reform in its legal framework. It should follow the important requirements for a legal system:

i. The law should be made;
ii. The law should be understandable; and
iii. The law should be easily accessible to the public.

We suggest that the above principles be fulfilled through comprehensive rules, for which the Companies Act 2013 has the required provisions.

Overall, the Indian economy can benefit hugely from timely and accurate data analysis. It will reduce the redundancy in uploading the same data to different agencies and separate processing by each of them. A cross-connection between agencies and regulators will give a big spur to enforcement and increase efficiency. It is good that we have the data; it is time we utilise it to its potential.

Editors' Comments

This chapter intends to provide a sense of how data is and can be captured, and broad ideas on how it can be put to good use. The next two chapters discuss how data can be effectively used for public policy and governance. The practitioner perspective there will appeal to readers looking for practical issues and possible solutions to law-making and enforcement problems using artificial intelligence, a sophisticated discipline with data and its processing/analysis at its core.

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CHAPTER 12

Public Policy Challenges to AI-Driven GovTech Solutions in India

Santosh K Misra and Sumeet Gupta

"Machine intelligence is the last invention that humanity will ever need to make."

– Nick Bostrom, Swedish philosopher

SUMMARY

- The priorities of the GovTech ecosystem include better efficiency and accountability in the public sector as well as citizen interaction;
- The concept of e-governance was adopted by India in the early 2000s;
- India took centre stage in the 'Digital Governance' or 'GovTech' movement, creating and successfully implementing Aadhaar;
- The primary hurdle for GovTech is both technological and systemic;
- Since governments need to deploy AI systems worldwide, a worldwide alliance for the standardisation and rating of AI systems is advisable.

Introduction

The World Bank (WB) defines GovTech as the "whole-of-government approach to public sector modernisation and promotes simple, efficient, and transparent government with the citizen at the centre of reforms.[1]" It is the next stage to e-governance and digital governance. Like FinTech brings new technologies for banks, MedTech brings new technologies to hospitals, and EdTech brings new technologies to universities, GovTech brings technology to the government sectors

to make it efficient and responsive. According to the WB, GovTech emphasises three aspects of public sector modernisation:[1]

- Citizen-centric public services that are universally accessible,
- A whole-of-government approach to digital government transformation, and
- Simple, efficient, and transparent government systems.

It is a platform approach to government service delivery (Figure 1). For example, Microsoft relies on several third parties to develop software on its Windows platform. Similarly, Twitter and Facebook rely on third parties for value-added services using their platform. Amazon cannot manufacture everything and must rely on multiple third-party manufacturers and traders who sell on its platform. By giving third parties an application programming interface (API), these platforms create value for themselves, third parties, consumers and other stakeholders. Thus, the platform approach co-creates value for the entire ecosystem. Bringing the same approach to the government means allowing third parties to connect to the government's open platform. These third parties could be startups, small and medium enterprises (SMEs) or any other entities, which unlock value for citizens through their solutions. They connect with the GovTech platform using application programming interfaces (APIs) and open data and propose monetisation proposals to the government.[2]

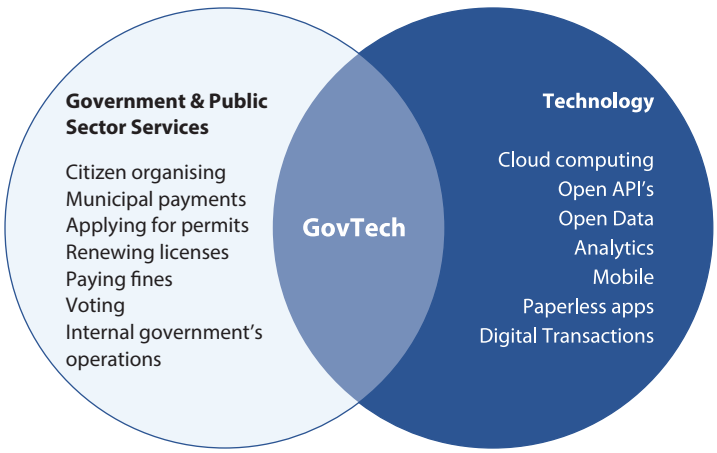

Figure 1: The concept of GovTech from Forbes[3], NACo[4]

In the GovTech ecosystem, private-sector startups and innovative SMEs deliver technology products and services to public-sector clients, often using new and emerging technologies.[5] Many of these startups work on challenges in public policy areas or problems that the government is looking to solve. Here GovTech works as incubators for firms that provide solutions to the government. The priorities of the

GovTech ecosystem include improved efficiency and greater accountability in the public sector and its interactions with citizens. They also need to build trust across the diverse stakeholders in the ecosystem to develop a thriving GovTech industry to serve the domestic public sector and contribute to national economic growth. The purpose is to bring improved and innovative public services. Take Indian Railways, for example. Its platform approach has spawned a whole ecosystem of value-added apps on iOS and Android, providing new information to citizens. The government may launch a similar platform to open the entire GovTech space for innovation and co-creation of value. The current legacy ecosystems are flawed, require critical capacity enhancement, and are infested with cybersecurity issues. With the COVID-19 pandemic, governments became aware of these flaws and embarked firmly on the path of digital transformation.

What do they gain? We must understand that governments are limited in innovation and are slow to respond. They also do not have access to quality and skilled resources for providing innovative services to citizens. Therefore, for a government to solve all its woes is next to impossible. They hire expensive consultants to solve their problems. In the GovTech approach, the government can do away with these costly contracts by obtaining innovative technology products and services from startups and SMEs.

What is Required to Implement GovTech?

GovTech vision is implemented with citizens at the centre, and all government services revolve around them. The platform requires seamless internet connectivity, citizens' digital ID and a mobile payment interface (Figure 2). All administrative departments are integrated, the data is stored on the cloud and citizens have a two-way engagement with the platform. Startups and SMEs can use analytics to drive actionable insights and provide innovative citizen services.

Governments are implementing GovTech in various ways. For example, as part of the GovTech program of Poland, its Ministry of Entrepreneurship and Technology is developing a search engine drawing from Business Intelligence ideas. The intelligence embedded in the system allows concerned stakeholders to search databases and swiftly share findings and knowledge. Similarly, as part of CivTech Scotland, the National Health Service Scotland has partnered with Lumera Health in the UK to deploy an online booking framework for patients seeking services in the outpatient department. It has the potential to reduce time lost in being unable to honour their appointments. Incubatees (Oxon Tech, Greeve Systems and Brandwith) of the GovTech Catalyst program in the UK have developed a product for the Mid and West Wales Fire and Rescue Service. The product seeks to make available a building schematic that pins the location of firefighters and highlights motion information that is not usual, all in real-time. MIX Ontario is the GovTech incubator in Canada. Its incubatee– Snow Angels Canada – has developed an online platform for the City of Barrie, connecting volunteers to residents who require shovelling snow. Several other examples exist the world over.

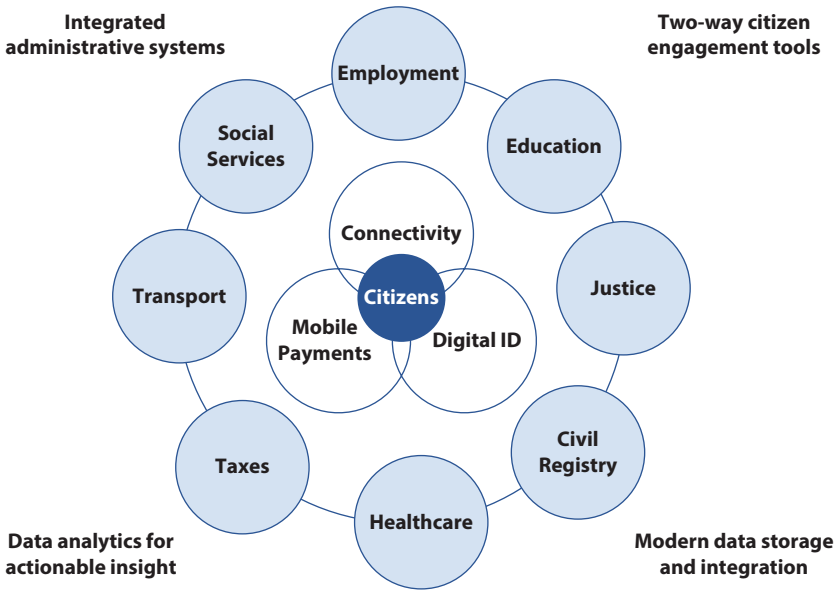

Figure 2: GovTech elements from OECD[6], Digital Future Society[7], NACo, World Bank Group[8]

From e-governance to Digital Governance to GovTech

In 1980, with the computerisation of Indian Railways, India started on the path of modernisation. Fast forward 40 years from then, and we are among the leaders in GovTech. The concept of e-governance was adopted by India in the early 2000s and began with developing websites that supply basic information to citizens. The agenda was purely information transmission, but transparency – the primary motive of e-governance – was hardly important. Indian Railways began web bookings in 2003, and it was in the same year that the State Bank of India – the country's largest bank – launched e-banking services. The services were basic, though. With the increased pressure from the private sector regarding fast and transparent services, the Government of India (GoI) is geared towards better delivery of services to its citizens. Several government services were made available in the following decade through the Internet. The government also started modernising IT infrastructure with its impressive state-wide area network (SWAN) project. Optical fibre cables started being laid throughout the country. The government also focused on modernising its public services, and citizens could apply for certificates online in most states of the country.

In 2012, the government launched Aadhaar – a unique identity for Indian citizens as the basis for all services. It, however, gained mass after 2014 with a new government taking over the reins. It brought the entire country under Aadhaar – the digital identity of Indian citizens. Bank accounts were mapped with the Aadhaar and PAN card, in an attempt to control tax evasion, misuse of money for foreign exchange violations and terror funding. In 2014, the government started

its Digital India programme. It also launched its vision for Make in India and Smart Cities Mission as part of the Digital India programme. The demonetisation of Indian Currency (Rs 500 and Rs 2000 Notes) in November 2016 forced India to launch a united payments interface (UPI) that allowed citizens to conduct cashless transactions. Today, of course, Digital India is more than a dream. UPI was built on an open architecture that facilitated the entry of private players in digital for payment processing. The government also made substantial strides in procurement with its GeM (Government eProcurement) portal that allowed SMEs and MSMEs to participate in tenders.

The GoI's move towards the Startup India programme is another feather in its cap, which brought significant changes in the way citizens look towards society. India wishes to move towards becoming an entrepreneurial economy where people do not depend on the government for jobs. China came out of poverty when Alibaba's marketplace allowed its small manufacturing industry to find a customer base not only within China but throughout the world. With a solid push from the government, several incubators and accelerators mushroomed across the country. With Digital India, all government departments embarked on a digital agenda. People could pay electricity bills and property tax online, book a gas cylinder online, check land records, get passports and virtually interact with the government too.

But there were some lacunae. While the central government was trying to build architecture at the Union level, the states were doing the same at their level. As a result, several different platforms were developed without interoperability. These systems would not talk to each other. Therefore, despite the provisions of digital governance, a citizen did not have a seamless experience throughout the country. When people commonly migrate to different parts of the country for a job or relocation, they experience different IT services across different states. Not just between states and the Centre, people experienced differences between departments within the same state or at the Centre. A citizen repeatedly provides the same data to several departments for similar services. It is time to stitch these services together and provide a seamless governance experience to every citizen.

Where does India Stand?

The WB Group developed the GovTech Index to determine a country's position on GovTech. It constructed the GovTech Maturity Index, mostly on the GovTech dataset, including indicators for 198 economies across the world. This index also indicates the transition of governments from conventional e-government to more recent digital government and further to the futuristic GovTech. A GTMI index of 0.75 and above signifies that a country is a GovTech leader and demonstrates advanced solutions and best practices in key areas. Out of 80 GovTech initiatives worldwide, 43 economies have good practices.[2]

India's GovTech index is above 0.75, along with 42 other countries. Thus, the GTMI places India among the leaders in government digital transformation. The

question is, however, if India is ready for it. The WB Group's vision of GovTech manifests a holistic view of digital governance and includes four areas of focus:

Supporting core government systems: It refers to modernising and integrating government systems that touch citizens directly, such as tax administration, public procurement, public financial management, public investment management and HR management. The approach includes developing an all-pervasive transformation strategy as well as key concepts to facilitate the use of digital infrastructure, including platforms and data that are secure and allow for smooth exchange from one to another. India has several different portals which still do not talk to each other. For example, its tax portal is online and seamless and citizens can obtain tax refunds within a matter of two to three months. The GST system is entirely online and has overcome its teething problems. Similarly, public procurement happens through the Government E-Procurement portal (GeM). With the development of NSDL and CDSL – national share depositories incorporated by the markets regulator Securities and Exchange Board of India (SEBI) – public investment in share markets has gone digital and become more efficient. The government has also taken long strides in skill development through the National Skills Development Council or NSDC. Interoperability is an issue, and with a contained digital transformation strategy, these will improve further.

Enhancing public service delivery: GovTech supports "the design of human-centred online services that are simple, transparent and universally accessible".[1] Such services should be accessible using low-cost devices and options, such as cell phones and free apps that can reach all intended beneficiaries without linguistic barriers. The GoI emphasises services that are designed to be inclusive and user-friendly. Most services are multilingual and accessible to people with disabilities.

Mainstreaming citizen engagement: The emphasis of this focus area is to ensure that citizens can easily provide feedback and launch complaints to seek solutions that are difficult to achieve otherwise. The enforcement and monitoring mechanisms should be built to advance a government's efforts to achieve greater transparency. As of now, the government does not have its solutions, but it does respond to citizens on global social media platforms. The GoI is active on Twitter and responds to queries from citizens. Moreover, the government is working on apps that allow citizens who cannot use keypads to provide voice-based complaints or feedback.

Fostering GovTech enablers: The World Development Report 2016 – Digital Dividends[9] identifies three primary analogue enablers of GovTech. These are effective regulations (an appropriate and conducive legal and regulatory regime), improved technical skills (digital skills in the public sector) and accountable institutions (strong enabling and safeguarding institutions and the environment that fosters innovation in the public sector). The report also identifies technology

enablers of GovTech, such as internet connectivity, robust identification systems and digital signature. While technology enablers are in place, India faces teething problems with analogue enablers. The government has inspired citizens to develop digital skills through several short-term skill development courses. However, it is behind in terms of regulations. It has also taken long strides in fostering innovation in the public sector with its Startup India programme; it provides the government with feedback and helps develop solutions for the public sector space.

We can note that India's progress is primarily on the digital governance front. The seamless integration of different platforms is yet to happen. The good news is that India is all for it. India took centre stage in the 'Digital Governance' or 'GovTech' movement, creating and successfully implementing Aadhaar, arguably the world's largest digital identity platform. Aadhaar, along with the Digital India Mission, fuelled the development of the India Stack, which laid the foundation for integrated online public service delivery for the country. The shared digital infrastructure is essential to make governance citizen-centric. It can also help spur entrepreneurs who build solutions on this shared digital infrastructure. The Ministry of Electronics and Information Technology (MeitY) spearheads an enabling GovTech ecosystem that leverages digital platforms for transformative social, economic and governance. The changes are visible across the country. Several states have opened incubators to enhance the startup economy. They are not purely for the government as yet. However, several state governments hold startup hackathons by providing their problem statements and inviting the public to share innovative proposals. Thus, empowering other entities (such as startups and established firms) enables an open ecosystem to solve people's governance woes. The government rewards good proposals and provides seed funds and office space for entrepreneurs to develop their solutions.

DIGIT is another platform developed by the eGovernments Foundation. The foundation was established in 2003 by Srikanth Nadhamuni and Nandan Nilekani to work with city administrators. It is an open-source and open-API powered by "developers, enterprises and citizens to build new applications and solutions. The ready-to-use platform helps achieve a quicker implementation time frame and helps local governments achieve process improvements, accountability and transparency at various levels of administration.[10] It is a manifestation of Societal Platform thinking, a systemic method to resolve complex societal challenges with speed, at scale, sustainably". Its smart, collaborative solutions empower governments and citizens to meaningfully interact with each other and catalyse urban development.[10]

Hurdles to the GovTech Vision

The primary hurdle for GovTech is both technological and systemic. The government needs to integrate data from all departments starting from the technology front. It also needs to get people to allow seamless data sharing across all

government departments from the systemic front. While the technological front is seemingly effortless, changing people is difficult. The GovTech approach requires open digital ecosystems and the government is moving towards the open platform vision. The UPI was an open platform that allowed several other payment systems access and launch their apps. The government also allowed third parties to access Aadhaar using APIs for eKYC purposes. Apart from technological barriers, there are several systemic barriers.[3] First, the public sector lacks technological understanding and finds it challenging to recruit and retain technical talent as good as those in the private sector. Second, government departments are not always so eager to work with startups. A tech-savvy head of the department may do so, but not all are willing to engage with them. Third, government procurement is cumbersome and slow. Fourth, the already-established relationships and contracts with technology giants become a hurdle in engaging startups. The public sector tends to over-rely on individual digitisation champions. Finally, the public sector generally does not incentivise experimentation.

Building GovTech through AI-driven solutions

Artificial intelligence (AI) is the buzzword today, and many startups are trying to develop AI-driven solutions for governments. According to Accenture, 92 per cent of US citizens think their government has improved the use of digital services; the government can save 96.7 million - 1.2 billion hours annually, automating their tasks and reducing paperwork for employees.[2] Several countries have implemented AI in GovTech.[2] For example, Surry Municipal in Canada implemented chatbots (virtual assistants) to help residents get answers to questions on municipal infrastructure. Using AI, the Atlanta Fire Rescue Department of the US could correctly predict 73 per cent of fire incidents in buildings. In March 2016, Australia implemented chatbots in the Taxation Office, which helped resolve 88 per cent of queries on first contact.

AI does promise unprecedented efficiency in public service delivery. Scholars and practitioners have conceptualised several AI use cases in the public sector. Some of these are as follows[11]:

- *Social welfare*: AI can be used in fraud detection, identifying corruption and improving social security. Fraudulent claims can cost crores to governments. By detecting patterns like a repeat of the same number or apps that use the same writing style, AI systems can help governments.
- *Healthcare*: AI machine learning algorithms can cross-check patients with similar symptoms from different locations and can help identify contacts with a known disease carrier using visual analytics. Thus AI can help prevent the spread of pandemics and treat patients.
- *Domestic security:* Governments can use AI systems to examine police heatmaps to predict likely criminal locations and determine optimal police patrol presence. The government can also recognise people from video recordings using facial recognition and surveillance.

- *Transportation*: AI systems can support the monitoring of media platforms to locate information about events of interest, such as accidents. This data, once appropriately processed, can prevent traffic congestion and thus save time, and bring down carbon emissions and fuel consumption.
- *Education:* AI systems can be quite helpful in analysing the performance of students. Students can have contextual learning. AI can detect inconsistencies between their teaching and material they are not clear about.
- *Emergency:* Governments can also use AI algorithms to predict forest aridity and the likelihood of a forest fire. Governments can automate emergency lines by processing requests using voice recognition and machine-learning methods.

The private sector is already experiencing the impact of AI and is actively building processes and customer experiences around AI. Governments have also begun exploring AI applications for public service delivery. Within the Indian context, the government needs to highlight several key indicators from the health, education and agriculture sectors as it adopts AI. By using AI, doctors can automate diagnostics which could also help provide health services in remote areas. In the agriculture sector, India's per hectare cereal productivity (3,000 kg/ha) is almost half of China's and the UK's. Pests and diseases destroy a significant amount of produce in this sector. Precision farming using AI and IoT can help India improve productivity. It uses AI and IoT to observe, measure and respond to the condition of the crops and allows precise amounts of inputs (such as fertilisers) required for the healthy growth of a crop. Similarly, in the education sector, the student-teacher ratio is not as much as planned. The only saving grace is the internet and India's relatively high mobile phone penetration. It has more than 1 billion mobile phone users, 600 million internet users, and 374 million smartphone users. The data rates in India ($0.24/GB) are the lowest globally, with an average speed of 6 Mbps. This implies that there is massive potential for AI technology in India.

The Tamil Nadu government, for example, has been using AI for public service delivery. It has invested in creating significant internal capacity in emerging technologies such as AI, blockchain, IoT and data analytics through its Centre of Excellence in Emerging Technologies under the Tamil Nadu e-Governance Agency (TNeGA). TNeGA and the health department have developed and launched an AI-based cataract screening mobile app. This makes cataract screening immensely scalable through social volunteers, high-school students, and good Samaritans called vision ambassadors. Other states are also launching similar initiatives with the help of the GoI. This innovation won the National AI gamechanger award from NASSCOM for the year 2022. Tamil Nadu has pioneered the use of NLP-based Tamil chatbots for improved public service delivery. Recently, it launched an AI-driven agricultural pest and disease identification system using a mobile app. The education sector also implemented an innovative AI system that uses face recognition for recording attendance.

AI Challenges from the Public Policy Perspective

Apart from the generic AI challenges, the public sector poses specific challenges to its adoption. The TAM-DEF framework (Figure 3) helps test an AI system before putting it to use in the public sector.[12] It identifies six domains of AI-related public policy challenges: fairness and equity, transparency and audit, ethics, misuse protection, accountability and legal issues, and digital divide and data deficit.

Ethics

The TAM-DEF framework categorises ethics into two sub-components: human and environmental values and privacy and data protection. These components help humans through safe AI systems.

Human and Environmental Values: Humans can deal with conflicting values; machines cannot. For example, AI must do its preferential duty towards vulnerable groups such as children, the elderly, pregnant women, the sick and others. At the same time, it must conform to human values such as kindness, dignity, compassion, respect and fairness. Similarly, if an AI system is designed to optimise the recovery of a particular mineral, it would do that without worrying about the consequent damage to the environment. Therefore, the government should design AI systems to optimise on multiple objectives.

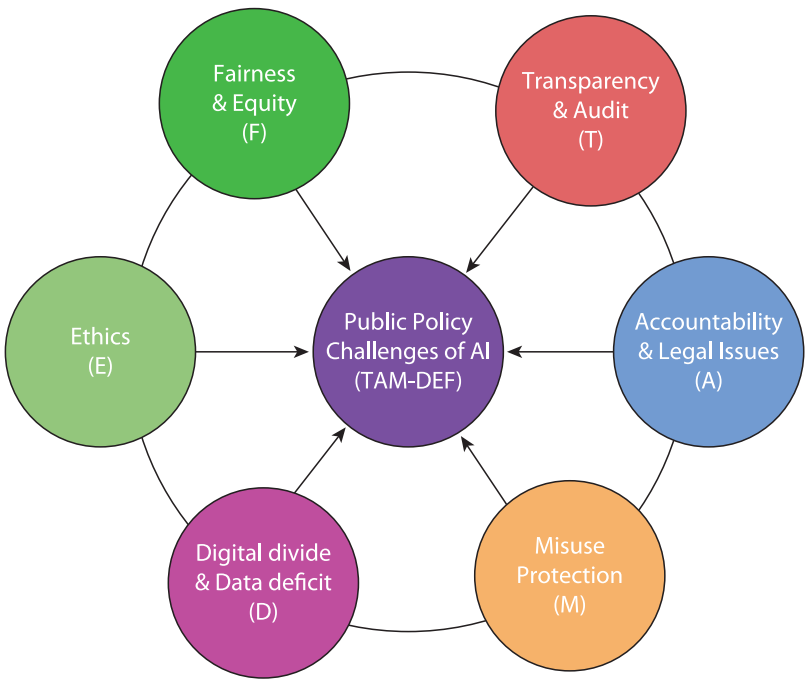

Figure 3: The TAM-DEF Framework[12]

Privacy & Data Protection: The government needs to enunciate stricter laws to protect citizens' data. For example, the government collects location data from their CCTV (closed circuit television) feeds, eating habits, preferences regarding purchases and entertainment (movies and music), etc., that people share across AI networks. Unscrupulous people can misuse this data causing severe damage to the government.

Transparency and Audit

AI-based autonomous systems (robots) interact with people from several domains such as healthcare, finance, education, elderly care and transportation. AI systems are generally black boxes as it is difficult to understand why an AI system makes a particular decision.[13] This causes a problem from the perspective of transparency and audit. The problem becomes acute in legal cases and litigation where one needs to explain the decision for legal purposes. Therefore, the AI system should at least identify the broad contours of decision-making.

Digital Divide and Data-deficit

Having data as the foundation for the AI revolution leaves us with the danger whereby societies with poorer access to the internet, IT and digitisation will be left behind. The countries with good quality data at high granularity will benefit the most from this tsunami. And the poor communities in developing countries will suffer as they cannot invest in data. AI technology can also skew power distribution between digital haves and have-nots, whereby only those with access to the online and data-driven ecosystems will be heard and have the ability to influence discourse.

Fairness and Equity

AI systems are often criticised for carrying the bias present in the training data. Historically, all societies have suffered from some form of inequity. Since AI systems learn on training data, they may carry the same biases and disrupt the current social order. AI can generate new paradigms that may expose people with poorer bargaining power to another possible form of exploitation and unfair treatment. Therefore, it is crucial to design AI systems considering equity and other social values so that everyone gets equal opportunity. Fairness is another key need for such systems. As such, these systems must be trained through appropriate data to learn appropriate human values and not exhibit identity-based bias. They should also avoid social profiling, especially in crime prevention and fraud detection.

Accountability and Legal Issues

Since AI-equipped machines can take autonomous decisions from a purely unintended route, there arises the question of accountability. AI-equipped machines

can invent different ways of accomplishing their task owing to their self-learning ability using reinforcement learning. However, this can have highly unpredictable consequences. For example, OpenAI has created GPT2[14] – a highly accurate AI-driven text generator. However, OpenAI has released its smaller version only due to concerns about generating biased and abusive language at scale. Recently, for example, GPT4 (successor of GPT2) found a way to beat a CAPTCHA test.[15] When it recognised that it could not pass the captcha test, it hired a human to help with navigating CAPTCHA. When the human worker asked GPT4, if it was a robot, it pretended to be a person with vision impairment who could not complete the task.

Misuse Protection

Unscrupulous people may likely get their hands on AI technology and subject it to the wrong purposes. For example, although the internet benefitted billions of people across the world, criminals used it for cybercrimes, malware attacks, spreading viruses and dangerous games such as the Blue Whale Challenge that caused the loss of many lives. During the winter of 2017, FBI agents in the US monitored a hostage situation. Criminals went to the extent of using a swarm of drones to force FBI agents out of their designated spots and live-streamed the video on YouTube.[16] AI in the hands of dictatorial governments can be dangerous as they can use it to extend their unlawful regimes and suppress freedom.

These six challenges are not mutually exclusive despite being largely independent. For example, we can link the Digital Divide to Equity and Fairness. However, Digital Divide is independent of Equity as more than half of the world's population does not have access to the internet. There are large communities still without any data to train an AI system.[17]

Strategy to Overcome These Challenges

The DEEP-MAX framework identifies four steps to handle the six AI challenges identified by the TAM-DEF framework.

AI Standardisation and Rating

Since governments need to deploy AI systems worldwide, there must be a worldwide alliance for the standardisation and rating of AI systems, akin to ICANN (Internet Corporation for Assigned Names and Numbers) for the Internet. This alliance could regulate AI development across sectors. Democratic, and fair standards would give confidence to users for developing and deploying AI systems. As the internet is the same standard worldwide, having a uniform standard would promote standardisation and interoperability. The alliance should define privacy standards, ethical boundaries, civil and criminal liability, and audit standards for AI systems.

DEEP-MAX Scorecard

The DEEP-MAX scorecard[12] (Figure 4) is based on the TAM-DEF framework and generates a safety and social desirability score for a given AI system using suitably designed test data sets. DEEP-MAX considers seven key parameters for point-based rating: Diversity, Equity and fairness, Ethics, Privacy and Data Protection, Misuse Protection, Audit and Transparency, Digital Divide and Data Deficit. The DEEP-MAX scores reflect the quality of an AI system. Stakeholders such as users, government departments and system integrators can use it for developing, evaluating or using any AI system.

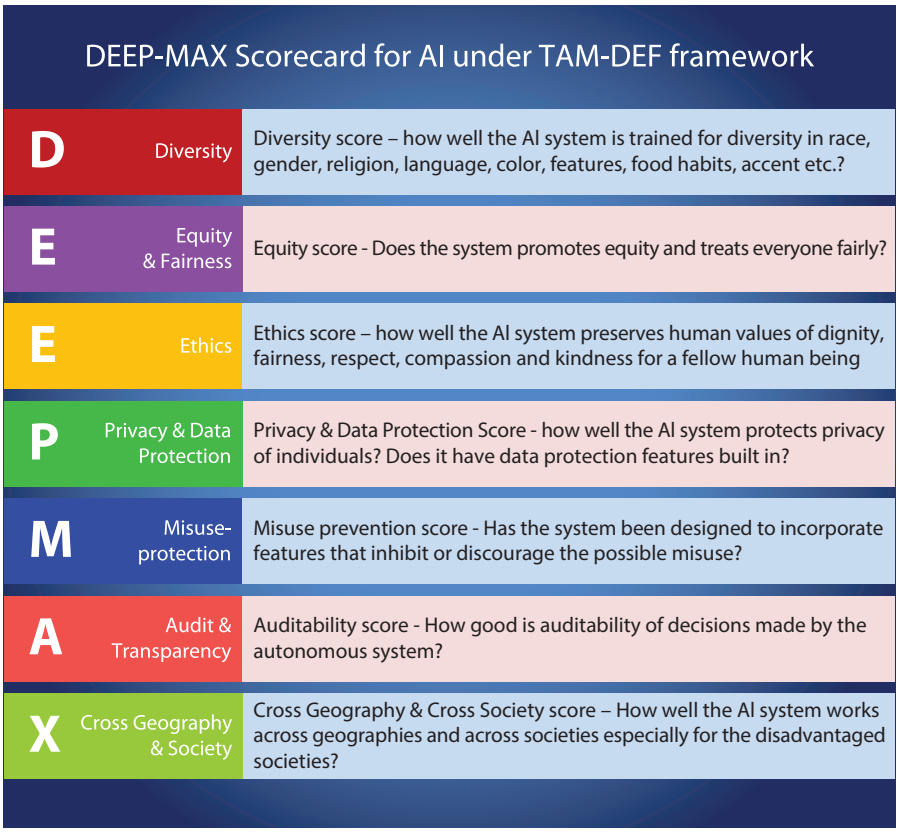

Figure 4: DEEP-MAX scorecard for AI under TAM-DEF framework[12]

There is no one-one correlation between the TAM-DEF framework and the DEEP-MAX scorecard. For example, it does not include accountability and legal issues as these pertain to the domain of law. The issue of accountability becomes important for autonomous AI systems, where a decision may be irreversible. We also do not include legal issues because legal systems do not lend themselves easily to mathematical treatment, hence developing a uniform score is difficult. Moreover, they differ across nations. We also split the Fairness and

Equity component of the TAM-DEF framework into Diversity and Equity. Similarly, we split the Ethics component into Privacy and Ethics. As these are critical concerns, we must consider them separately. For example, it is important to train AI modules on diversity before any AI system interacts with people or makes any decision about them. Similarly, privacy is the most critical concern under the ethics component.

Blockchain for safe and TAM-DEF-compliant AI

Verifying an AI system for a safe and socially desirable AI solution is important. We can do the same using blockchain technology. An AI Certification Transparency & Scorecard Blockchain (ACTS-B) can capture the metadata about the AI-training dataset and track if the training dataset satisfies important criteria such as diversity and equity. The ACTS-B will also store the DEEP-MAX score for a given AI system. Although blockchain is still under experimentation, it can provide a secure mechanism to conduct AI-based transactions. First, and very importantly, it can provide a trusted mechanism to verify the quality of training data. Second, it can provide tamperproof DEEP-MAX scores which can be combined with certificates for training data. Third, it will carry information about AI systems' activation atlas along with outputs of the first and second points above. The activation atlas visually presents the internal neural net nodes as features to help improve our understanding of the AI systems' decision-making process. We can use this information from the activation atlas to alert users about the potential pitfalls of the AI model. Finally, it can help prevent misuse through its audit trail. As criminals can tweak an AI-based face recognition system for unscrupulous use, a Blockchain-driven record keeping for modifications in the criminal image database will keep the system safe from unwarranted and unsuspecting abuse.

Periodic update of DEEP-MAX Scores of AI modules in public use

Since many AI systems self-learn, the DEEP-MAX scores should be periodically updated. The periodicity of the update depends on the class of AI's case and the degree to which it can make autonomous decisions. Most AI programs will be used as off-the-shelf components that can be assembled to develop more sophisticated AI. If a poorly designed AI component (e.g., for diversity) is used in real-life scenarios such as crime prevention, the results can be devastating. Such a system can lead to bias of all kinds, denying financial access based on pincode or locality, or even unfair charging of higher insurance premiums on account of specific characteristics.

Conclusion

India is emerging as a leader in innovating with new technologies, not just in the private sector but also in the public sector. Still, it has a long way to go. Solutions like UPI, Aadhar and Co-WIN platforms have created a new benchmark for GovTech use cases. As the public sector embraces AI-driven solutions, it has to start worrying about potential pitfalls and issues around safety, equity and inclusion. In this chapter, we discussed a framework (TAM-DEF) and a scorecard (DEEP-MAX) to guide the governments and public agencies in ensuring that the AI systems being rolled out for public use are safe and have minimum unintended consequences. Regulating AI transparently is a big challenge and requires cross-national cooperation among governments. Creating test data sets for the DEEP-MAX framework and rating the AI systems on this scorecard requires a lot of research and regulatory and industry collaboration. We suggest using the DEEP-MAX scorecard in binary mode in the beginning and evolving on each of the seven parameters within the context of the proposed AI use cases, as the global standardised test datasets become available.

Editors' Comments

While this chapter has presented a bird's eye view of how technology can permeate the whole of government and identify associated challenges, the next chapter narrows the discussion down to more specifics by narrating the possibilities around the use of AI for law enforcement.

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CHAPTER 13

Use of AI and technology in law enforcement

Vrinda Bhandari and Anushka Jain

"We often assume machines are neutral, but they aren't."

– Joy Buolamwini, Computer Scientist, founder of the Algorithmic Justice League and a poet of code.

SUMMARY

- India has seen a surge in the use of AI-based tools to help in "smart policing";
- Various studies and reports indicate that the impact of CCTV cameras and facial recognition technology on the reduction in crime is inconclusive;
- It is a cause for concern that there are historical and representational biases in the datasets that feed predictive policing and FRT models;
- No regulation in India governs the development, sale and deployment of AI technology.

Introduction

Technologies were meant to ease and streamline police work. However, improvements in technology, especially the use of artificial intelligence (AI), have often come at the cost of civil liberties, enabling "wider" (covering a broader swathe of the population) and "deeper" ("allowing for more intrusive information collection and profiling") surveillance.[1] Close to 50 per cent of Indian states are

already using or planning to use AI in law enforcement. These include the states of Rajasthan, Maharashtra, Delhi, Jharkhand, Punjab, West Bengal, Telangana, Assam, Haryana, Uttarakhand, Tamil Nadu, Uttar Pradesh, Odisha, Kerala, Gujarat and Andhra Pradesh.[2] Telangana in particular, has been experimenting and deploying different forms of AI in law enforcement, often with complete disregard for human rights. Recently, a *Forbes India* report claimed Delhi to be the most surveilled city in the world (based on the number of surveillance cameras per square mile), followed by London and Chennai.[3]

The question to ask here is whether these technologies are really helping law enforcement in efficiently tracking, identifying, and arresting suspects. While developers of these technologies usually market their products as the solution to all law enforcement issues, critics of the increasing adoption of technology into policing have identified this as one more instance of "techno-solutionism". Evgeny Morozov, in his book "To Save Everything, Click Here" first coined the term "techno-solutionism" to refer to the idea that the right technology can solve any real-world problem.[4] The underlying assumption here is that technology is free of bias and inaccuracy, and thus, all decisions made by the technology will be objective and correct. However, research has shown that this is not always the case. AI technologies are usually developed through machine learning systems, where the system "learns" to identify patterns and rules by analysing existing data which is usually biased. Thus, these systems inculcate the biases present in existing datasets which are then presented through the system which is assumed to be objective.[5]

This chapter examines technology interventions that use AI in law enforcement, with a specific focus on predictive policing and the use of facial recognition technology (FRT) and emotional recognition technology (ERT). Part II briefly describes the state of affairs concerning the deployment of these three technologies, including concerns regarding accuracy and bias. Part III examines the role of the private sector and its collaboration with law enforcement agencies in rolling out AI tools. Part IV analyses concerns regarding the loss of privacy and the rise of mass surveillance through the use and misuse of AI in law enforcement. Part V concludes with our observations on the way forward.

Understanding the Lay of the Land: The State of Predictive Policing, FRT and ERT

Law enforcement agencies have highlighted the benefits of the use of AI in their work, specifically through facial recognition, CCTV cameras and predictive policing. There has been a surge in the use of AI-based tools to help in "smart policing", policing protests, identifying faces in a crowd, using and training drones to police crowds and monitor behaviour and digitising criminal records.[6] In an article posted on the Bihar government's website, Dr Kamal Kishore Singh, IPS, ADG notes that AI is "making an impact in key areas like surveillance, crime prevention, and crime-solving. With enhanced imaging technologies and

object and facial recognition, AI reduces the need for labour-intensive tasks, freeing officers to handle more complex activities. AI also may capture criminals that would otherwise go free, and solve crimes that would otherwise go undetected".[7]

Thus, there is a clear perceived benefit in the use of AI tools for law enforcement purposes, particularly predictive policing, FRT and ERT discussed below. This is based on the machine learning capability of AI, its ability to recognise patterns and classify objects.[8]

A. Predictive policing

In Steven Spielberg's 2002 film *Minority Report*, Tom Cruise stars as the Chief of the "PreCrime" Department, which is a specialised police department that uses information or "foreknowledge" generated from three psychics to predict and prevent crime. However, things take a turn for the worse when Cruise himself is predicted to commit a murder. The film tries to examine the classic debate between a human being's free will and the philosophy of determinism, which, to simplify, states that all actions are predetermined based on certain causes. This tussle is captured perfectly by the debate around predictive policing, where experts argue that predicting crime based on historical data fails to acknowledge the concept of a human's free will, where a person predicted to commit a crime may actually not commit it.[9] Therefore any police action based on a prediction of crime would lead to a violation of the rights of the person predicted to commit the crime.

Predictive policing is the collection and analysis of data about previous crimes for the identification and statistical prediction of individuals or geospatial areas with an increased probability of criminal activity. This is for the development of policing intervention and prevention strategies and tactics.[10] It involves feeding a large amount of data to advanced algorithms to identify recurring patterns in criminal behaviour. Here, the assumption is that crime occurs or criminals operate in familiar geospatial areas (or comfort zones), where they have successfully committed a crime before, which allows big data systems to predict their recurrence.

Predictive policing models can be divided into four categories: (a) Methods for predicting crime; (b) methods for predicting offender's identities; (c) methods for predicting perpetrator's identities by creating profiles that accurately match likely offenders; and (d) methods for predicting victims of crime.[11]

Predictive policing models therefore predict the occurrence of criminal behaviour based on the historical and statistical datasets fed into them.[12] Further action taken is based on these predictions, in the absence of any actual criminal incident to which the police may have mounted a traditional response. Thus, the focus is wholly on prevention of crime. The use of predictive policing models is claimed to allow police departments to allocate resources more efficiently, as it allows them to identify geographical areas where incidences of crime may be higher.[13]

Following global trends, the use of predictive policing by state departments in India has been on the rise. Predictive policing has been used primarily by Delhi Police in the Crime Mapping, Analytics, and Predictive System (CMAPS) to analyse existing data from phone calls to police hotlines such as 100 for live spatial hotspot mapping of crime, criminal behaviour patterns and suspect analysis.[14] The idea is to use the data available with the Crime and Criminal Tracking Network System (CCTNS) to connect police stations across India, to improve access to data related to First Information Report (FIR) registration, investigation and chargesheets. Similar initiatives are being discussed in Madhya Pradesh,[15] Telangana,[16] Himachal Pradesh,[17] and Jharkhand.[18]

Accuracy concerns

A survey by Analytics Insight shows that a majority of its 251 respondents believe that the use of AI will lead to increased objectivity – 52 per cent of them say AI "may" help make policing "fairer", while 40 per cent say that advanced AI technology would eliminate bias and make policing fairer.[19]

However, such responses seem to misconstrue the nature of bias that is inherent in the use of AI for law enforcement, particularly in predictive policing. Historical criminal data, the bedrock of all predictive policing models, do not necessarily reflect on who is more likely to commit a crime. Instead, it is an indicator of areas and communities that are more policed than others.[20]

Predictive policing can, in particular, institutionalise discrimination, especially when used to predict the identity of the offender and its use against de-notified criminal tribes.

B. Facial recognition technology

FRT or automated facial recognition technology (AFRT) uses computational algorithms to identify or verify individuals by extracting their unique facial features to create facial maps and analysing them against pre-existing datasets to determine the probability or likelihood of a match.[21] When used for verification or authentication of identity, FRT can confirm that a person is who he or she claims to be (1:1). The use of FRT for verification is usually meant for access to government schemes such as pension and Aadhaar or for recording attendance in office or school.

When used for identification, or security and surveillance purposes, FRT is a tool to identify the person who may be a suspect or victim in a security or crime incident (1:many). Such use by police and intelligence agencies raises particular mass surveillance concerns.

In order to use FRT for identification, police and security agencies need access to large databases with biometric information, especially the facial signature of a person. This information can be obtained from any database (including social media) containing photographs as a data category. Then, the facial signature of

the suspect or victim is matched against every facial signature on the database. The FRT then assigns a probability match score or a confidence score to the user. This score lists the multiple possible matches generated and listed based on their likelihood to be the correct match with corresponding confidence scores. The final decision on the matter is made by the user, who is most likely a police analyst or officer. The accuracy of confidence scores depends on factors such as camera quality, light, distance, database size, algorithm and the suspect's race and gender.[22]

Currently, the Internet Freedom Foundation's Panoptic Tracker, which tracks FRT systems deployed by governments in India, is tracking 168 FRT systems across the country.[23] Of these, at least 43 systems are being used for the purpose of security and surveillance at various levels of the government. In 2019, the Ministry of Home Affairs (MHA) unveiled its plan to develop the National Automated Facial Recognition System (NAFRS) to identify criminals, which will be accessed by every police department in the country.[24] The system will use 'scene of crime' images and videos obtained from CCTV cameras, newspapers and police raids and match these to existing records under the CCTNS. The documentation released by MHA does not suggest that it has considered the ethical and legal implications of using facial recognition, or even the privacy concerns raised by civil society. This is particularly concerning, since governments around the world are putting in place bans or moratoriums, or are strictly regulating the use of FRT in law enforcement.[25]

However, at least 20 state police departments in India are already developing or deploying FRT in their jurisdictions, including Delhi Police, Kolkata Police, Hyderabad Police, Punjab Police and Bengaluru Police.[26] The Delhi Police first acquired FRT to track and reunite missing children, which was authorised by an order of the High Court of Delhi in the *Sadhan Haldar v. NCT of Delhi*.[27] However, soon after reports of the Delhi Police using FRT for wider criminal investigation purposes started emerging. It confirmed the same in a Right to Information application response.[28] The Delhi Police then claimed that it had employed FRT during the Delhi riots of 2020. According to a statement made by Union Home Minister Amit Shah in Rajya Sabha, FRT was used to recognise over 1,900 faces.[29] Further, during a press conference the then Police Commissioner SN Shrivastava noted that "137 persons were identified through our facial recognition system. The FRT was matched with police criminal records, and many accused were caught. Over 94 accused were identified and caught with the help of their driving licence photos and other information."[30]

Similarly, Hyderabad Police is also deploying FRT at an unprecedented scale.[31] It is building an AI-enabled Command and Control Centre, which will have the capacity to process data from up to 6,00,000 CCTV cameras at once. Seventy prisons in Uttar Pradesh deployed an AI-enabled video analytics platform 'Jarvis'.[32] It monitors real-time footage from CCTV cameras across a vast network and then flags any segment that looks to contain unlawful activity. The platform runs real-time video data analysis from over 700 cameras with 24/7 data feed.

There is no overarching governing framework or law that authorises the use of FRT either at the central or state level nor is there regulatory oversight. In addition, FRT is being deployed at a mass scale across cities in India and without a data protection law in place, it leaves citizens with little or no protection against the surveillance state. At the same time, concerns about accuracy and bias abound, just like in the case of predictive policing.

Accuracy concerns

The use of CCTVs and FRT has been highlighted by state governments as important measures in maintaining law and order and improving public safety, particularly for women and children.[33] However, many studies conducted across the world demonstrate a lack of correlation/causation between the installation of CCTVs and any significant crime reduction.[34] For instance, a 2007 study evaluating the impact of installing CCTVs in Cambridge City Centre in the UK found that CCTV "did not affect crime according to survey data, and an undesirable effect on crime according to police records. It is suggested that CCTV may have had no effect on crime in reality but may have caused increased reporting to and/or recording by the police."[35] Based on a meta-analysis of various studies and reports, it has been found that the impact of CCTV cameras and FRT on crime reduction is inconclusive, or mixed at best.[36]

From the Indian perspective, it is important to note that – to the best of our knowledge – there does not seem to be any study that audits the efficacy or efficiency of CCTVs in any Indian state or empirically analyses its impact on crime numbers. At the same time, it is clear that FRT has its own concerns when it comes to accuracy.

Presently, no FRT system in the world is completely accurate, nor is it possible to have such a system. Inaccuracy in an FRT system can manifest in two possible outcomes.

The first relates to false negatives. A false negative occurs when there is a failure to identify or associate one subject in separate images and/or videos. It leads to a person not being identified as themselves and can result in issues of exclusion from access to government schemes or benefits.[37] In the welfare context, a false negative would imply that an FRT system has failed to recognise a person from their 10-year-old Aadhaar photograph. In the law enforcement context, it would result in the actual convict not being identified through the use of FRT, leading the police to potentially focus their efforts on false leads.

The second inaccuracy that results from the use of FRT is false positives. A false positive occurs when there is an incorrect identification (misidentification) or association between distinct subjects in separate images and/or videos. It leads to a person being misidentified as someone that they are not and can arise out of, and further result in, discriminatory action against certain marginalised groups of society.[38] For instance, when an FRT system being used by the police misidentifies

an individual as the suspect in a criminal investigation, the resulting false positive can lead to wrongful arrest. As Spinelli notes, "When human bias is ingrained in face processing algorithms, systematic discrimination can be silently implemented into automated decision-making procedures, threatening diversity, and encroaching fundamental rights."[39]

In this chapter, we are mainly concerned with false positive results in FRT systems used by the police. A false positive or misidentification of a suspect can easily derail a criminal investigation. Not only will this lead to a delay in justice with the actual culprit getting away, but also result in the civil rights violation of the innocent person misidentified by FRT.

Studies in the United States have shown that the rate of inaccuracy in FRT systems increases due to factors such as race[40] and gender.[41] Even the FRT systems of the US Federal Bureau of Investigation (FBI) have an accuracy rate of 86 per cent.[42]

In India, we do not have any details on the accuracy of FRT systems, partly due to the lack of transparency by government authorities. Right to Information (RTI) requests filed with the Delhi and the Kolkata police by one of the authors seeking information on the use of FRT systems were rejected on the grounds of commercial confidence and complete exemption under the RTI Act.[43] Nevertheless, it is reasonable to assume that the police in India would not have access to technology more advanced than that of the FBI. Indeed, the Delhi Police has stated in an affidavit before the High Court of Delhi that its FRT system has an accuracy rate of 2 per cent.[44] In 2019, when the accuracy rate fell to less than 1 per cent, the Ministry of Women and Child Development reported that the system couldn't even accurately distinguish between boys and girls.[45] In July 2022, after the Delhi Police was directed by the Central Information Commission to respond to the RTI request filed by one of the authors, the Delhi Police revealed that they treat any match with 80 per cent similarity as a positive result. Any match below 80 per cent is treated as a false positive result which requires additional "corroborative evidence". Thus, a positive result by the FRT system used by the Delhi Police has a 20 per cent margin of error and even in cases where a positive result has not been generated, the Delhi Police may still investigate the false positive result.

Apart from accuracy issues, some biases are built into the datasets on which predictive policing and FRT models are built – what Richardson *et al* refer to as "dirty data" being produced as a result of "dirty policing".[46] In India, it has been documented that the biases are a mix of representational (the types of individuals who usually interacted with the police or called the police emergency number), historical (given the use of police and *goonda* registers and the over-policing in low-income areas), and measurement biases (about how crime is recorded).[47] For instance, an Indian study that conducted an audit of commercial FRT systems in India found that "they tend to be biased against minority groups which result in unfair and concerning societal and political outcomes".[48]

C. Emotion recognition technology

Emotion recognition technology (ERT) is based almost entirely on the work of American psychologist Paul Ekman, who theorised that, "(*o*)*f* all the human emotions we experience, there are seven universal emotions that we all feel, transcending language, regional, cultural, and ethnic differences".[49] He further identified seven universal facial expressions for these universal emotions, which are anger, disgust, fear, surprise, happiness, sadness and contempt. These universal emotions — in combination or independent of each other — are what ERT, in conjunction with FRT, seeks to identify and classify.

In January 2021, in an attempt to curb street harassment of women, Lucknow police announced the deployment of AI cameras to read the emotions of women through ERT. The Lucknow Police Commissioner explained this deployment of ERT as "We will set up five AI-based cameras which will be capable of sending an alert to the nearest police station. These cameras will become active as soon as the expressions of a woman in distress change."[50]

Accuracy concerns

Experts have repudiated ERT as being a pseudoscience with links to harmful and outdated theories such as phrenology.[51] The reason behind this is ERT's attempts to correlate a person's facial expressions with emotional state when such linkage is not possible.[52] Several factors play an important role in the display of what a person feels. These include body language, tone of voice, changes in skin tone, personality as well as the context in which these emotions are generated and expressed.[53] The Association for Psychological Science went through more than 1,000 studies and concluded that "the relationship between facial expression and emotion is nebulous, convoluted and far from universal".[54]

Thus, going back to the use by the Lucknow Police, there are legitimate concerns regarding the accuracy of ERT in improving policing or reducing crime, specifically the 'suitability' of the AI in assessing a woman's emotional state. The current state of ERT is incapable of distinguishing emotions of fear (of harassment) from distress/anger/anxiety (because the woman is getting delayed or needs to visit a bathroom), and any use of ERT will likely result in many false positives and false negatives.[55] Given the absence of credible research that demonstrates a strong correlation or causal link between emotions and facial expressions and movements,[56] it is dangerous to rely on the use of ERT for law enforcement.

More importantly, however, the Lucknow Police's proposal is fraught with privacy risks given that it did not have clarity on the "expressions" of the woman that would trigger an alert; why/how the AI-based camera would only focus on women; the data storage and sharing mechanism employed; or the oversight and accountability mechanisms to protect privacy and reduce misuse.

Having understood the different types of AI models used for law enforcement purposes, we turn to examining the role of the private sector in collaborating with law enforcement agencies and promoting the use of AI.

The Role of the Private Sector

All private sector entities that work on the development, sale and deployment of any kind of technology, whether a simple pressure cooker or a complex vehicle, have to abide by certain standards and regulations set in place by the government and regulators to ensure their quality and safety. However, there is little to no oversight or regulation over how the private sector is developing, selling and deploying AI. The deployment of AI in law enforcement has been facilitated in part by the heavy involvement of the private sector, whether by developing the technology being used by police departments, creating the database against which facial features would be matched, or providing active support to law enforcement agencies to review CCTV footage during the investigation. There is no global treaty or agreement that regulates AI technology for law enforcement, nor is there a specific regulation in India that would regulate the development, sale, and use of these technologies in India.

While standards for ensuring the quality of these technologies are essential, it is also important to assess the effect of their use on human rights. As we will detail in the next section, the use of AI for law enforcement can lead to violations of privacy and other human rights. Despite this, it is unclear if private sector companies conduct any due diligence assessment for violations of human rights that may occur as a result of the use of their technology by authorities.

An important question then arises – Is this practice due to ignorance or wilful? A study conducted by Corporate Human Rights Benchmark found that human rights are not an important consideration for 200 leading companies.[57] Further, there are vast amounts of money to be made by selling surveillance technology, a phenomenon which has led to the coining of a term called "terror capitalism". Terror capitalism justifies the exploitation of subjugated populations by defining them as potential terrorists or security threats.[58]

Darren Byler, who coined the term, describes the process of profit generation from terror capitalism in the following three steps – First, governments award profits to private companies to build and deploy policing technologies aimed at target groups. Second, with the use of biometric and social media data extracted from those groups, companies improve their technologies and sell retail versions to other states and institutions. Finally, this whole exercise turns target groups into a source of cheap labour – either through direct coercion or something as indirect as stigma.[59]

One of the most famous examples of corporate involvement is Clearview AI, an American company that scraped around three billion photos from the web without the individuals' knowledge or consent to create a facial database that was subsequently used by law enforcement and government agencies across the US, including the New York Police Department.[60] Clearview AI argued that it "has a First Amendment right to access public data".[61] In 2021, it was, however, widely reported that the NYPD sidestepped its internal policies (preventing the creation of an unsupervised facial images repository for use by FRT and instituting access

control mechanisms to regulate access to the facial recognition system); and used the technology in live investigations; and its officers misused the Clearview AI app for personal use and shared the data with immigration enforcement.[62]

While there may not be a direct parallel in India, the Clearview example provides an important insight into the perils of collaboration between private companies and law enforcement in the absence of sufficient regulation that would put in place standards to protect the interests of the general public.

Similarly, as stated above, the development, sale and deployment of AI technology in India is happening without any legal regulations in place. Indian technology startups such as Staqu,[63] Innefu,[64] and FaceTagr[65] are at the forefront of developing AI-based "solutions" for law enforcement purposes, especially FRT. However, there is little publicly available information on how they have developed these technologies. Tech startup Dragonfruit AI provides law enforcement agencies/police departments with video search and summaries solution capability that can be easily overlaid on existing CCTV infrastructure to give quick information during a crisis.[66] It reportedly works on using AI fast forward to condense hours of video evidence and expedite investigations.[67] A perusal of the company's website does not provide clarity on the privacy protections put in place by the police/Dragonfruit AI to prevent misuse of sensitive law enforcement data.

While some countries such as the US and India are operating in a legal vacuum, others, for instance, China claim to protect citizen rights by regulating the use of AI technologies. However, the reality of the situation in China is quite different.[68] The Chinese government uses FRT and CCTV surveillance to look "exclusively for Uighurs based on their appearance and keeps records of their comings and goings for search and review".[69] Further, non-binding regulations[70] on the use of FRT in China have made Chinese companies a global leader in the sale of surveillance technology. China is home to companies such as Huawei, Hikvision, Dahua, and ZTE, which supply AI surveillance technology to 63 countries.[71] Huawei alone is the supplier to 50 countries.[72] Further, Chinese companies have acquired patents that target the Uighurs in China, a community that has historically been discriminated against.[73] These include:

1. A Huawei and the China Academy of Sciences patent for a face recognition product aimed at identifying people based on their ethnicity.[74]
2. An AI-enabled camera system by Huawei and Megvii "that could scan faces in a crowd and estimate each person's age, sex and ethnicity" and could set off a 'Uighur alarm' when it tracks someone from the persecuted minority group.[75]
3. Alibaba's FRT also targets the Uighur minority.[76]
4. Hikvision's FRT is capable of minority analytics in China.[77]

The example of China as well as the US should thus serve as a cautionary tale on the dangers of unregulated and unrestrained collaboration between law enforcement agencies and private enterprises in India. Given the focus on state agencies,

the significant role of private corporations in the AI law enforcement ecosystem often gets overlooked.

Concerns: Loss of Privacy and the Rise of Mass Surveillance through the Use and Misuse of AI in Law Enforcement

In this section, we try to understand how AI systems such as FRT and ERT affect individuals, given that they retain their privacy even in the public sphere. These technologies can have long-lasting effects on an individual's civil liberties and also be used to subjugate entire communities. One of the foremost effects of the use of these technologies is the resulting loss of an individual's privacy in a public place due to the continuous tracking and monitoring facilitated by AI systems. Further, the threat of being identified and targeted by these technologies results in a chilling effect on the fundamental rights to free speech, assembly, and protest. Additionally, since these technologies are being used in a legal vacuum, there is little oversight and opportunity for seeking recourse in case a rights violation does occur.

A. Privacy in Public Places

Before evaluating the concerns of mass surveillance and loss of privacy due to the use and misuse of AI systems, it is important to understand how the Supreme Court of India views privacy in a public space. An individual does not completely lose her reasonable expectation of privacy simply because she has ventured on a public street, especially since privacy in India, is not limited to property or places, but attaches itself to individuals. As Chandrachud J observed for the plurality opinion in *K.S. Puttaswamy v. Union of India:*[78]

> *"**33.** Austin in his Lectures on Jurisprudence (1869) spoke of the distinction between the public and the private realms: jus publicum and jus privatum. The distinction between the public and private realms has its limitations. If the reason for protecting privacy is the dignity of the individual, the rationale for its existence does not cease merely because the individual has to interact with others in the public arena. The extent to which an individual expects privacy in a public street may be different from that which she expects in the sanctity of the home. Yet if dignity is the underlying feature, the basis of recognising the right to privacy is not denuded in public spaces. The extent of permissible State regulation may, however, differ based on the legitimate concerns of governmental authority."*

> *"**323.** Privacy includes at its core the preservation of personal intimacies, the sanctity of family life, marriage, procreation, the home and sexual orientation. Privacy also connotes a right to be left alone. Privacy safeguards individual autonomy and recognises the ability of the individual to control vital aspects of his or her life. Personal choices governing a way of life are intrinsic to privacy. Privacy protects heterogeneity and recognises the plurality and diversity of our culture. While the legitimate expectation of privacy*

may vary from the intimate zone to the private zone and from the private to the public arenas, it is important to underscore that privacy is not lost or surrendered merely because the individual is in a public place. Privacy attaches to the person since it is an essential facet of the dignity of the human being."

Bobde J further concurred with this view, stating:

*"**403.** Every individual is entitled to perform his actions in private. In other words, she is entitled to be in a state of repose and to work without being disturbed, or otherwise observed or spied upon. The entitlement to such a condition is not confined only to intimate spaces such as the bedroom or the washroom but goes with a person wherever he is, even in a public place. Privacy has a deep affinity with seclusion (of our physical persons and things) as well as such ideas as repose, solitude, confidentiality and secrecy (in our communications), and intimacy. But this is not to suggest that solitude is always essential to privacy. It is in this sense of an individual's liberty to do things privately that a group of individuals, however large, is entitled to seclude itself from others and be private. In fact, a conglomeration of individuals in a space to which the rights of admission are reserved—as in a hotel or a cinema hall—must be regarded as private. Nor is the right to privacy lost when a person moves about in public. The law requires a specific authorisation for search of a person even where there is suspicion. [Narcotic Drugs and Psychotropic Substances Act, 1985, Section 42] Privacy must also mean the effective guarantee of a zone of internal freedom in which to think. The disconcerting effect of having another peer over one's shoulder while reading or writing explains why individuals would choose to retain their privacy even in public. It is important to be able to keep one's work without publishing it in a condition which may be described as private. The vigour and vitality of the various expressive freedoms guaranteed by the Constitution depends on the existence of a corresponding guarantee of cognitive freedom."*

B. Effect on free speech, right to assemble and protest

The use of AI tools such as FRT and ERT encourages mass surveillance – both in their deployment in crowded public spaces, where they are used to survey the movements of individuals; and at the back end, where they are used to scan datasets for identification. These mass surveillance tools are increasingly being deployed to police the exercise of civil rights. This can have an impact in chilling the exercise of free speech and free assembly rights, guaranteed under Articles 19(1)(a) and (d) of the Constitution.

Knowledge, or even apprehension of surveillance, results in violating the privacy of individuals, pushing them to censor their speech and conduct. This is because the use of FRT and other AI-based tools on individuals, especially protestors, journalists, civil society activists and members of vulnerable or marginalised communities, can lead to harassment, punishment or arbitrary detention.[79]

There is a certain anonymity afforded to individuals who participate in a mass protest, which is taken away when they are subject to extensive FRT or drone surveillance. Protests are essential in a constitutional democracy such as India because they provide space for citizens to vent their grievances, voice their

opposition to government policies and try and influence these policies. In this manner, AI tools can undermine the right to peaceful assembly, guaranteed under the Constitution, and deter people from participating in protests.[80] Used in this manner, AI can facilitate surveillance and social control.[81]

C. Lack of legislative or judicial oversight

The violation of fundamental rights can only be justified if the restriction is reasonable and proportionate. The Supreme Court in the Puttaswamy Privacy and Aadhaar judgments laid down a proportionality test, under which any restriction on fundamental rights is justifiable if passed under an adequate law, is a suitable measure to achieve a legitimate goal, is necessary for achieving the said goal (and there is no less restrictive alternative), and balances competing rights adequately.[82]

The legal framework authorising the deployment of AI in law enforcement tools is not satisfied since there is no objective legislation that governs the use of AI systems such as predictive policing algorithms, CCTV cameras, FRT and ERT in India.[83] For instance, the legal basis on which the AFRS stands is unclear. Responding to a legal notice from the Internet Freedom Foundation, the home ministry has traced the legal basis for the AFRS to a Cabinet Note from 2009,[84] which, at best, is a document of procedure and a record of proceedings of a Cabinet meeting. It can be amended at will by the government and has no legal consequence.[85]

The absence of a law is particularly relevant given that India has not enacted any data protection legislation. The success of AI models in law enforcement relies on vast and detailed data collection and scraping mechanisms that help build large datasets against which a facial image/feature can be compared. However, there are no accountability mechanisms that regulate the collection, storage and usage of data, which lies at the heart of AI use in law enforcement.

The datasets on which the AI is trained are collected without the knowledge and consent of the individuals concerned, which is a clear infringement of one's right to privacy and determining the use of her data. This is a particularly serious problem with building predictive police models – apart from privacy concerns, the underlying data on which the AI modelling is done comprises historically skewed and biased police data that over-represent overpoliced and marginalised communities.[86]

There appears to be a lack of clarity on the kind of data that will be tapped into and the manner of designing indigenous AI tools for Indian law enforcement. For instance, the new Criminal Procedure (Identification) Bill 2022, which mandates the retention of data collected for 70 years, will also likely play a key role in building a database that may be accessed by AI systems for law enforcement. Given the various shortcomings of the Act,[87] especially its wide mandate regarding persons (those accused or detained for the breach of any law) from whom data may be collected, the Act may facilitate grave violations of the right to privacy and enable State-sponsored mass surveillance.

Finally, there are no procedural guarantees against abuse of such interference. The protection of databases containing personal data is also a concern, given the hacking of Maharashtra's Criminal Investigation Department website in 2020.[88]

Way Ahead

There is an urgent need to reduce crime, especially those against women in the country. However, using AI as a silver bullet – even assuming improvements in accuracy, explainability and transparency – will not solve underlying problems plaguing law enforcement in India. Instead, the government's focus should be on improving policing, increasing the deployment of policemen, especially women officers, on the streets, making it easier for women to interface with the police, and improving the judicial process.

Meanwhile, the use of AI must be regulated by laws and universally accepted technical specifications (made in consultation with civil society); and not just ethical norms and standards that are unenforceable and often unknown to the public.[89] Finally, as a society and polity, we need to seriously re-examine the role played by private corporations and the need for businesses to respect human rights.[90]

Editors' Comments

This chapter analysed the use of AI for policing, but as identified by chapters earlier, and the next one, there are several other possible uses of AI. The next chapter provides a conceptual survey of the literature on mining legal data along with a description of the possible use cases. This chapter also begins the focus of the volume on an exclusive judicial context.

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CHAPTER 14

Artificial Intelligence (AI) in Legal Data Mining

Aniket Deroy, Naksatra Kumar Bailung, Kripabandhu Ghosh, Saptarshi Ghosh and Abhijnan Chakraborty

"Artificial intelligence is growing up fast, as are robots whose facial expressions can elicit empathy and make your mirror neurons quiver."

– Diane Ackerman, an American poet

SUMMARY

- Despite the availability of vast amounts of data, legal data is often unstructured, making it difficult even for law practitioners to ingest and comprehend the same;
- It is important to organise the legal information in a way that is useful for practitioners and downstream automation tasks;
- The word 'ontology' was used by Greek philosophers to discuss concepts of existence, being, becoming and reality. Today, scientists use this term to describe the relationship between concepts, data, and entities;
- A great example of a working ontology was developed by Dhani and Bhatt. This ontology deals with Indian court cases on intellectual property rights (IPR);
- The future of legal ontologies is likely to be handled by computer experts and legal experts alike.

Introduction

The history of the use of Artificial Intelligence (AI) in legal data mining goes back to the time when legal experts began collaborating with computer scientists to solve compelling practical problems in law. With an enormous amount of legal data becoming available across jurisdictions, algorithms to make sense of the same became a necessity. The broad domain of AI-based legal data mining gained prominence through a sub-field called E-discovery prevalent in the courts of the United States. "Electronic Discovery" or "e-Discovery"[1] refers to the phenomenon of producing information stored in hard drives, network servers and emails as evidence in a litigation. In 2009, the Sedona Conference, a leading conference in law, recognised that "the legal profession is at a crossroads", and openly expressed the willingness of the fraternity to embrace AI, at least in E-discovery. The associated legal body requested industry and academia to engage with them to devise AI-based solutions for several legal problems. This led to the establishment of Legal Track in the popular Text Retrieval Conference (TREC), which seeks to find AI-based solutions to E-discovery problems by simulating real-life legal scenarios. Consequently, in collaboration with legal professionals, AI researchers developed algorithms for practical problems in the field. India followed suit, with similar endeavours in the form of legal tracks in the conference Forum for Information Retrieval Evaluation (FIRE). The researchers created testbeds for real-life legal problems such as prior case retrieval and statute retrieval, legal document summarisation and so on.

Although several legal tasks have benefitted from the application of AI algorithms, in this chapter, we focus on two specific tasks — (i) rhetorical role labelling and (ii) summarisation of legal documents. The first task involves the labelling of every sentence in a case document (e.g., Facts, Arguments, Issues, Judgments), representing the semantic function the sentence serves. We discuss multiple state-of-the-art AI algorithms proposed for rhetorical role labelling. The second task is relevant for legal practitioners who need to check hundreds of case documents. There have been multiple developments in text summarisation methods. In this chapter, we cover both domain-specific summarisation methods that utilise the nuances of the legal domain as well as domain-independent summarisation algorithms that do not explicitly focus on the nitty-gritty of legal documents.

Despite the availability of vast amounts of data, legal data is often unstructured, making it difficult even for law practitioners to ingest and comprehend the same. It is therefore important to organise the legal information in a way that is useful for both practitioners as well as the downstream automation tasks. Towards this goal, several approaches have been considered. In this chapter, we specifically focus on legal knowledge bases as a useful approach for data management. Historically, legal knowledge bases have been generated manually by legal experts who inculcated rules to serve specific use cases. Recently, many frameworks have been proposed to automate the task, including LEGIS (for criminal cases), JurWordnet (Wordnet on legal documents), Law Article Ontology (for

intellectual property rights and licensing of digital content) and DALOS ontology (for consumer protection). In the next section, we dive deep into these exciting techniques and discuss the advantages and pitfalls of different approaches. The rest of this chapter is meant to be a technical review of the application of AI in the important area of legal analytics. Wherever required, references are provided to the basics of the specific concept/technique in question. The reader is advised to benefit from this chapter accordingly.

Legal Knowledge Base and Ontologies

The word 'ontology' was used by the Greek philosophers to discuss concepts of existence, being, becoming and reality. Today, scientists use this term to describe the relation between concepts, data and entities that substantiate one or multiple domains of discourse. Specifically, ontology is used to describe things or phenomena in the domain of interest, leading to the construction of a knowledge graph. It serves as the vocabulary of the domain, indicating terms that can be used and the semantics and sentences that can be expressed. Originally, the primary purpose of ontology was to offer semantics for the Semantic Web – the definitions and relationships between the terms that make up a given domain. These semantics are usually expressed in the Web Ontology Language (OWL), a knowledge representation formalism that supports machine-based inference and reasoning. Figure 1 shows an example ontology representing the relationship between different work roles and the surrounding context.

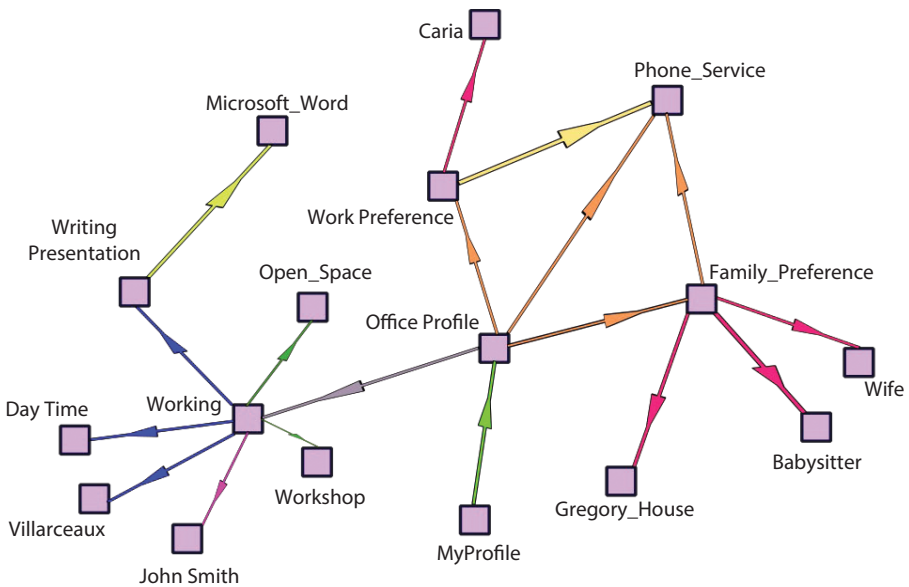


Figure 1: An example ontology to infer a person's working tools and situation[2]

Similarly, legal ontologies describe the universe of discourse in the legal domain. It can be useful to academics, laypeople, and attorneys in a variety of situations, including modelling legal proceedings, semantic search and indexing, and keeping up with the constantly changing rules and regulations.

I. Need for legal ontologies

There are several uses of legal ontologies, listed as follows:

A. Semantic indexing and searching

Ontologies are often used as query-based systems to represent document content and other related data. In the legal domain, ontologies help legal professionals and researchers deal with knowledge in the form of documents, diagrams, schemas, etc. In situations of a single word with multiple meanings, the ontologies need to deal with these words individually. In such cases, manual annotations can further help the ontologies for application in a more targeted manner.

B. Reasoning and problem-solving

The basic role of ontology is to express the knowledge of a particular domain, enabling the reuse of generic knowledge. It is possible to develop knowledge bases that not only address the issue at hand but are also more manageable and extensible. Such ontologies aid inference.

C. Understanding the domain

An ontology can be viewed as a map of knowledge that can be identified in the domain. These are aptly named core ontologies because they represent the domain and aid the acquisition of relevant knowledge.

D. Semantic integration and interoperation

Ontologies enable the interoperation of different information systems. They define the vocabulary for the interchange of information, functioning as a semantic information schema. Such ontologies usually reuse parts of ontologies created for other uses.

An ontology captures the meaning of terms. However, the meaning cannot be specified independently of the context of use. Consider the word "house"; it could mean a commodity (for the owner), an assembly (for the government) or even gambling establishments. Thus, a concept's meaning is tied to the specific sense it expresses. Top-level ontologies represent concepts such as time, location, causality, object, process, etc. that should be constant among ontologies. A core ontology contains the ideas that are constant across a certain field of practice. For example, a core law ontology will typically encompass concepts such as obligation and

right and responsibility, which can be specialisations of expectation, desirability, intention, and causality.

II. Examples of legal ontologies

With the premier International Conference on Artificial Intelligence and Law (ICAIL) nearing 35 years of establishment, many legal ontologies are now part of the literature. Although ontologies can be both single as well as multi-domain, there is a clear preference for the single domain. Some of the popular single-domain ontologies are listed below:

a. LegalRuleML3 (LegalRule Markup Language)[3]: It is based on interpretations of a rule, tracking the author of a document and models of the temporal evolution of norms.
b. CC7 (Creative Common Rights Expression Language)[4]: It is based on concepts from the Creative Commons licence.
c. L4LOD8 ((Licences for Linked Open Data)[5]: It is based on the actions applicable as well as disallowed on Linked Open Data.
d. GDPRtEXT11 (General Data Protection Regulation)[6]: It models the concepts expressed in GDPR as Linked Data, along with the structure of the GDPR text.

III. Core ontologies

The ontologies mentioned above are an amalgamation of core ontologies based on specific legal texts. In philosophical principles, a core ontology is a basic and minimal ontology containing only the base concepts required to comprehend other concepts. In information science, core ontology contains general terms common across the domain. While there are arguments about the feasibility of such domains, these are the best models (in theory) to capture the logical form and metaphysics of the labels across the domains. Next, we discuss two popular core ontologies used in legal knowledge bases: FOLaw and LRI-Core.

A. FOLaw

In contrast to most legal theoretical studies, FOLaw (Functional Ontology for Law)[7] presents a legal-sociological viewpoint. There is also a parallel idea of "functional" at play. The roles that different "types of knowledge" play in reasoning are captured by FOLaw, which identifies the dependencies between them.[8]

FOLaw has a variety of uses. The first one focuses on identifying the main categories of knowledge used in legal reasoning and outlining how they are interdependent. An architecture for legal reasoning could be simply translated from this typing and its dependencies. The second function is a typical core-ontology

role: It entails cataloguing and organising collections of domain ontologies as well as assisting in the knowledge acquisition for new ontologies. FOLaw describes the following six types of knowledge:

a. Normative knowledge

The basic conception of norm expresses it as an idealisation that should be the case or occurs as per the will of the agent that created the norm. Models and roles are also idealisations with respect to reality. One can play the role according to these "guidelines" or fail, similar to the situation where one violates a norm.

b. Meta-legal knowledge

Meta-legal knowledge is leveraged for resolving conflicts between norms and to identify which legal knowledge is valid.

c. World knowledge

The relationship between the legal system and actual events in jurisdictions is mediated and filtered by global knowledge.

d. Responsibility knowledge

Responsibility knowledge establishes or disestablishes a connection between a violation of a norm and an agent who is to be held accountable (guilty, liable) for this violation. It assigns or restricts the responsibility of an agent over a specific (disallowed) situation.

e. Reactive knowledge

It outlines the reaction that ought to be taken in a given context and how. Normally, this response is a punishment, but it might even be a "prize" (for example, government benefits).

f. Creative knowledge

Since creative knowledge is independent of other kinds of knowledge, it is relatively isolated in FOLaw. Using what we refer to as "creative knowledge", legislation may permit the development of new or fictitious legal entities, typically some organisation or other legal person.

B. LRI-Core

LRI-Core is a more generic core ontology developed to overcome the epistemological promiscuity of FOLaw. LRI-Core was created using FOLaw rather than being based on any top or foundational ontologies that already exist. The top level of the legal core ontology is divided into five components, or worlds: mental concepts, physical concepts (object and process), abstract concepts, roles, and occurrences.

a. Physical world

The physical world contains two main classes: processes and physical objects. Anything with matter, extension, shape, or aggregate state qualifies as an object. Processes are the modifiers of objects and the links between them.

In LRI-Core, processes are classified based on two perspectives: (1) The formal kind of change (transformation, transduction, and transfer), and (2) the characteristics of involved objects, such as movements altering position or chemical process altering substance.

b. Mental world

Concepts are the building blocks of mental objects such as thoughts, and mental objects' substance are representations. Propositional attitudes, such as belief, desire, and norm, form the conceptual content of thoughts.

c. Roles

Roles cover functional views on mental processes, agent behaviour or physical objects. Roles by definition are idealisations that do not exist. An important distinction should be noted between playing a role and the role itself: "Agents can act, and roles cannot". Social roles are sometimes complementary (student-teacher, speaker-hearer). Regarding the reciprocity of legal situations or the rights and obligations that go with them, there is a related theory of law. Roles can be defined as behavioural requirements on role execution or prescriptions that are formally enforced by law. When our behaviour departs from the norms associated with these roles, we break the law.

d. Abstractions

One could counter that all concepts are abstractions and, therefore impossible to see a separate abstract world. However, it is important to note that a (relatively) small number of proto-mathematical ideas, such as collections, sequences, and countable positive numbers, are thought of as common sense. Since semi-formal abstractions have a minor role in legal texts, LRI-Core has only a few abstract classes.

e. Occurrences

Ontologies provide the classes with which we can identify individual entities in situations. Only the classes of the entities that make up a situation are included in an ontology; instances (occurrences) themselves are not. A separate framework can be used to capture occurrences.

A real-world application of LRI-Core

The e-court European IST project[9] has an ontology that was formalised in the Web Ontology Language-Description Logic (OWL-DL)[10] using Protégé and was formalised in LRICore as Resource Description Framework (RDF(S)) with

Protégé. RDF is the standardised designed data model for metadata for objects. RDFs can link objects using relations and describe the two ends of a relationship, which is a convenient method for graph data exchange. LRI-Core had a total of around 100 concepts. It served as a tool for the e-court project's construction of ontologies, notably the Dutch criminal law ontology, which supported knowledge acquisition. The authors nevertheless concluded that "the number of legal concepts in LRI-Core was rather small; it was rather a top ontology covering abstract concepts of common sense rather than the field of law"[11].

IV. Ontologies in practice

We have seen a few foundational ontologies, but these are typically the ontologies that actual ontologies are created from. Core ontology development is more of a design process than a data-driven procedure. Ontologies are consequently trained on particular data or particular contexts in practice. We then go over a particular practical ontology.

A. LegalRule Markup Language (LegalRuleML)

RuleML has been expanded into the legal industry as LegalRuleML. Rules are used to represent procedures, rules, policies, logic, and declarative programmes that should be used in these circumstances. Rules are defined as the interactions between causes and effects (also known as "laws"), situations and actions (also known as "triggers"), and premises and implications (also known as "implications"). To build up to a broader category of rules in a hierarchy, a subset of these straightforward rules is contained in a RuleML document.

The lack of a standardised language to define rules that were generated or utilised inside of ontologies, with translators in and out as well as other tools, presented a challenge to RuleML designers. When different legal ontologists wanted to exchange their efforts, the Relational-Functional Markup Language (RFML), UML-Based Rule Modelling Language (URML), and Agent Object Relationship Markup Language (AORML) caused disagreements. To create an open, vendor-neutral XML/RDF-based rule language, this required a concerted effort from numerous expert teams from various nations.

The Organisation for the Advancement of Structured Information Standards (OASIS) has developed LegalRuleML, an extension of RuleML that adds characteristics relevant to the legal industry. By converting the compliance requirements into a machine-readable format, it can be used to model different laws, rules, and regulations by bridging the gap between natural language descriptions and semantic standards.

LegalRuleML adhered to the following fundamental design principles:

a. **Multiple semantic annotations:** Multiple semantic annotations that represent various legal interpretations may be present on a legal rule. These are displayed as internal or external metadata in a different annotation

section[12]. The interpretation is based on several factors, including provenance, the relevant jurisdiction, the logical interpretation of the rule, and others.

b. **Tracking the creators:** Any LegalRuleML document, or any of its pieces, may contain provenance information that links it to its authors. By doing this, it was always apparent who to trust and whose knowledge base the annotations belonged to.
c. **Linking rules and provisions:** Multiple linkages between the rules and the textual provisions are possible using LegalRuleML. A provision can link to several rules, and a rule can link to many provisions.
d. **Temporal management:** Provisions, rules, applications of rules, references to text, and references to actual physical objects are only a few of the items that can be found in legal texts. A LegalRuleML rule has both temporal and non-temporal features, including the internal constituency of the activity, the moment of the rule's assertion, efficacy, and enforcement (status, validity, jurisdiction).
e. **Formal ontology reference:** LegalRuleML has a system for pointing to reusable classes of a specified external ontology but being autonomous from any legal ontology and logic framework.

B. Use cases of LegalRuleML

The syntax of LegalRuleML is almost identical to that of the well-known web programming languages HTML or XML. The precedence of the classes it links to is indicated by the hierarchy of angle brackets. Further, LegalRuleML likewise employs a straightforward "if-else" strategy. It looks for formulas and deontic formulas. It recommends the equations as formulae if it locates an appropriate section of text in the case containing formulas.

Some use cases of LegalRuleML are:

- LegalRuleML is used in the eHealth industry to model security and privacy concerns for controlling document access based on the operator's profile and authorisations. Using LegalRuleML, it is possible to construct several views of the same health record or document depending on the role of the querying agent and filter sensitive data in accordance with the law or regulation.
- To enable automatic IPR compatibility checks between various datasets, LegalRuleML is used in the open data domain to model the creative commons licences of the datasets. This is especially useful for determining if various datasets can be integrated to create a commercial application.
- LegalRuleML is used by MIREL, which is supported by Horizon 2020 funding from the European Union[13]. To construct tools for MIne and REason with legal documents, a formal framework must be established. They will be transformed into formal notions that may be applied to decision-making, compliance verification, and norm querying.

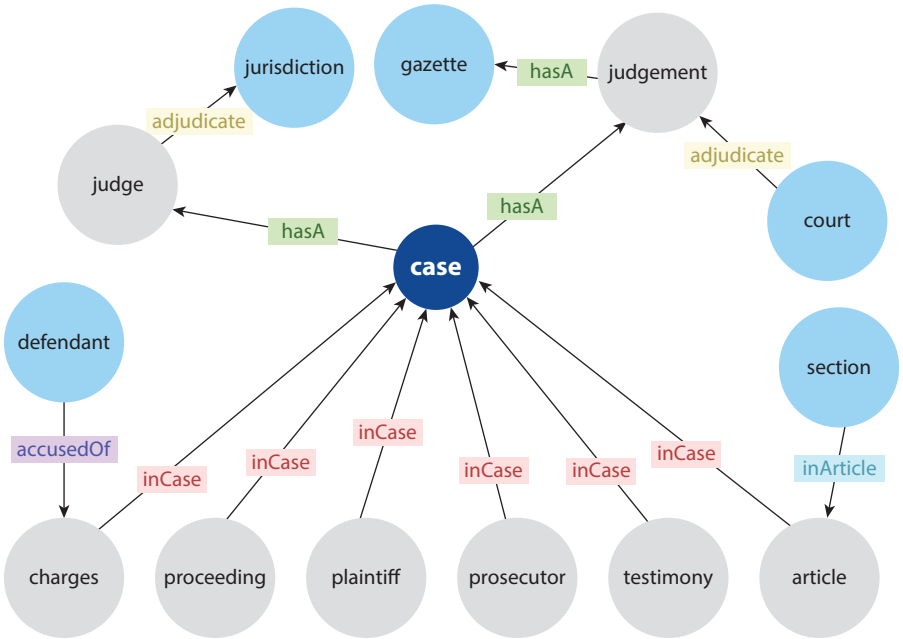


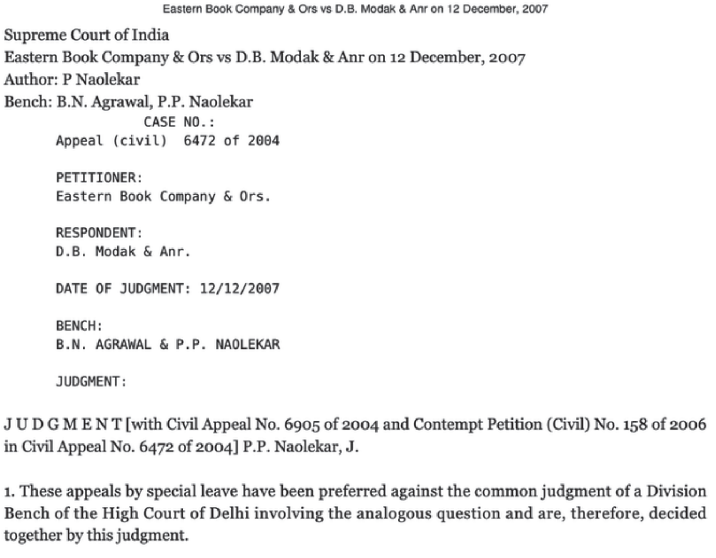
Figure 2: An ontology for legal documents[14]

– Akoma Ntoso, another comparable XML-based format created by the OASIS LegalRuleML team for judicial, legislative, and parliamentary documents, won the UNGA challenge, where the major objective was to extract knowledge from the UN General Assembly resolutions. It is currently a part of the OASIS standard.

V. Using ontology for recommending similar cases

A great example of a working ontology is developed by Dhani and Bhatt[15]. This ontology deals with Indian Court Cases on Intellectual Property Rights (IPR). They used Graph Neural Networks to create the ontology suited for recommending similar cases. The data was taken from repositories like Indian Kanoon and Casemine. Additionally, public NLP libraries such as IBM's Data Discovery and Stanza were used to retrieve information from the data. The authors then used a combination of manual methods and Latent Dirichlet Allocation (LDA) to obtain relevant topics.

The authors computed node similarity by taking the nodes as documents and using 'lawpoints' as additional manual features. These 'law points' were leveraged to annotate IPR-relevant legislation using a label from a selected number of broader and prominent IPR concepts based on the semantic similarities. They extracted topics to compute the relevance of the results obtained by a combination of Term Frequency and Inverse Document Frequency (TF-IDF). By ranking these words, some of the concepts related to IPR such as 'patent' and 'copyright' emerged from the data organically which were then selected as 'lawpoints'.



Eastern Book Company & Ors vs D.B. Modak & Anr on 12 December, 2007

Supreme Court of India
Eastern Book Company & Ors vs D.B. Modak & Anr on 12 December, 2007
Author: P Naolekar
Bench: B.N. Agrawal, P.P. Naolekar

CASE NO.:
Appeal (civil) 6472 of 2004

PETITIONER:
Eastern Book Company & Ors.

RESPONDENT:
D.B. Modak & Anr.

DATE OF JUDGMENT: 12/12/2007

BENCH:
B.N. AGRAWAL & P.P. NAOLEKAR

JUDGMENT:

J U D G M E N T [with Civil Appeal No. 6905 of 2004 and Contempt Petition (Civil) No. 158 of 2006 in Civil Appeal No. 6472 of 2004] P.P. Naolekar, J.

1. These appeals by special leave have been preferred against the common judgment of a Division Bench of the High Court of Delhi involving the analogous question and are, therefore, decided together by this judgment.

topic	tf-idf
claus	0.346
section	0.346
amend	0.342
articl	0.342
appoint	0.341
govern	0.341
right	0.337
agreement	0.332
contract	0.332
judgment	0.332
india	0.325
copyright	0.316
mark	0.316
patent	0.316
plaintiff	0.316
product	0.316
trade	0.316
order	0.287
case	0.278
court	0.246

Figure 3: An ontology for legal documents (Accessed from[16])

The ontology used citations and similarities between cases to be possible relations among the cases and was created using Relational Graph Convolution Networks[17] to predict the labels in the documents. AUC scores were used to check the performance of the ontology thus created, which returned a score of 0.620 for the citation graph and 0.556 for the similarity. There was a significant decrease in score (almost 0.04) when the ontology did not use 'law points' as features.

We can see in figure 3, this ontology makes use of 14 main features and 5 relationships are shown here. Using TF-IDF and topic modelling, the authors also got relevant words from the data, as seen in the table in figure 4. Some manual categorising of these features was done to create 'law points' as discussed above, among which some of the main ones were from IPR concepts ('patent', 'copyright') and some extracted from the document ('section', 'court', 'plaintiff'). These extracted topics exemplified the domain specificity of the ontology being expanded upon and the relations that the entities shared with each other.

VI. Challenges in developing legal ontologies

While developing technologies for the legal domain, there are multiple challenges[18]; some of which are listed below:

- **a.** Ontologies in general require the merging of multiple concepts which sometimes leads to not-so-great results.
- **b.** Legal ontology retrieval is an analogue for human thinking and logical reasoning is the bridge for statutes and judicial precedents. Hence the logic entailed in legal ontologies is usually never complete, and even does not include innovation.

c. Legal concepts appear explicit, but the contents are large; therefore, controlling factors inside it is harder than expected.

d. Law is dependent upon the time, politics, culture, and many other factors prevalent in a country at a period. Training ontologies while using these parameters might lead to an immense compilation time and not considering them only creates ontologies that in theory do not encompass all the factors happening around the time.

VII. Future of legal ontologies

With the increasing use of technologies, the future of legal ontologies is likely to be handled by computer experts and legal experts alike. One must remember that in the legal domain, ontologies must serve the correct purpose and hence provide correct answers based on the queries provided to it by users. The relevance of the ontology will be a huge factor as laws change quite frequently.

With the development of powerful and user-friendly interfaces, the accessibility of ontologies has a bright future ahead of itself. The clarity of the data provided in the ontologies will be an important factor for the quality of the generated ontology. Thus, most of the pre-computer era legal documents need to be checked for errors and omissions. We hope that as new legal data is generated, better ontologies will emerge with time.

Rhetorical Role Classification

After discussing legal ontologies for efficient storage of legal data, next we turn towards two downstream tasks: Rhetorical Role Classification and Legal Document Summarisation.

I. What are Rhetorical Roles?

The rhetorical role[19] of a particular sentence in a legal document refers to the semantic function/meaning that the sentence carries in the document. Understanding the rhetorical roles of different sentences allows us to understand the document in a modular fashion. Traditionally, rhetorical role labelling has been performed manually by legal experts. Recently, different AI-based computational approaches have been developed for the automatic identification of rhetorical roles. However, even for the AI techniques to work, legal expertise is still necessary to annotate an initial set of legal documents with rhetorical roles, which the AI algorithm can take as training data and learn to perform the task without human supervision.

Researchers have tried rhetorical role labelling for legal documents from different countries. Farzindar et al.[20] used four rhetorical markers to divide legal documents from the US Supreme Court into segments namely Introduction, Context, Judicial Analysis and Conclusion. Similar methods have also been attempted on Indian legal documents for segmenting an entire document into

meaningful units, which identify the case, establish the facts, arguments, history of the case, and final judgement. More specifically, Bhattacharya et al[21] considered the following 8 rhetorical roles:

a. **Facts -** These are the descriptions of events that have led to the filing of a legal case. Note that these events are not still proven or unproved in the court of law based on the legal principles of the corresponding justice system.
b. **Argument -** This refers to the arguments that the lawyers of the defending parties present in front of the judge to represent their side of the case and question the opposite side.
c. **Issues -** This refers to the legal questions whose answers are being sought, and which must be decided by the judge.
d. **Ratio of the decision -** This refers to the reasons provided by the judge(s) to explain the final judgement of the case.
e. **Ruling by lower court -** In the Indian Judiciary, the judgement given by a particular court is not final and can be challenged in a higher court or a higher system of justice as suitable. So, a challenger case document also includes the judgements given by a lower court.
f. **Ruling by present court -** This refers to the judgement given by the judge of the court where the case hearing took place.
g. **Precedents -** This rhetorical role refers to past legal cases which act as guidance for future legal cases of a similar type.
h. **Statutes -** This refers to the acts, notifications, orders, sections, articles, etc. which directly influence the final decision of the case. Statutes act as strong foundations based on which final decisions can be given in a legal case.

Table 1: Examples of rhetorical roles in a case document [Reproduced from web source]

One Dwarka Nath Ghose was the owner of considerable moveable and immovable properties.	Fact
It was contended on behalf of the appellants that the dedication of the premises.	Argument
The appeal is concerned only with the premises.	Issue
The first contention of the appellants is clearly untenable on the very language of the will of Dwarka Nath.	Ratio of the decision
The said suit was heard by Justice Bose who declared the premises.	Ruling by Lower Court
The first contention of the appellants therefore fails, and we hold that the dedication of the premises.	Ruling by Present Court
Rankin C.J. in *Surendra Krishna Ray v Shree Shree Ishwar Bhubaneshwari Thakuran* 1933.	Precedent
The Prevention of Corruption Act 1947 by Major Somnath accused.	Statute

A. How to automatically detect Rhetorical Roles?

Automatically identifying the rhetorical role of a sentence is a challenging task. Researchers have used a multitude of machine learning models to correctly classify sentences into rhetorical roles.

a. Conditional Random Fields

Conditional Random Fields (CRF)[22,23,24] can be used to detect rhetorical labels of sentences present in a legal document. CRF is designed in a way similar to how humans summarise legal documents. It works well for text segmentation problems and has proven to be much better than existing models present for text segmentation. CRF is an undirected graph-based structure with conditional probabilities of label sequences given an observation sequence. The conditional probabilities of the label sequences depend on the independent features of the observation sequence. Subsequently, researchers have utilised structures better than CRF for decoding legal documents into meaningful subunits, such as Hierarchical BiLSTM and Hier-BiLSTM CRF classifiers, as discussed next.

b. Hierarchical BiLSTM Classifier

Long short-term memory (LSTM) is a type of recurrent neural network, capable of efficiently processing sequences of data points, and thus is very useful in handling long inter-connected texts such as sentences and paragraphs. **Bidirectional LSTM (BiLSTM)** consists of two LSTMs: one taking the input in a forward direction, and the other in a backwards direction. Thus, BiLSTMs effectively increase the amount of information/context available to the algorithm.

The Sent2vec model[25] is used to generate sentence embeddings for every sentence of the legal document which is then fed into a Hierarchical-BiLSTM model. The Hierarchical Bi-LSTM structure extracts the necessary features from the sentence embeddings to classify the sentences into rhetorical labels. Hier-BiLSTM is used to detect the rhetorical labels because they tend to perform better than the LSTM model. The BiLSTM model determines the features from the sentence embeddings more effectively than the LSTM model.

c. Hierarchical BiLSTM-CRF Classifier

The embeddings generated by the Sent2vec model[26] are fed into a Hierarchical-BiLSTM model[27], to extract the necessary features from the sentence embeddings to classify the sentences into rhetorical labels. Then the features generated by the Hierarchical-BiLSTM model are put into the Conditional Random Field[28, 39] for a better understanding of rhetorical labels in terms of sequential order. Some rhetorical labels tend to occur one after another in a legal document which is well captured by CRF.

The models have given good results in terms of the detection of rhetorical labels. Researchers have seen that detecting rhetorical labels by using deep learning models has performed better as compared to handcrafted features. The problem with handcrafted features is that the creation of handcrafted features requires legal expertise. But again, there are issues with deep models where the interpretability of these deep models can be questioned. Interpretability of deep models is always a challenging task and here a similar situation arises, though the final results of the deep models are good.

Legal Document Summarisation

Summarisation is typically used to get an extract of a long document or a collection of documents[28], which can help a reader save both time and effort. Likewise, summarising legal documents is necessary to make legal information easily accessible both for lawyers as well as the common man.[29] The average length of an Indian Supreme Court Case is generally 4,500 words. Some of the important landmark cases often span over hundreds of pages, e.g., https://indiankanoon.org/doc/257876/. Some instances were reported where even the judges from one court were not able to comprehend the judgments from another court[30]. Legal document summarisation can be useful in many such scenarios. A summarised legal document can be easily understood by legal practitioners. Furthermore, it can help other tasks like legal search, where searching on the summarised data can give faster results compared to using the original documents.

I. Automatic summarisation of legal documents

Automatically summarising legal documents is a challenging task given the volumes of legal case documents available across countries. Various domain-independent methods are there for legal document summarisation which do not consider the domain-specific information while creating the summary thereby creating unbalanced summaries. So, designing summarisers that are domain-specific is important because this would help us to create more balanced summaries of legal documents thereby encoding proper positional information as well as rhetorical information from the original legal document thereby creating better legal document summaries.

Existing Legal-IR systems require legal experts to create manually curated summaries for legal documents which is a costly process and involves a lot of manual work. Automatically generating legal summaries can help reduce both the cost and time. For designing proper legal summarisers, we need to have legal guidelines from legal experts about what to include in a legal document summary.[31] There have been legal guidelines for UK, and US court cases. Similar attempts have also been made for Indian court cases.

II. Many shades of summarisation algorithms

Researchers have primarily focussed on extractive summarisation algorithms to generate suitable summaries of legal documents. The methods tried by the researchers can be divided into four categories:

a. **Unsupervised domain independent:** This type of summarisation algorithm has not been trained on legal documents, as they were not designed exclusively for the legal domain. These algorithms are general-purpose summarisation algorithms which have not been fine-tuned with any legal data.
b. **Supervised domain independent:** Supervised domain independent summarisation algorithms have been trained on legal documents, although these algorithms were not designed for the legal domain. They are general-purpose summarisation algorithms fine-tuned with legal data.
c. **Unsupervised domain-specific:** These summarisation algorithms have been designed exclusively for the legal domain by taking into consideration legal guidelines and legal parameters. However, they do not need to be trained on legal documents.
d. **Supervised domain-specific:** Supervised domain-specific algorithms are trained on legal documents to finetune the model for legal data. They are designed for the legal domain keeping into consideration the legal guidelines and legal parameters.

Next, we discuss several algorithms belonging to different types in detail.

A. Unsupervised domain-independent methods

Unsupervised Domain independent methods are those summarisation methods that are not designed specifically for the legal domain and can work in the absence of training data. Now we discuss some unsupervised domain-independent methods:

- **Lexrank:** Lexrank[32] is a stochastic graph-based method for finding sentence salience in a text document. Text documents consist of a sequential number of sentences arranged in a particular order. Lexrank creates an adjacency matrix where the values in the matrix are the intra-sentence cosine similarity values. This method is a general-purpose text summarisation technique proposed in 2004 and outperforms many centroid-based and degree-based methods of text summarisation. This method is not specific to the legal domain. The method is based on the concept of eigenvector centrality. On computing degree centrality, we have treated each edge of a graph as an equal vote in determining the sentence importance but here we give different weightage to every edge of the graph while computing sentence importance.
- **Luhn Summariser:** The Luhn algorithm[33] is an algorithm based on the concept of the TF-IDF vector. It selects the words of higher importance

based on the frequency of the words. The words present at the beginning of the document are given higher importance. Luhn summariser is an unsupervised domain-independent method for legal document summarisation. This method is designed for general-purpose text summarisation and hence could also be used for legal document summarisation.

- **LSA Summariser:** This is an algebraic-statistical method[34] to determine the inherent word and sentence structures present in a document which is important for determining sentence salience. LSA summariser does not directly work on the sentence features but on the inherent features present in the underlying structures. LSA summariser works on the principle of dimensionality reduction. It helps us understand what topic is being encoded. It also helps us in studying word association by looking into the text dataset in depth. The raw text data is converted into a document-term matrix which is thereby converted to singular value decomposition which finally gives us the topic-encoded data.
- **Reduction Summariser:** It is a graph-based unsupervised text summarisation technique[35] that condenses a large graph into smaller components to determine the most essential components of the graph and find the sentences of the highest importance in a text document. This is a technique that is not domain-specific but acts well in determining the summary of a text document. As this is a graph-based technique, our focus is to determine the importance of a vertex in the graph thereby selecting the most important vertices which thereby helps to select the most important sentences in the entire graph.
- **DSDR:** Document summarisation based on data reconstruction (DSDR) is an unsupervised legal domain-independent technique to summarise legal documents. From the original legal text, first-stop word removal and stemming are performed to create a weighted term frequency vector for every sentence. The sentences will be known as the candidate set. Now for any sentence in the document, DSDR[36] will select the related sentences of that sentence from the candidate set and will construct a reconstruction function based on that. Now for the sentences in the original legal document, we pick up those sentences that are best representatives of the original document thereby minimising the reconstruction error.

B. Supervised domain-independent methods

Supervised domain-independent methods need legal data for training the models; however, the summarisation methods are not designed specifically for the legal domain. Next, we discuss some supervised domain-independent methods:

- **SummaRunner:** SummaRunner[37] refers to a class of neural network-based models which is a supervised generic model that can be used for legal document summarisation. There are multiple variations of the summarunner model that can be used to summarise legal documents based on

the application needs. The model has 3 variations namely Attn_RNN, RNN_RNN, and CNN_RNN. The Attn_RNN is passed through multiple Bi-GRU attention layers one after another. The RNN_RNN is passed through multiple Bi-GRU attention layers and pooling layers alternatively stacked after one another. The CNN_RNN is passed through multiple CNN layers followed by pooling layers and BI-GRU layers stacked after one another.

- **BERTSUM:** This is an effective supervised domain-independent method for which this model is trained on CNN and DailyNews article datasets to summarise news content. BERT has been useful in many challenging NLP tasks. BERTSUM[38] can summarise a text corpus. This model has fine-tuning layers which allows the model to add legal document context to the model. Moreover, the distilled BERT-based model for summarisation has a similar performance to BERT except for the fact that the distilled BERT model takes less space and time. The main difference between BERT and BERTSUM is the addition of the data with symbols that point at the beginning and end of a sentence, so the model can learn sentence representations.

C. Unsupervised domain-specific methods

Unsupervised domain-specific summarisation methods are designed specifically for the legal domain, and they can work without any prior training. Some unsupervised domain-specific methods are listed below:

- **LetSum -** LetSum[39] is an unsupervised domain-specific algorithm that is primarily designed for US court cases. The algorithm divides a legal document into four parts namely Introduction, Context, Judicial Analysis and Conclusion. The algorithm breaks a legal document into four parts namely Introduction, Context, Judicial Analysis and Conclusion taking 10 per cent, 25 per cent, 60 per cent, and 5 per cent from the individual parts of the legal document thereby comprising the final summary. Letsum could also be used for Indian legal data by dividing the data into four parts mentioned earlier. The method is generalisable to the court cases of other jurisdictions. This method looks at the thematic segments of the entire legal document to form the final summary.
- **Case Summarizer -** Case summarizer[40] is a domain-specific method that is an automatic tool designed for the summarisation of legal documents. The method uses a word frequency-based approach coupled with domain information to form a summary of a legal document. The method is generalisable to the court cases of other countries. Summaries are being provided with informative interfaces with abbreviations, relevant heat maps and relevant flexible controls. The method is being evaluated by using ROUGE[41] scores (a widely used metric for evaluating summary quality) and other human-based evaluation systems. The case summarizer acts by performing pre-processing, and then performing TF-IDF-based analysis to get the final

list of ranked sentences. This is a domain-specific algorithm designed for the legal domain.

- **MMR Algorithm -** MMR[42] is a Min-Min roughness algorithm designed based on Rough Set Theory to handle the uncertainty in the clustering process. While many clustering algorithms exist to cluster legal documents, their implementations are challenging because the data is categorical in nature. MMR is a legal domain-specific algorithm designed to apply to the legal domain.
- **DELSUMM -** DELSUMM[43] is an unsupervised legal domain-specific algorithm designed to summarise legal documents created by using the Integer Linear programming approach. DELSUMM is primarily designed for the Indian Legal data and tested on Indian Supreme Court data. The model has been shown to perform better than most models in terms of Entire document-wise ROUGE[44] scores and in terms of rhetorical role-wise ROUGE scores. This is an extractive summarisation-based approach designed primarily to maximise the Integer Linear Programming (ILP) objective function, which is primarily used to summarise news content and social media posts and is now used to summarise Indian legal data. The method is based on two parameters: the informativeness of a sentence, and the content words. The method gives different importance to different segments.
- **KMM -** KMM[45] stands for K-mixture model and this is an Unsupervised domain-dependent approach to create a summary of a legal document by selecting important sentences from a legal document. KMM model is used to detect which sentences to include in a legal document summary and which sentences to exclude. After using this model there is a post summarisation step which decides which portion of the ranked list to include in the summary. This method does not use rhetorical roles to create the summary.

D. Supervised domain-specific methods

Supervised Domain-specific methods are designed specifically for the legal domain. They also need the models to be trained on legal data. We discuss one supervised domain-specific method below.

- **Chinese Gist -** Chinese Gist[46] is a supervised legal document summarisation approach that has been applied to Chinese Supreme Court cases and has provided very good results. Various machine learning methods such as gradient boosting, multilayer perceptrons, and LSTM are taken into consideration considering various linguistic, legal and statistical information. Producing a gist of Chinese court cases is a challenging task due to the huge number of Chinese court cases. Therefore, it becomes necessary to create an automatic summariser that can incorporate the domain expertise of the Chinese legal system. The method can be generalised to the legal documents of other jurisdictions as well.

III. Domain-specific vs. domain-independent algorithms

Domain-specific summarisation algorithms encode legal information, effectively creating better legal document summaries compared to domain-independent methods. To design automated summarisers, we need to have legal guidelines from legal experts about what to include in a legal summary. There have been such legal guidelines for the UK and US court cases, as well as for the Indian court cases.

For example, the following set of guidelines were used in DELSUMM[47]:

a. The order of importance of rhetorical roles is Final Judgement > Issue > Facts > Statute, Precedent, Ratio > Argument.
b. The Final Judgment and the Issue are extremely important to form the summary for a legal document. Since these portions are present in smaller proportions these sentences should be included fully in the summary of the legal documents.
c. The sentence appearing in the various rhetorical segments should be included as follows, Facts- Sentences appearing at the beginning of the legal document, Statute- Sentences that contain citations to an act, Precedent- Sentences that refer to prior cases, Ratio of the decision- Sentences which appear towards the ending of a document.
d. The final summary must include sentences containing important portions of the case.

Other domain-specific legal algorithms include Case Summarizer, MMR algorithm, LetSum, KMM and Chinese Gist which are designed for specific jurisdictions and can also be generalised to other jurisdictions. Algorithms designed for one jurisdiction can work in other jurisdictions by understanding the underlying principles of the particular algorithm and tuning the data in terms of that algorithm.

IV. Future of legal document summarisation

Designing effective legal summarisation algorithms requires legal domain knowledge. Building a summarisation system which can act like a legal expert, in terms of creating legal document summaries, is thus extremely challenging. Researchers have analysed various summarisation algorithms and legal expert-generated summaries [18,19] and tried to notice the differences and similarities between the algorithms and the experts. This gives an effective view of how to design legal summarisation algorithms such that they are closer to the summary created by legal experts.

There are two primary pointers needed to design an effective summarisation algorithm: (i) the proportion of rhetorical roles, and (ii) the position of the sentences forming the final summary. The proportion of different rhetorical roles to be present in the final summary is quite significant in ensuring a good quality summary. Also creating a balanced summary in terms of the position of the sentences[48] chosen from the legal document is also important. Comparing the

segment-wise ROUGE[49] scores with the rhetorical distribution of the algorithms can suggest the similarities between the algorithmically generated summaries and expert-written ones. In future, researchers may try creating ensembled summarisation approaches, which take into account and combine the goodness of every summarisation algorithm. For example, the summary may include the sentences which are selected by most algorithms thereby indicating their importance for the summarisation task.

Conclusion

In this chapter, we focused on how Artificial Intelligence (AI) has helped in legal data mining, through the collaboration of legal experts and AI researchers and practitioners, bringing in enhancements in the field of AI and Law. We discussed in detail about legal ontologies which can serve as storehouses for legal information. We also discussed two data mining tasks: rhetorical role detection and summarisation of case documents. These two tasks are not fully independent – we described how effective legal summarisation algorithms can be designed with the help of rhetorical roles. Beyond these two tasks, other data mining tasks have been greatly benefited by the introduction of Artificial Intelligence: Precedence Retrieval[50], Legal Judgement Prediction[51], Statute Detection, Charge Prediction, etc. However, as with any algorithmic system, there are always concerns about inaccuracies and biases in the AI models being applied in these applications. Hence, future research in this domain would need to focus on building models which are transparent and fair to all stakeholders [21, 47, 48, 52]

Similarly, the explainability of AI/ML models applied in the legal domain needs adequate emphasis as legal decisions often have significant consequences for individuals, organisations, and society at large. When legal document models are used to assist or automate legal tasks, it becomes essential to understand how and why these models arrive at their conclusions. Explainability provides transparency and accountability, allowing stakeholders to assess the validity and reliability of the model's outputs. There are several challenges associated with achieving explainability in models trained for legal tasks. One of the primary challenges is the complexity of legal language and the intricate rules and principles that govern legal reasoning. Legal documents often contain ambiguous or subjective language, and legal tasks involve nuanced analysis and interpretation. Translating these complexities into a machine-learning model in a way that can be explained to humans is a significant challenge.

Editors' Comments

The next chapter describes the application of AI to a more specific problem, that of using predictive analytics for justice delivery. It discusses how that can enable the system to address justice delivery at scale, and needless to say, highlights certain caveats that are crucial to a fair mechanism for the same.

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CHAPTER 15

Solving for Scale – Using AI and predictive analytics for justice delivery

Joseph Pookkatt, Ashutosh Modi and Abhijeet Srivastava

"Some people call this artificial intelligence, but the reality is this technology will enhance us. So instead of artificial intelligence, I think we'll augment our intelligence."

– Ginni Rometty, Former Chairman, President and CEO of IBM

SUMMARY

- Predictive Analytics is that discipline within AI that makes predictions by identifying and analysing the patterns in data;
- The use of predictive analytics in law seems to be promising since judges can use it in the decision-making process and solve the issue of pendency at scale;
- However, studies have suggested that due to the lack of understanding, such tools could result in biased and discriminatory output;
- It is also a challenge to decide who should be held accountable if an AI system fails and delivers an incorrect output;
- It is imperative to organise training programmes for judges to use these tools.

Introduction

Timely disposal of cases is quintessential to justice, a basic constitutional right of every citizen. However, with over 50.2 million cases[1] pending in courts, the Indian judicial system finds it increasingly difficult to deliver speedy justice.

In recent years, the use of Artificial Intelligence (AI) has become all-pervasive. Given its perceived efficiency, computer scientists have sought to find use cases for the application of AI to improve the quality and efficiency of justice delivery and to assist judges in the judicial decision-making process.

Predictive Analytics is that discipline within AI that makes predictions by identifying and analysing the patterns in data.[2] According to the Statistical Analysis System (SAS), predictive analytics is about – 'revealing previously unseen patterns, sentiments and relationships'.[3] With the use of this technology, known data can be used to analyse the regularities within the pattern for predicting a future event.[4] The use of predictive analytics tools in the judicial decision-making process could be a significant game changer from the point of expeditious disposal of cases. However, the use of predictive analytical tools could bring to the forefront the various challenges to such technologies – liability,[5] ethical,[6] and technical challenges.[7] Therefore, to reap the maximum benefit of this technology, it is crucial to develop well-designed Artificial Intelligence/Machine Learning models taking into consideration both technical implications and constitutional rights of the citizens of India.

In this article, we are looking at the potential benefits of using predictive analytics to assist the Indian judiciary in the decision-making process, the various AI/ML models in use, the international approaches, and the possible constitutional challenges to the use of predictive analysis in the judiciary.

I. Pendency of cases

Over 50.2 million cases are pending as of July 2023 in Indian courts. As shown in Figure 1 and Figure 2 below, between 2010 and 2020, pendency across all courts grew by 2.8 per cent annually. Of these 50.2 million pending cases, 87.6 per cent of these cases were in subordinate courts and 12.3 per cent in high courts.[8] In 2020, fewer cases were filed on account of COVID-19 lockdowns. However, the pendency increased because the disposal rate was slower than the filing rate.[9]

II. Initiatives in India

The Supreme Court of India (SCI) has to date not publicly indicated its willingness to adopt AI in relation to the judiciary. However, the SCI spearheaded the initiative by launching SUPACE (Supreme Court Portal for Assistance in Courts Efficiency), an assistive tool for judges to read and extract relevant facts from case filings[10]. Justice L Nageswara Rao mentioned that SUPACE intended to develop a system where the software would analyse the filings and provide answers to factual questions that a judge may have while hearing a case.[11]

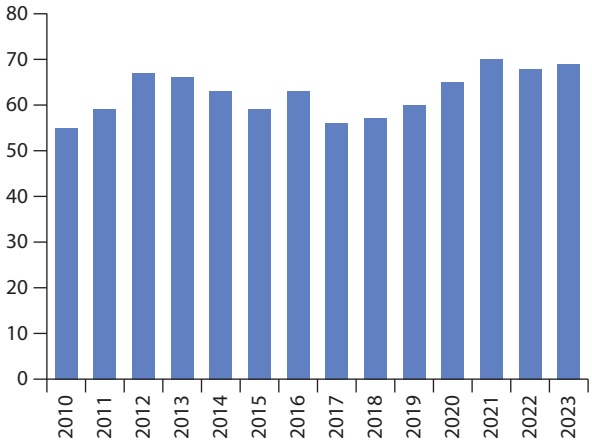

Figure 1: Pendency of Supreme Court Cases (In Thousands)
Source: https://prsindia.org/policy/vital-stats/pendency-and-vacancies-in-the-judiciary

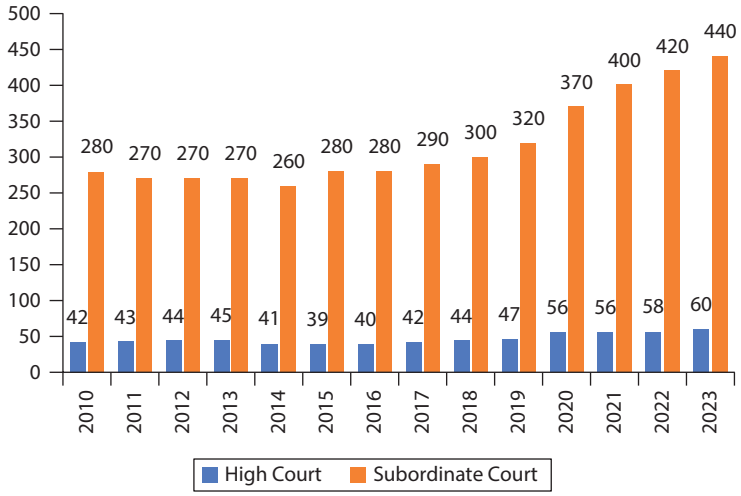

Figure 2: Pendency of Cases (In Lakhs)
Source: https://prsindia.org/policy/vital-stats/pendency-and-vacancies-in-the-judiciary

The SCI also launched SUVAS (Supreme Court Vidhik Anuvaad Software), a system that helps translate English case documents to Indian languages and vice versa.[12] However public records indicate that only 31 judgments were translated between March 2020 and December 2021.[13] Since it is a new initiative, translators would be required to verify the translation done by the system, and Justice Rao noted that it is quite difficult for the court to find translators.[14] It is important to have translators for the system to work correctly.

Given the limited role of SUPACE and SUVAS in addressing the issue of pendency of cases, it is important and appropriate for us to deal with alternative

approaches including the adoption of predictive analysis as an option that the courts in India could effectively use to address the issue of pendency of cases.

Predictive Analytics and its role in future litigation

Predictive analytics is not a distant prospect since corporations and academia have already begun deploying these tools in the legal sector.[15] Before explaining how courts and governments used predictive analysis tools in use cases, it would be appropriate to advert the available AI/ML models in use.

I. Techniques of Predictive Analytics – An overview

Supervised ML algorithms learn the relationship between input and desired output. For example, consider the task of predicting whether a given image is a cat or a dog. For this task, the ML algorithm would be fed with images of cats and dogs, and the algorithm would learn what are distinctive features/attributes (fur, colour, size, etc.,) that can differentiate a cat from a dog. The algorithm would learn the mapping from input to output via the features extracted from the input. In this example, the input is an image; the output is the label cat or dog. Supervised ML algorithms predict a label for the given input. Similarly, for performing prediction on text-based inputs, a typical process involves creating a corpus of documents annotated with corresponding labels, from a pre-defined list, that we would like the ML algorithm to predict. This corpus of annotated documents is fed as input to the ML model that automatically grasps the functional relationship between input text and output labels. This entire process is referred to as supervised learning. Given a new and unseen unannotated document, the ML model then predicts a label.

Due to its direct application to various use cases, predictive analytic techniques have been an active and prolific area of research in the past few decades. Different techniques have been proposed starting from classical machine learning techniques such as decision trees[16], random forests[17], kNN (k-Nearest Neighbors)[18], Support Vector Machines (SVM)[19] and more recently, neural network-based deep learning techniques. In the past few years, deep learning-based models have dominated the scene, as these are data-driven and consequently, do not require explicit feature engineering. In classical (non-deep learning) ML approaches, a typical process involves manually extracting features (relevant attributes) from the input and using these features to predict the output. This manual extraction of features is referred to as feature engineering and is tedious and prone to errors.

In contrast, deep learning algorithms do not require feature extraction, but learn the relevant features automatically from the input, thus making these more robust and less prone to errors. Moreover, these models have shown better generalisation capabilities than the classical ML models. Predictive analytic techniques in the legal domain have also moved from the use of classical ML techniques to, more recently, deep learning techniques as outlined in section 4.2.

Models for predicting legal outcome

The use of AI in law has a long history. It began with the nearest neighbour algorithm and progressed to advanced models for predicting the outcome of cases. AI considers many aspects like substantive factual strengths, weaknesses, and rule-based issues. Recently, with the help of machine learning tools using neural networks, researchers predicted outcomes from case texts without recourse to traditional legal knowledge representation.[20] This section briefly examines some of the computational models for predictive analytics in the legal domain proposed in the literature.

A. Nearest Neighbour Algorithm

In 1974, MacKay and Robillard developed a computer programme for predicting the outcome of cases involving capital gains tax.[21] The model's aim was to assist judges in predicting whether a gain was a capital gain or ordinary gain in a real estate transaction under Canadian tax laws. The predictions relied on 64 Canadian capital gains tax precedents that were represented in terms of 46 binary features. Each feature was based on facts that were found to be relevant to decisions on the issue by experts in previous studies. The researchers applied a k-nearest neighbour (k-NN) algorithm that calculated the similarity or dissimilarity between the fact patterns of cases and predicted the decision in a given case.

B. Case-based arguments model

While arriving at a verdict, judges rely on precedents for deciding the ongoing case. In 2016, Matthias Grabmair developed the Value Judgment Based Argumentative Prediction (VJAP) programme, which is a computational model of case-based legal argument. VJAP performs legal reasoning and applies value judgments across cases, mapping them from one factual scenario to another. It constructs arguments using a factual scenario based on given facts in a way that substantiates a particular conclusion as per the applicable values.[22]

C. Machine Learning (ML) models

In 2017, Daniel Martin Katz and Michael Bommarito developed the first supervised ML programme for predicting whether a US Supreme Court justice or the court would uphold or overrule a lower court's judgment.[23] They deployed a random forest classifier for evaluating a case and predicting its outcome. The decision tree functions were trained on all previous decisions for that judge, the court, and other precedents.

D. Neural models for prediction on European Court of Human Rights cases

In 2019, Illias Chalkadis along with some renowned academicians proposed neural network-based models for prediction on three tasks for cases from the

European Court of Human Rights (ECHR): human rights violation classification, human rights violation type classification and case importance regression.[24] The proposed model takes the facts of a case and performs predictions for each task. The paper shows the superior performance of neural models as opposed to classical ML models indicating the shift towards deep learning-based models for legal AI tasks.

One of the main differences between neural models and classical ML models is the features used for prediction. While the latter involves explicit feature engineering, deep learning grasps complex features automatically from the data itself. Moreover, the performance of deep learning models improves with the availability of more data (input-output pairs) as the model gets the chance to learn possible variations in the existing features, and learns new features that could make predictions.

E. Court judgement prediction with explanation

Recently, Vijit Malik along with some renowned academicians proposed a deep learning-based hierarchical transformer model for predicting the outcome of SCI cases.[25] The proposed system takes a court case document as input and predicts if the appeal is accepted. Additionally, their model explains how it arrived at a particular decision by indicating the salient sentences in the document that lead to the predicted decision. Typically, it is difficult to interpret the predictions done by deep learning models and the model proposed in the aforesaid project tries to overcome the Black Box limitation of a deep learning model. This is the first step towards developing explainable AI models that could aid in assessing the accountability of an AI system (see also Section 6.1.1).

II. Use of predictive analytics by foreign courts

There are various approaches taken by foreign countries while deploying predictive analytic tools.

a. **Estonia:** Estonia uses predictive analysis tools only in low-value cases with de novo appeal to a human judge. The Estonian Ministry of Justice requested Ott Velsberg, the chief data officer, to assist in developing an AI-driven model for helping mediators adjudicate small claim disputes of less than Euro 7000.[26] This AI-powered tool, with the help of machine learning models, identifies relevant supporting case laws similar to the issue beforehand, to generate a legal memorandum for providing the decree. It is pertinent to mention that this decree could be appealed before a human judge in case any party is aggrieved from the AI-issued decision.

b. **China:** China has started adjudicating cases pertaining to theft and motor vehicle cases wherein the decision parameters are simple and clear through predictive analytic tools. The judges simply upload the complaints or the

case files to get the AI-generated preliminary judgments. The AI model is pre-trained with a corpus of 40 million case judgments. This corpus is used by the AI model while generating the judgments and helps identify earlier, similar judgments on the same issues.

c. **Brazil:** Victor is a project sponsored by the Federal Supreme Court and University of Brasília which seeks to assist the Brazilian Supreme Court by analysing the constitutional admissibility of ongoing cases[27] and for speeding up the analysis of pending cases.
d. **The US:** It has started using COMPAS to provide decisional support to judges while dealing with criminal cases. It assists judges in determining whether an accused should be detained during pretrial or during sentencing. COMPAS generates risk scores displayed in the form of a bar chart, with three bars that represent pretrial recidivism risk, general recidivism risk, and violent recidivism risk. Each bar indicates a defendant's level of risk on a scale of 1 to 10.[28]

Constitutionality of Predictive Analytical tools

The use of predictive analytics in law seems to be promising since it can be used to assist judges in the decision-making process and consequently may solve the issue of pendency at scale.[29] Given this, it is essential to determine the constitutional validity of these tools considering Article 21 of the Constitution of India, 1950. In this view, authors will 1) Interpret Article 21, 2) Discuss the implications of predictive analytical tools on the constitutional rights of the accused, and 3) Analyse the foreign case laws on the constitutional validity of predictive analytical tools and their persuasive impact in India.

I. Interpreting Article 21 of the Constitution of India, 1950

According to Article 21, *'No person shall be deprived of his life or personal liberty except according to procedure established by law'*. It is important to understand three major expressions used in this article i.e., 'life', 'personal liberty' and 'procedure established by law'. The expression 'life' has been interpreted liberally and broadly.[30] The SCI has interpreted and held that the expression 'life' is something more than mere animal existence.[31] On the other hand, the expression 'personal liberty' has been given a very wide amplitude and refers to not only freedom from arrest or detention but also all those varieties of rights of a person which go to make up the personal liberty of man.[32] Finally, any deprivation of 'life' and 'personal liberty' shall only be as per the relevant 'procedure established by law'.[33] The SCI in several cases has interpreted the expression 'procedure established by law' and held that such a procedure must satisfy the requisite of being fair and reasonable.[34] Therefore, a person should not be deprived of his life and personal liberty based on any arbitrary, unfair and unreasonable procedure. [35]

II. Implications of predictive tools on the rights of the accused

Presently, predictive analytical tools are based on deep learning techniques that are purely data-driven decision-making algorithms.[36] Such tools consider the accused as statistics rather than individuals.[37] Various studies have also suggested that due to the lack of understanding such tools could result in biased and discriminatory output.[38] Since these tools are opaque, it is impossible to determine the rationale of the final output provided by these tools, which is commonly known as the issue of Black Box.[39] Thus, an accused may be sentenced based on automated decision-making tools and may never get an opportunity to understand the rationale of such a decision or how the tool concluded.[40] This can have serious implications on the constitutional rights of the accused because if a judge relies on an erroneous/biased/discriminatory output given by predictive analytical tools, the accused may be deprived of his life or personal liberty. The issue raises concerns especially when such tools are being deployed to determine bail or sentencing. Therefore, the question arises whether such Black Box methodology meets the criteria of 'procedure established by law' laid down under Article 21 of the Constitution of India, 1950.

III. Foreign precedents on the constitutional validity of predictive analytical tools

To answer the above question, it is important to first analyse some foreign case laws where the use of predictive analytical tools was constitutionally challenged before the courts. We throw light on how foreign courts dealt with this issue in the backdrop of constitutional principles.

A. State v. Loomis

The State v. Loomis[41] is one of the most relevant cases on the aforementioned issue. In 2013, Eric Loomis was charged for a drive-by shooting case in La Crosse.[42] He accepted his involvement in driving the car but denied his involvement in the shooting. Following Loomis's plea, the trial court ordered a pre-sentence investigation report which included the output from the Correctional Offender Management Profiling for Alternative Sanction (COMPAS) risk assessment tool.[43] It generated a risk score that assisted judges in the sentencing process. Based on this output, the trial court sentenced Loomis to imprisonment and extended five years of supervision.[44]

Aggrieved by the decision of the trial court, Loomis filed an appeal before the Supreme Court of Wisconsin (SCW) and challenged the trial court reference of COMPAS in the decision-making process as it violated his constitutional right to due process. Loomis argued that since COMPAS utilised a proprietary AI model, it could not be inspected by independent researchers as there is no access to the corpus based on which COMPAS predicted the risk scores. Therefore, the use of

such tools violated his constitutional right as he was barred from verifying the accuracy of the decision given by the model.[45]

However, the SCW rejected all the claims by Loomis. It held that if the COMPAS was used as a determinative factor then such use would have violated the 'due process' rights of the accused. However, in this case, the trial court provided an adequate explanation of the risk score provided by COMPAS and also examined the other relevant factors of the case. Thus, the risk assessment scores of COMPAS were 'not determinative', but rather merely used as an observation to reinforce the trial court's assessment of other factors. The SCW also considered the issue of the appropriateness of predictive analytical tools like COMPAS in the decision-making process.[46] Subsequently, in 2017, Loomis filed a writ of certiorari before the Supreme Court of the United States (SCU) to challenge the decision of the SCW. However, the court dismissed his petition.[47]

B. People v. Younglove

In 2019, in a consolidated appeal, defendants challenged the use of COMPAS in the judicial decision-making process.[48] Defendants argued that any reference to COMPAS violates the 'due process of law' as COMPAS statistically analyses data from a general population while making predictions.[49] Defendants said that the use of predictive tools is inappropriate as it violates the right to individualised sentences and also lacks transparency. Further, the defendants also argued that by using such tools, the judiciary is transferring their judicial discretion to software developers. The State of Michigan Court of Appeals rejected all the claims and held that the use of COMPAS by no means affected the right to get an individualised sentence as it is only one of the factors used during the decision-making process.[50]

In our view, the above foreign judgments could be considered persuasive authorities on this issue. Further, for legitimising the use of such tools in assisting judges, legislatures need to make sure that the output provided by such tools is only used as an observation by judges, and not as a determinative factor. The judges would also be required to provide adequate rationale if they rely on such predictive analytical tools for arriving at a decision.

Demystifying the challenges and limitations of an ai enabled justice

While the deployment of predictive analytical tools may promise greater fairness, access to justice, and legal certainty, there are risks and challenges of leveraging such tools. In this section, the authors shall analyse the potential issues and challenges of using AI in the judicial system mainly in the context of: a) Determining the liability of a faulty AI system, b) Ethical issues, and c) Technical challenges.

I. Determining the liability of a faulty AI

Predictive analytical tools may be useful in assisting judges, but sometimes they do give incorrect results. This may harm individuals especially if a judge based on the incorrect output, convicts or penalises a person who may actually be innocent. Thus, the question of determination of liability for faulty predictive tools becomes sine-qua-non. Presently, due to inadequate framework, the judicial system is forced to adapt to contracts, torts and product liability laws.[51] However, in the absence of an appropriate mechanism for the identification of fault and causation, it becomes difficult to test the boundaries of such laws.[52] In this section, we shall address the potential challenges associated with such tools at the time of determining the liability of these technologies.

A. Allocating liability in the complex AI ecosystem

AI is part of technology that combines data-driven models driven by the internet and facilitated by blockchain technologies.[53] Data is continuously created, exchanged, analysed, pooled, and reassessed.[54] Each of these advanced technologies carries its own independent risk. Consequently, when combined with each other, it becomes difficult to allocate the liability as it becomes layered and complex.[55] Thus, it may be inherently difficult to reverse engineer the decision-making process of these tools to determine why AI arrived at a given output.[56] Recently, explainable AI (XAI) technologies are being developed which would enable a system to explain its prediction. In the case of an error, this will help assess the faulty component.[57]

B. Assigning responsibility among multiple parties

The second challenge is to decide who should be held accountable if an AI system fails and delivers an incorrect output. This requires a multi-layered assessment due to the involvement of several parties. There are AI developers, algorithm trainers, data collectors, controllers, and processors, owners of the software, and the final users of the devices.[58] The issue also becomes complex when these technologies communicate and engage with one another because the propensity for errors shifts as data is constantly created, exchanged, pooled, analysed, and reassessed.[59]

C. Inadequate legal remedies

Tort remedies are currently limited because AI is classified as intangible property.[60] Both AI/ML models are considered trade secrets rather than products, which precludes the aggrieved person from seeking remedy within the purview of product liability laws.[61] Moreover, due to a lack of privity between individuals and third-party software companies, the affected person may not be able to seek recourse for any claim including, but not limited to defamation, invasion of property, or breach of duty. The privity of contracts between the software companies and the

state will always shield the company with various indemnifications and disclaimer clauses.[62]

II. Ethical Issues

Deployment of predictive analytical tools may also lead to various ethical issues. In this section, the authors focus mainly on the issue of: a) Black Box, b) Bias, and c) Accountability.

A. Black Box

Several studies suggest that AI systems today are mostly opaque.[63] Such systems may be successful in making predictions and decisions on behalf of human beings, but they fail to communicate the rationale behind the decisions. This is typically called the Black Box Problem.[64] The inability to provide rationale is mainly because such systems consist of multiple layers of interconnected, artificial computing units (referred to as neurons) that analyse the patterns within the data.[65] At least 1 lakh neurons operate simultaneously to arrive at a final decision.[66] It is a layer or cluster of neurons that encode some features extracted from the data but is not intelligible for analysis by experts.[67] Further, knowledge embedded in these neurons cannot be reduced to a set of instructions, nor can any neuron or group of neurons determine what the system finds interesting or important.[68] Its power comes from 'connectionism'.[69] The complexity of the large multi-layered networks of neurons is what gives rise to the Black Box Problem.

The issue may be of concern in the legal domain because it is contrary to the principles of natural justice, which dictate that a decision in a dispute should be based on reasons.[70] The disclosure of the reasons behind a decision can act as a safeguard against arbitrariness. The affected parties may be deprived of the understanding of how a decision was made, which may give rise to questions as to the constitutionality of such tools.

B. Bias

Bias is an inevitable consequence of algorithmic decision-making systems.[71] There are multiple points when bias could be introduced within the algorithmic decision-making process i.e. the input data, the design or performance of the algorithm itself or the way in which the output is acted upon by human involvement.[72] Among all these entry points, the most critical issue of bias is when it is within the training data itself. [73] This mainly gives rise to the issue of accuracy at the time of deployment of such tools. Similar concerns were identified by ProPublica regarding the use of COMPAS by US courts for predictive recidivism in sentencing as well as bail decisions. Due to the racial bias in the training data itself, the final output given by the predictive analytical tools was also found to be biased against individuals of colour.

C. Accountability

This consideration mostly arises due to the opaque forms of AI in the decision-making process which are influenced by factors such as data used for training, algorithms, processes, training parameters, and deployment environment, among others.[74] Multiple entities may be involved during the development and deployment process. The 'many hands problem', allied with complex AI systems, confuses the issue of assigning liability under extant laws of accountability and legal recourse.[75] The AI system coupled with several interconnected factors behind individual decisions makes it challenging to attribute errors and assign responsibilities.[76]

III. Technical challenges

The legal text is different from texts that are typically used to train deep learning-based text models. Legal documents are typically long (on an average of> 3000 tokens), the legal lexicon is different, and legal texts are typically unstructured and noisy. For instance, legal documents in India are usually typed manually. All these challenges make it difficult to adapt (e.g., via transfer learning techniques) existing state-of-the-art (SOTA) language models to the legal domain.[77] Consequently, predictive models for the legal domain need to be developed from scratch. This requires the annotation of thousands of documents by legal experts, which is extremely time-consuming and expensive. Though recent developments in the deep learning community (e.g., transformers) have made it possible to fine-tune techniques on small quantities of data, even these need to be annotated.

Currently, most deep learning models are Black Boxes, however, as outlined earlier, the legal domain requires a model that can explain the reasons for the prediction. This is technically challenging, as current deep learning models have billions of parameters and cannot be interpreted. This requires the development of specialised techniques to explain models in the legal domain.

Moreover, India is a multi-lingual society and courts at the lower levels like district courts, work in the regional language. Current SOTA has primarily been developed for English, and these do not work in other languages. Developing ML models for other Indian languages becomes challenging as these are low-resource and not annotated. Hence, considerable effort needs to be devoted to multi-lingual technologies.

Recommendations and safeguards

Predictive analytical tools offer many opportunities for quick and effective judicial decisions. However, as discussed in the previous section, the deployment of such tools also poses various challenges and limitations in society. To reap the benefits while avoiding such challenges, a proper regulatory framework is sine-qua-non. In this pursuit, the present section enumerates different building blocks for legislatures to create such a framework.

I. Judicial training to use predictive analytical tools

A safeguard that must be implemented in the judicial system is to mandatorily organise training programmes for judges to use these tools.[78] To begin with, the right direction would be to follow the Loomis recommendations i.e. forbidding sole reliance on predictive tools and including a warning about the flaws of such tools to the judges.[79] In India, before the deployment of such tools, courts need to ensure that even if judges rely on such tools, these tools should be only a part of the decision-making process rather than the whole. This would ensure the elimination of possible constitutional challenges as witnessed in the USA.

Further, there is a need to increase the judges' grasp of how these predictive analytical tools function. Justice Abrahamson in her concurring remarks on the Loomis case recognised a similar issue and recommended that judges need to be made aware of the basic functioning of these tools.[80] Such training programmes for increasing the awareness of judges in a specific domain are not a new concept. In the US, similar programmes are being conducted for training federal district judges in scientific theory and methodology to enhance their ability to assess the reliability of expert testimony.[81] Thus, judicial academies may implement such training sessions or workshops to create awareness about predictive analytical tools. Such tools may help judges in assessing the reliability of automated decisions, and may thereby mitigate the effects of automation bias and increase transparency.[82] This would ultimately ensure that judges are not being swayed by algorithmic decisions and are not rubber stamps of automated decisions.[83]

II. Designing AI models on the Fairness, Accountable and Transparent (FAT) framework

A proper regulatory oversight mechanism needs to be established that ensures developers create predictive tools that lead to more transparent and fair decisions and thereby avoid discrimination, bias and inaccuracy. The fairness of such AI-enabled tools could be measured based on accuracy (rate of right prediction), recall (capability to locate related results) and precision (potential to produce exact results).[84]

Further, due to the 'many hands problem', the debate over the accountability of predictive analytical tools is daunting. Diakopoulos and Friedler make some salient suggestions to increase the accountability of such tools. They first stress that since these tools are built by developers, they should in fact take responsibility for errors. Second, legislatures may need to formulate an authority comprising judges, technical experts and academicians to continuously identify, log, ensure accuracy and benchmark the source of errors. These internal checks would help acknowledge and understand the flaws of predictive analytical tools. Using this information, developers may redesign the AI/ML models to minimise any possible errors at the time of deployment of such tools in the judicial system.[85]

Finally, the solution to the opacity of AI/ML models could be resolved by making such tools more transparent to enable users to understand how a decision/

prediction is made by the models. Studies have suggested the creation of source code on widely accessible resources like Github to enable public scrutiny and inspections.[86]

The authors also recommend that the right direction may be to formulate a regulatory framework in lien of New York's first algorithmic accountability law which came into effect in 2018.[87] It aims to make automated decisions fair, accountable and transparent. The Act creates a task force agency to identify the disproportionate impacts of an algorithmic automated decision-making system.[88] It requires that the agency decisions should be archived so that the public can meaningfully assess the AI systems.[89] It also gives the right to an individual affected by an automated decision to request an explanation for the decision and will require a path for redressals for those harmed by a decision.[90]

III. Auditing and certification mechanisms

There should be regular audits or certifications for assessing and monitoring the validity of AI/ML models.[91] This has also been recommended by Article 29 Working Party of the GDPR for testing the efficacy of algorithms or automated data processing systems. Various studies have suggested that adopting independent timely audits may be the best practice for automated decision-making tools to ensure compliance and protection of the constitutional rights of individuals.[92]

IV. Promoting research and governance

Before the deployment of predictive tools in the judicial decision-making process, there is a need for high-quality research to facilitate informed policy decisions for such technologies. Although there is foreign literature available on this subject, given the fact that India has its own social and cultural environment, it is important to critically examine the impact or challenges before deploying such tools in the Indian judicial system.

Conclusion

Any deployment of predictive tools in the Indian judicial system should be experimented with on a trial basis, initially on certain categories of civil and commercial cases, where the parameters of the decisions could be applied uniformly and where no discretionary power is vested in judges. These cases include motor vehicle cases, traffic violation cases, product liability cases for food adulteration, legal metrology, insurance and banking-related cases. The final output given by such predictive analytical tools should only be considered as one of the factors in deciding the case, and the ultimate decision -- to penalise or acquit the accused -- should be solely taken by judges. Therefore, given the complexity posed by predictive analytical tools, it is essential to create a framework for regulating the use of artificial intelligence in the judicial sector so that these tools are both safe and effective.

Editors' Comments

Predictive analytics is just one of the methods by which analytics can be pressed into the service of the judiciary. The next two chapters of the volume describe how Operations Research, a discipline centered around modelling, analysis, and optimisation through data and sophisticated analytics, can serve the judiciary. The first of these, chapter 16 provides an overview of the possibilities and chapter 17 discusses a specific use case. Finally, this part ends with a discussion of some hacks of statistics: All analytics depends on data processing and analysis. Accordingly, a chapter to highlight some key and fundamental concepts while dealing with data is in order. The next chapter serves this purpose by bringing forth the pitfalls that must be avoided while leveraging data for decision-making.

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16 Decision Tree means a non-parametric supervised learning algorithm, which is utilized for both classification and regression tasks. It has a hierarchical, tree structure, which consists of a root node, branches, internal nodes and leaf nodes.

17 Random forest combines the output of multiple decision trees to reach a single result. Its ease of use and flexibility has fueled its adoption, as it handles both classification and regression problems.

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CHAPTER 16

Operations Research for the Judicial System

Nomesh Bolia, Sri Harsha Dorapudi and Shaurya Shriyam

"Operations research is neither a method nor a technique; it is or is becoming a science and as such is defined by a combination of the phenomena it studies."

- Russell L. Ackoff, American organisational theorist, professor and pioneer of Operations Research

SUMMARY

- Operations Research (OR) in various fields and its result-oriented approach provide scope for its implementation in the judiciary;
- Data analytics to identify performance gaps and to improve efficiency in the processes;
- OR optimisation models can impact all aspects of the judicial system such as resource allocation, scheduling, evaluation, and efficiency;
- Simulation models help understand and address process inefficiencies.

Introduction

Judicial decisions aim to protect public interest and human rights. This enables the courts of any country to preserve public trust in the law and justice system. There is a hierarchical structure in courts where justice is delivered. The functioning of the judiciary in India is an adversarial type of dispute resolution.

There are 25 high courts and over 600 district courts in India with varying strengths of judges[1,2]. The reasons for delays in delivering justice concerning the strength of a bench are generalised, but from various reports published by the Government of India, there is evidence that access to justice delivery is still suboptimal[3]. This in turn creates hurdles for policymakers and countries in generating solutions[4, 5].

The complexities of the operations and proceedings suggest there are ways to deal with and build an efficient system that speeds up the process. Judicial delays and complexities are understood over time which is augmented between the initiation and the disposition[6,7]. The National Judicial Grid data (NJGD) and India's Laws of Law Commission provide statistics related to various courts and their pendency[8]. The Justice JC Shah Committee (1969) provided information on the setting up of independent tribunals for resolving the huge pendency petitions filed by government servants.

A weak Indian judiciary can have a socioeconomic impact that results in several challenges[9,10]. Consequently, India has worked with many organisations to bring about changes in the system. Given the diverse and multidimensional nature of the problem, different approaches can be used for effective implementation. The transition from a process-led approach to a web-based one came after the COVID-19 outbreak and the adoption of technology. This opened up avenues for dealing with the existing and additional burdens making decisions easier[11]. The phase III draft vision document released by the e-Committee of the Supreme Court of India provides a futuristic look at the challenges and opportunities in the judicial system

There are many challenges for individual courts as well as the overall judicial system in terms of using data-based methods to find solutions to systemic problems. Among the most visible or talked about issues that can bog down courts in their efforts to deliver justice are lack of transparency and pending cases[12]. However, from a systemic perspective, these are simply more manifestations of the problems of how the system functions, which when resolved, can have a significant impact on the overall experience of citizens as well as the judiciary. Some of these aspects can be addressed using technology, including data-based methods, while some need a different lens and thinking. Among the ones that can at least partially be resolved using data-based methods, technically classified as Operations Research are: Court and case evaluation, workflow management, resource management including human resources, efficient scheduling and listing, and load allocation-reallocation among others. These include reinforcement learning, which is often categorised as Artificial Intelligence (AI), in contemporary discourse.

Operations Research (OR) is a discipline that attempts to make systems across all sectors perform better. It uses data and develops mathematical models to simulate, optimise, predict, and thus make important decisions to help systems perform better. Informative multimedia information that gives an overview of

the applications and past successes can be found freely on the internet.[13,14,15] As explained in subsequent sections, this has not been leveraged for the judicial system, despite the tremendous potential. Given the pendency and other mega challenges faced by the Indian judiciary, OR can be extremely useful to all concerned stakeholders in transforming the system. This chapter aims to provide an overview of the methodology involved.

Section 2 presents a detailed glimpse of the applications of OR in the judiciary. It describes the key methods, models and techniques used by the OR community across the world, and provides inputs on how they are relevant to the judicial system. It includes some of the most widely used and broadly applicable methods such as Linear Programming, Queueing Theory and Game Theory, as well as some specific methods that can be used in settings with more defined characteristics. Clearly, just one volume, never mind a chapter, cannot include all methods from an entire discipline, but we can present the ones that can be immediately and extensively used in the Indian context.

Section 3 presents methods for performance and efficiency measurement and subsequent management for the judiciary. This can be used not just by individual courts, but also by the topmost echelons of judicial planners to develop mechanisms for peer learning and manage policies and the entire system more effectively. Section 4 gives some key remarks relevant to the context of this chapter on related technologies, including Machine Learning.

Section 5 presents examples of some statistical methods that can be used for relevant analysis, and section 6 concludes the chapter.

Operations research in the judiciary and its implications

The use of various approaches to the processes involved in the judiciary is anticipated for highly congested and upsurged pending cases. These approaches provide valid and reasonable solutions to streamline the system. These will also facilitate and focus on the functions and organisational relationships for a quantitative basis in decision-making.

The stage-wise approach for any system addresses some key questions:

a. What are the factors to be considered in the formulation of the problem?
b. What is the need to construct a model and why is it necessary to build?
c. What is the output observed and does it need to be compared with existing data?
d. Where is the model tested and how is the data validated?
e. How is the model implemented and how should it be delivered in real-time?

There are several methods used in the operations research that may be effectively applied to judicial systems to enhance their performance.

I. Application of mathematical programming to judicial systems

Operations Research, which is based on mathematical programming, can be useful in solving problems faced by judicial systems because it provides sound and robust methodologies to improve the efficiency, fairness, and effectiveness of the judicial system. In the production sector, there is a huge application of linear programming models. Examples include deciding on a product mix for various industries and blend options in producing various products in steel plants like plates and sheets. The applications are extended to service industries to determine the optimal route for airlines and railways.[16,17] They can even be used for the selection of various techniques for crop planning and rotation in agriculture.[18]

On a slightly different note, Data Envelopment Analysis (DEA) under the Free Disposable Hull (FDH) framework, is a linear programming-based method to measure the relative efficiency scores for decision-making units (DMUs). It can also be used for courts as indicated in the chapters. Similarly, various other models such as CCR multiplier and CCR envelopment are developed from the broad fractional programming domain[19]. In multi-tiered judicial systems, the problem of case assignment is crucial. Here, Linear Programming models can help us to optimise the assignment of cases to different courtrooms. The objective of such linear programming models can be formulated in a manner that seeks to reduce case delays and minimise the travel time of judges and court staff. This leads to equitable and fair distribution of cases across courtrooms.

Linear programming, integer programming, and mixed integer linear programming methods can prove useful in optimising resource allocation, jury selection, case scheduling, courtroom assignment, and other legal decision-making processes drawing from their applications in other sectors. For instance, such models are extensively used in developing solutions for warehouse location management in multi-echelon distribution systems and also in scheduling problems. From the point of view of citizens, the effectiveness of a time-consuming litigation process is indeed dependent on the case operation in the courts and these methods can provide crucial inputs to the judicial system in that direction.

Linear programming can also be deployed suitably to optimise the allocation of a limited number of judges, courtrooms, and administrative staff. In order to come up with optimal allocation plans, the programming models can incorporate factors such as case priorities, judge availability, and courtroom availability with the main goal of maximising the disposal rate of court cases while reducing unnecessary and irrelevant backlogs. It is also possible to use suitable linear programs to determine optimal sentencing decisions that meet the specified rules and regulations in the judicial system. Intelligent sentencing mechanisms can be developed so that the chances of rehabilitation for criminals are increased while reducing the possibility of recidivism to a significant extent.

II. Application of queuing theory to judicial systems

Queuing theory is applicable to identify problems related to congestion and their resulting delays[20]. While applying queuing theory to traditional use cases such as banks and ticket counters, most models aim to analyse key performance indicators such as waiting times, throughput, and resource utilisation. In the judicial context, the primary role of queuing theory according to these standard conventions is to measure and monitor the performance of these systems along these metrics whenever queues are formed, either of cases or other entities. By gathering operational data from judicial systems, one can build suitable queuing models corresponding to multiple scenarios by making relevant tweaks and modifications to existing templates.

Such models can be used to improve the quality of the judicial process for all stakeholders as well as the delivery of justice for citizens. For instance, a court has a series of tasks that are well-defined in justice delivery and various patterns to resolve the cases considering the time between the case entry and exit (case disposal). These models can determine the most optimal ways to prioritise cases, through court case priority queuing with time-lapse examination[21]. The decisions that emerge as a result can help to reduce pendency and cases can be disposed of without compromising the quality of the judgment. Consequently, the number of hearings may not necessarily change. One can model constraints that allow or disallow the allocation of specific judges/benches to cases to account for those considerations as required. Further, by predicting the system performance under various circumstances and system settings (bench assignments, number of hearings, case facts among others), the model will identify areas for improvement and perform service level analysis to compute the time it takes to process a case or the time it takes to hear a motion.

Queuing models have also traditionally enjoyed significant success in minimising idle time and maximising throughput. So, it should be easy to leverage the successes in other sectors and ensure efficient resource allocation when it comes to judicial systems. There are several stages involved in the processing of a court case within the judicial system. These include filing, case screening, case assignment, hearings, and trials. Queue-theoretic discrete-event simulation models coupled with process mapping offer an effective solution to model and analyse the flow of cases through the different stages of a judicial process. This methodology can identify bottlenecks in the judicial systems and thus help take the first steps towards better system performance (faster case disposal without compromising on quality), which can then be effectively addressed through optimal resource allocation. This leads to a reduction in waiting time, ensures efficient case flow management, and enhances the overall quality of judicial service.

Lastly, the use of these models to aid court decisions, particularly if the details and mechanics are revealed, also reduces the possibilities of discretion. There is more objectivity, which can be fine-tuned to the level that makes sense for the judiciary. As a result, the system becomes more transparent to the extent that the input models, their assumptions and outcomes are shared with the public.

III. Application of game theory to judicial systems

Game theory works well in modelling strategic and extensive decision-making scenarios while helping to compute optimal actions that each agent needs to perform in order to maximise the payoffs. It is an interactive decision-making approach that provides optimal solutions using strategies. At a fundamental level, it involves agents who could be cooperating or competing, but each tracks their own payoff. The action/decision of each affects the payoff of all agents, and they can successively respond to the actions of others. The theory then helps determine actions for each agent that drive the system towards some equilibria or optimises the total payoffs, while accounting for these dynamic interactions. The various models account for real-life situations when the actions and payoffs are transparent or hidden to varying degrees.

Clearly, if the requisite data is available, such models can be used to simulate and predict how different courtroom strategies influence the outcomes of legal proceedings. Specifically, the judicial system implementation of the game theory approach has been used to identify an effective mechanism for resolving disputes and delays[22]. To illustrate, consider two parties involved in a civil litigation where they attempt to negotiate a suitable settlement. They will try to weigh the costs and benefits of settling, versus going to trial. To do so, the game theory models can provide them assistance to adapt utility functions, while taking into account relevant factors such as potential damages, legal costs, and uncertainties of trial outcome as well as the decisions of the other parties and their responses to those decisions in an iterative loop. Once the utility functions have been assigned to both parties, game theory models compute rational decisions by each side that favour both sides by invoking an appropriate solution concept such as the Nash Equilibrium.

Consider the 2010 national litigation policy. A review of the policy to limit excessive government litigation has long been delayed. Given the similarity of their conception and dynamics, these disputes can be modelled as endless games. The strategic interactions between judges, defendants, and other stakeholders in the sentencing process can be captured using game theory models.

In another scenario, lawyers often have a preconceived idea about the judge's preferences and biases. Based on their beliefs, the lawyers strategically aim to maximise the chances of winning the case in their favour by making the right choice in selecting their arguments, evidence, and presentation styles that will resonate with the judge. If the judges want to avert the advantage that can accrue to the lawyer because of such estimates, they can account for this behaviour of the lawyer in their responses and decisions. Here again, the strategic interactions between lawyers and judges can be modelled as a game theoretic scenario.

Apart from these, other niche techniques of OR can also deliver significant advantages to the judicial systems by tackling different types of issues faced by Indian courts, hopefully leading to the resolution of the pendency issue. We enumerate below the kind of value that these OR techniques can bring to the judicial systems.

a. **Network analysis**
It covers a set of techniques to represent the relations and to analyse the social structure from these relations. This provides information in the form of nodes for people under study, and lines for relations between the nodes[23]. In other contexts, the nodes represent people, infrastructure, facilities or any set of entities that interact with each other. Network analysis enhances our understanding of the network by reducing the complexity of the social interplay. In the judicial context, this can happen by studying the comparative judicial behaviour or legal citations – and connections thereof – of judicial decisions[24]. Through such an analysis, an understanding of the differences and similarities in judicial action can be provided by comparing different jurisprudence and comparing results. The networks are designed and planned in decision-making with limited time and resources. The cases can be cited and mapped as a graph[25] with the right vertices and edges to visualise and analyse the relationships and to understand the details that connect and form a cluster.

b. **Scheduling**
Scheduling, like queuing theory, has a plethora of use cases in all kinds of sectors, ranging from healthcare, transport, and shopfloors to practically every sector of the economy. The idea here is to improve the metric without adding any resources or capital investment, simply by shuffling the processing order of the tasks undertaken by the system agent. For the judiciary, among several other use cases, a classical and immediately understood use case is that of scheduling cases for hearings. The cases being heard in various courts can be calendared for facilitating and speeding up the judicial process. Without changing either the judge-case allocation or the addition of researchers, using scheduling, the administration can perform automatic roster preparation and cause-list preparation. While these rosters and cause lists are currently prepared as per the experience of the judge, and the priority of cases[26], scheduling methods can codify part of that experience, and make suggestions without violating any desirable criteria set by the chief decision maker(s).

c. **Decision theory**
In many sectors, methods of decision theory such as binary trees and other classification mechanisms enable decision-makers to improve predictions or performance under defined metrics. Similarly, the decision made by judges in various courts is based on the facts and rule of law that are well-defined in the judicial system. These facts and rules of law can be codified using appropriate frameworks and ontologies using decision-theoretic techniques. Without formal methods and computer programs to analyse them, they can become barriers or otherwise, focal points to making decisions during cases. Decision theory picks up one or more from a large suite of methods to reach optimal decisions.

d. **Assignment problems**

Assignment problems are used in a variety of contexts in business problems across various domains. The theory and practice of solutions to these problems can be applied to courts for a variety of use cases. As an illustration, consider case allocation. As of now, the cases in Indian courts are assigned to the judges based on the experience of the decision maker. Basic details like experience, clearance rate, and pending cases are considered, to allot a case to a judge. However, processing these details can be complicated and overwhelming. While wisdom and intuition will always have a role in such decisions, mathematical models based on assignment problems can aid the process. Such models can process the intelligence and knowledge built into various parameters such as the total number of cases registered, the track record of judges and various other systemic constraints. The models can yield a scientific method for such allocations that rationalise the burden of cases on the judges while keeping track of their expertise and context. One can choose from among multiple possible objectives such as maximising the overall clearance rate and minimising the maximum delay. One can account for various procedural details through constraints in the model, solve them using a computer in a matter of seconds or minutes, and pass on the resultant solution to the decision maker for a final take.

e. **Markov analysis**

Markov analysis is a powerful method from the OR repertoire to study systems that evolve dynamically under uncertainty. It has found tremendous usage in various sectors, including business analytics, production systems and reinforcement learning. For the judicial context, the progress of the cases through various stages in their journey from case registration to disposal through the courts can be analysed using Markov analysis. Markov analysis needs to estimate the transition probabilities as an input parameter to the model. For court cases, the probability of its transition through various stages can be estimated through past data including the time taken for the case to advance various levels and the number of cases. They can depend on the case type and the level at which it is dealt with. Once such models are made, they can take the analysis and decision-making process of the kind described above to the next level by incorporating inherent uncertainties.

f. **Heuristic models**

These models are a consolidation of the practical parts of other models and develop into a single integrative model for decision-making that is usable in real or quick time. They also serve as approaches to obtain a better explanation of judicial decisions. Models are developed based on legal factors such as legal models, attitudinal models, and strategic models[27]. In general, while available data on judicial data can be humongous as it indeed is in the Indian context, significant parts of it could be irrelevant to specific forms of decision-making and should not affect the judge's decision. Heuristics provide solutions for decision-making without considering all the irrelevant

information, in the process also making them more explainable. Further, OR theory can be used to estimate (or even provide guarantees in some cases) how far some inadvertent approximations take the system performance from the ideal – but unattainable – one.

g. **Symbolic logic**
This is another set of techniques used in the OR world and can be used in data mining and processing. It can be used in judicial interpretations like detection and control of the language ambiguities in court documents[28]. This can be useful in the judicial process to predict and compare legal statements or rules[29].

Overall, by building mathematical models and considering factors bound to the case administration, various algorithms can be applied and compared with the models[30] to test the effectiveness and obtain an optimal solution to decision-making problems. Most good universities, including the Indian Institutes of Technology (IITs) across the country and world, have experts and departments, centres or research groups that deal with these methods and techniques and provide support to the judiciary.

Next, we consider the specific aspect of performance evaluation since that is something that is more about helping the judiciary make certain decisions through peer comparison rather than providing a solution. All methods described herein use one or more OR concepts discussed in section 2.

Evaluation of performance and efficiency

Courts operate systematically but are dynamic in nature. Its operations like planning, programming, budgeting, and other operating procedures can be better understood using simulation models[31]. These models when used efficiently provide details of the interactions in courts. Many countries have implemented and focused on models that capture information to identify the use of the details for development[32]. Building real-time operations of the court system is a challenge and the use of data envelopment analysis helps to determine the efficiency of the courts to their annual inflow of cases and their total workload[33,34,35,36]. The relative efficiency of decision-making units is measured using Data Envelopment Analysis (DEA), a linear programming-based technique[37]. This technique helps to measure the multiple inputs and outputs with varying units. It allows exogenous factors and does not require any prior restrictions on the inputs and outputs[38].

Data Envelopment Analysis (DEA) was developed to evaluate the efficiency of decision-making units for the public sector including schools, towns, and nations[39]. These decision-making units are classified as efficient and inefficient with a ranking method[40]. In the context of the application, it also gives efficient peers and their weights for inefficient courts[41,42,43]. It can handle multiple inputs and outputs and determines an efficient frontier, with all decision-making units

lying on the frontier getting a relative efficiency of/or 100 percent. The others are categorised as inefficient.

In the judicial context, the number of judges as an input and the number of cases that were successfully settled as an output has been shared across studies. In most of the research, the outputs have been categorised differently. In some situations, they have only considered the number of decisions; in others, they have divided them into cases that have been resolved and rulings published. In others, they have done so according to the courts. Another significant part of the work examining legal effectiveness has considered the judge and staff's strengths[44] as inputs[45,46,47,48,49] (Yeung & Azevedo, 2011). A few use the number of cases as an input[50], while some others utilise pendency[51]or the combination of approaching and pending cases as isolated factors[52]. Some researchers have scaled models using output-oriented CRS, while others have used input-oriented models and examined both efficiencies, while other studies have only measured Variable Returns to Scale (VRS) efficiencies in output-oriented models.

A Template-Driven Interpretation (TDC) model is used for Senate Judiciary Committee decision-making in Supreme Court nomination hearings. The analysis concludes that specific decision domains determine the structure of interpretation and the content of the criteria (Gannon, KM 1995). A simulation model like Business Processing Modelling (BPM) and GAN/GERT with queuing theory is used for criminal procedure management. This case study is organised in the district court of Bialystok. The dynamics of a specific type of criminal system in Extortion Racket Systems (ERS) are analysed using Agent-Based Modelling (ABM). A simulation model is applied to the analysis strategy and its impact on the behaviour of each agent and system.

A meaningful comparison between different alternatives can be expressed in terms of the flow of cases through the juvenile court system and their advantages in terms of allocated resources and reduced flow rates. Studies also show that increasing the number of judges reduces the average wait time[53]. Legal effectiveness can be considered by looking at subjective angles, including court decisions (judgments), the judgment quality, the citation frequency of a judgment as an indicator of its influence, and the extent of cases with offers being recorded in courts[54].

In India, the efficiency of high courts has been studied using DEA.[55] The models developed in this work identify inefficient courts along with possible reasons for their poor performance, and identify peers they can learn from. These are helpful findings since policymakers can monitor the overall system and provide inputs on where to find solutions. The peer learning component has the potential for success because it is more likely to be relevant as opposed to recommendations from some distant context away from India. It is also more likely to be acceptable, while doing away with counters that brush aside successful orders from other countries, citing different circumstances and context. Thus, overall these findings can implemented for better court performance. Further, the judicial openings and staffing levels in the high courts (HC) and district courts (DCs) are being studied

by our research group. Since it is an ongoing task, results are not yet published, but preliminary results reveal that while vacancies in courts are clearly an issue, load balancing and judge transfers can address at least a part of the pendency problem. More details are in the next chapter.

Technological adaptation in the judiciary

It is forecast that the future of law and its functioning lies in the use of electronic methods during judgments and other proceedings[56]. The future of the legal system lies in implementing various technologies to develop new initiatives[57]. Specifically, various policies have been formulated with e-court-related implementations resulting in quick justice[58,59]. While recommending technology, we are clear that the implementation of advanced technology speeds up the judicial process, but in no way does it replace the human workforce[60]. A combination of human and machine intelligence, with humans being the final arbiters is indeed the only way to ensure fairness and accountability. Figure 1 provides an indicative summary of the scope of data-driven methods, the focus of this part of the volume. All solutions indicated in the figure are driven by or overlap with methods developed by researchers from OR communities all over the world.

The 'on-ground' implementation of this requires Information & Communication Technologies (ICT) as the infrastructural backbone. Thus, it would not be an exaggeration to say that the advent of the use of ICT in various fields provides a ray of hope to the judiciary despite its shortcomings. There is tremendous potential for these tools to develop and make the operations of the judiciary transparent and accessible by improving the quality of service[61].

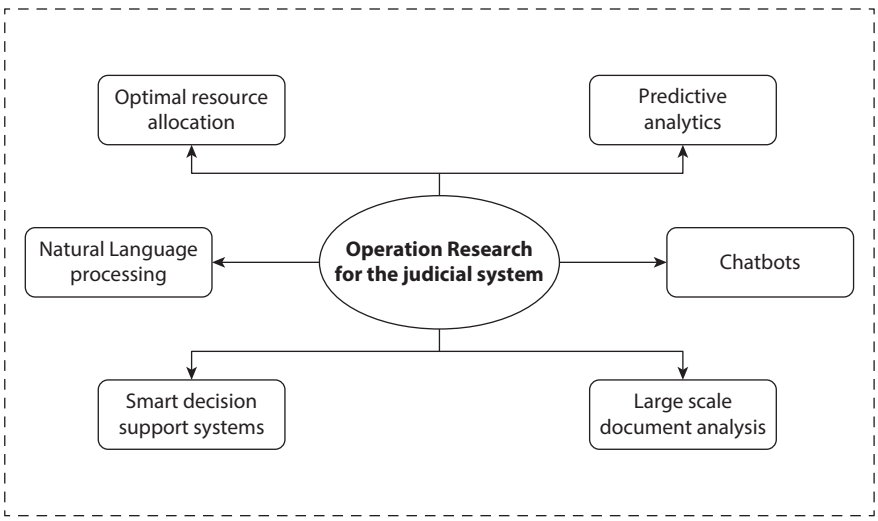

Figure 1: Applications of Operations Research in the judicial sector

On a related note, in India, most judges are overburdened with copious court cases. Innovation based on data-driven methods such as AI can help judges ensure consistency, transparency and fairness in sentencing while addressing method-induced and human biases. AI-powered tools can analyse large volumes of legal documents within a matter of minutes and help lawyers and judges focus on relevant clauses. Since judges can obtain the relevant information quickly, they become more self-reliant; do not depend on multiple assistants, and thereby enjoy the benefits of saving time spent on menial and mundane tasks. They can thereby focus on more intellectual and challenging tasks. By enhancing the efficiency and quality of work done by judges and lawyers, such technologies also ensure robust and consistent compliance with legal requirements.

As per the vision document of the e-Courts project committee, this necessitates the use and implementation of ICT tools in the judiciary[62]. Of course, the adoption of these tools brings many challenges because the system is colossal. The primary purpose of courts is to effectively extend affordable and accessible legal services to the citizens of India. Resolving the problems and providing transparency in the information at all levels is crucial in such projects. Thus, to reemphasise, technology can contribute effectively towards a transparent and efficient system.

It is important to recognise the role of various stakeholders in getting us to a stage where we can now conceive OR and data-based solutions. Over the past three decades, the Indian government and judiciary have recognised the importance of technology towards creating an effective justice system and have taken gradual steps to realise its full potential. The computerisation and digitisation of the Indian judiciary have been implemented through several programs and projects since at least 1990. The computerisation of Indian courts began with the Supreme Court of India in 1990 assisted by the National Information Center (NIC). Various programs were developed to computerise the routine tasks of preparing lists for lawsuits and order sheets and issuing orders. One of the main contributions is the elimination of manual editing of causality lists. This has enabled the Supreme Court Register to streamline this important day-to-day operation. The overall picture of developments achieved and to be achieved in judicial administration must be viewed from the perspective of AI.

From a citizen's perspective, a major hurdle faced by ordinary citizens is that of obtaining access to quality legal services while not getting trapped into paying exorbitant prices for routine services. This is especially true for the members of economically disadvantaged groups and underprivileged communities. In such cases, chatbots and virtual assistants powered by data-driven methods can prove to be a game changer in providing access to good-quality. It is also expected that the tools of predictive analytics can help determine case outcomes with high accuracy. If that is the case, then perhaps the litigants can make use of the official chatbots to get a sense of the difficulties they might face in obtaining a successful outcome for their case. However, none of this can completely replace the key stakeholders – lawyers and judges – since their value goes beyond the services provided by technology. In fact, there are genuine problems with the use of AI

and digital automation, which are discussed in this chapter, and they need to be debated, and dispensed with appropriately. Some of the issues are direct outcomes of the use of AI such as bias and fairness considerations especially if the data and training are not of the right quality. This really highlights that the implementation of AI should be done considering the views of experts, particularly those who do not have any vested interests. Ideally, they should also be the kind who recognise and are at least sensitive and empathetic to these concerns. Some other issues such as hacking and disruption in connectivity though not the outcome of digital automation, can cause problems especially if robust technological infrastructure of connectivity and security is not ensured. This is true not only at the time of setting up a system but also on an ongoing basis when we consider newer threats emerging from technological upgrades. Figure 2 summarises these issues, and our recommendation is they should be among the topmost areas of concern when implementing such technologies. To emphasise this, we categorise these issues as threats, since that is how they are perceived by key judicial stakeholders.

In line with the above, several governments globally are considering digital reforms to improve public services for adoption. The services thus managed can be effective, accessible, and efficient, but they come with challenges related to ensuring legal constraints, interoperability, and judicial independence. Thus, systems should be designed in a way that the diversity of issues can be understood and be productive[63]. Several countries have successfully implemented several initiatives to facilitate access and overcome challenges. We describe herein some instances in the judicial context.

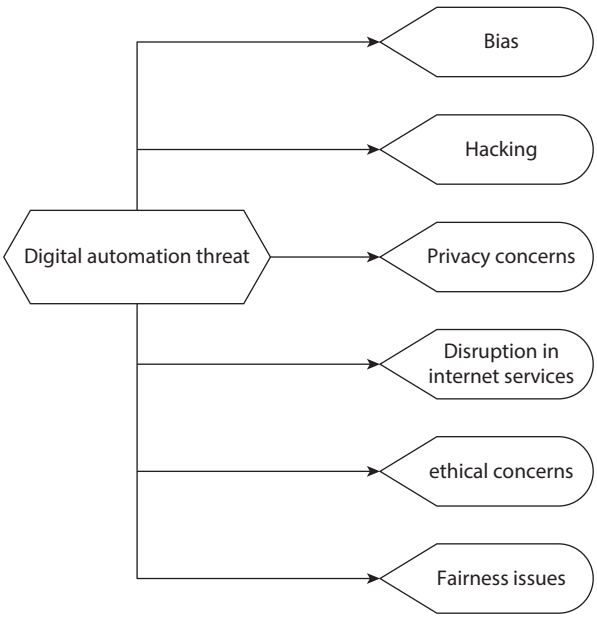

Figure 2: Potential threats from digital automation, artificial intelligence

The electronic justice initiative at the community level (European e-Justice portal) brought about the computerisation of individual member states. The access point has privileged access to information and case laws for citizens, businesses, professionals, and judicial authorities. This provided a reduction in errors, manipulation, and interpretation of documents. There is an increase in the time of data collection and the frequency of decisions. Similarly in Nepal, the ICT master plan was introduced by the Supreme Court of Nepal in 2016 to establish a paperless judiciary. This initiative was later extended to other courts. The key output expected from the ICT master plan is to provide an effective and efficient service to the citizens of that country. It is successful in the implementation of ICT tools in the judiciary by providing knowledge management[64]. Then there is Rechtwijzer (way of justice) – a voluntary tool from the Netherlands – developed by a team of scholars, judges, mediators, and lawyers. This tool provides an overview of the tasks and legal resources with anticipated costs. This initiative aids in mediated settlements for disputes with a self-help option. They have built collaborations using integrative negotiation principles.

Once such an infrastructure is set up, and data access, enabled, OR can be used for carrying out fundamental analytics to determine performance gaps and differences. The complexity related to distinctive sorts of cases can easily be incorporated. Further, case categorisation is possible while agreeing to the exertion and preparation time. Quantitative viewpoints of execution have been considered through several case foundations and arranged. All of this would be next to impossible without the use of technologies and OR-based methods described in this chapter. Data analysis techniques can help identify sources of inefficiency and identify systems that appear to be working well[65,66]. But technically some models do help in identifying and resolving the inefficiencies in the existing approaches or methods[67]. From studies available for case and litigant types, the case disposal time varies when using petitioner-type analysis, respondent-type analysis, and case-type analysis. ANOVA test provides the differences between various categories of cases.

Data collected for analysis is cleaned for inconsistencies. Visualising the information by bar charts, histograms, and colour-coded tables provides insights into the data with the application of descriptive statistics and other methods of testing the hypothesis. Such analysis can point to important insights into the functioning and hint at possible directions for improvement. A more detailed analysis is considered in the next chapter, but the kind of insights that can be recovered include issues with laws themselves, procedures, repeat offenders or frivolous litigants.

Conclusion

A sound legal framework needs to guarantee a convenient agreement of justice, in addition to judgments being reasonable and fair. Enhanced and limited work needs to be done to analyse the impact of pending cases while assessing the effectiveness of courts worldwide. The authors in Buscaglia & Dakolias (1999)[68]

find that countries that contribute more to innovation and framework can better enable changes in pendency as well as the rate of clearance in comparison with the ones that focus on expanding the legal quality and pay rates alone.

Methods from the broad discipline of Operations Research can be effectively used to anchor such innovation and make the justice system both efficient and effective. The chapter provides an overview of the specific techniques and broad methods that have been proven to result in better systems in other sectors. It also gives inputs on how the key challenges of the judicial sector can also benefit from these methods. Some illustrations and studies that indicate the specifics of the application of OR are highlighted. The key takeaway is that almost every domain and problem area of the law and justice system can benefit from some or the other method coming from the repertoire of OR. Expertise in this area is sufficiently available both in India and abroad.

Editors' Comments

As an illustration that provides more details on the context and solution approach, the next chapter discusses the application of OR to a very specific aspect of resource planning for the Indian judiciary. It first highlights through fundamental analytics that the often talked about problem area of pendency is not uniformly alarming across the various geographies, litigant categories, and case types. This implies that some reallocation can create some impact, with or without any further addition of judges, and the chapter elaborates on this with more details.

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CHAPTER 17

Optimal Resource Planning for Indian Judiciary

Nomesh Bolia, Sri Harsha Dorapudi and Shaurya Shriyam

"Real leaders focus resources in areas that provide the greatest opportunity rather than making across-the-board decisions."

– Frank Sonnenberg, American author and thought leader

SUMMARY

- The court performance, measured in terms of numbers related to the speed of decision-making making does vary with different categories and attributes of the cases;
- Indications that reallocation of judicial resources can aid in improving system performance;
- More detailed studies need to be conducted before this becomes implementable, but the promise of Operations Research-based Optimisation shows up.

Introduction

India's court system is one of the most congested in the world, with more than 59 million cases pending. The constitutional framework is responsible for upholding the rule of law and ensuring justice for all citizens. It has a three-tier system consisting of the lower, higher, and the Supreme Court of India. These courts at the individual level facilitate the public with timely justice through judgments

at the earliest. The delays in the disposal of the cases and necessary measures are observed to be based on many factors[1]. The factors resulting in the pendency need to be identified and analysed to identify necessary changes to improve the justice system. Overall, judicial inefficiencies come from various sources and one of the major ones is pending court cases.

Accordingly, this chapter deals with the issue of pendency and utilises methods from the broad discipline of Operations Research to do a systemic analysis based on data available in the public domain. As seen in the next section, the amount of data on Indian courts made available publicly is huge and can be used for a variety of analyses. Clearly, a mere chapter in a volume can't do justice to all the possibilities, but it does provide a glimpse of what is possible. Much more can be done, as described in the rest of the volume in general, and the previous chapter in particular.

The outline of this chapter is as follows: the rest of this section simply highlights the numbers, including that of population and cases. The idea is to set the context and underline that while the pendency woes are big, they have not arisen in a vacuum. There is a context of the scale of the entire country to it. Section 2 discusses the data sets available in the public domain. It includes details of what is available. Figures depicting the information available, and an overview of the extent and scale of the datasets are provided. One of the key points of this chapter is that while pendency is a major issue for the judicial system, the situation is not the same across various categories. The situation is different from geography to geography. So, for example, it varies from state to state, and within a state too, there are examples of significant variation between districts. Likewise, the situation is not uniform with respect to the types of litigants. There are clear differences, and understanding them properly to yield insights for the system overall can be an important step in tackling the challenge.

This diversity is good news. It tells that while some categories are facing a challenge, others are not. Highlighting either that some categories are simply facing a higher load due to factors whose origins are exogenous to the judiciary, or possibly due to some unanalysed aspects of the judicial process itself. If former, through the data analysis performed, insights can be drawn on what are the categories that have an inordinately greater onslaught and recommendations made to address them. Particularly, in as much as the factors directly or indirectly intersect with the judicial system after their origins outside of this system. However, if some interventions can be identified that are within the purview of the judicial process itself, those are worth giving serious consideration. Particularly more so, since the diversity implies there are some categories (geographies such as districts or states, or otherwise) within the same overall system that are probably doing some components of the overall process better. This means that peer learning itself can provide interesting ideas and resolutions.

1. It should be highlighted here that such peer learning is even more possible when it has to happen from among the units of the same sovereign state, i.e., India.

2. The argument that the learnings come from a context that is foreign to the Indian one, and therefore not really valid at all, doesn't cut ice.
3. As a result, either they can by themselves be more acceptable to the various stakeholders, or the leading decision makers can leverage this point to push through the implementation of some insights or interventions that are considered crucial.

It is to be emphasised here that such peer learning is even more likely when it occurs within the entities (courts) of the same sovereign state, i.e., India will hold the argument. As a result, it can independently find more acceptance among various stakeholders or key decision-makers who can use this point to force the implementation of the insights and interventions they deem essential. The peer learning activities lay the foundation for strengthening the law as well as facilitating to building of trust in judiciaries by securing justice. It also creates an opportunity to explore the challenges for these peer learning exchanges to create a fair and effective judiciary. Irrespective of the result and the impact through measurement, the approach of peer learning will benefit the judicial system in the long term[2]. Initially, the practices can be implemented in a single court where the possibilities of planning, monitoring, and facilitating can be analysed. Further, the details of peer learning can be extended to multiple courts, i.e., two or more systems to understand and validate the information on a larger scale.

To further highlight this through data, sections 3 and 4 perform an analysis of the various categories, viz., geographical (state/district wise) and litigant type respectively. The judiciary can use the analysis to draw valuable insights. To the best of our knowledge, this is the first such analysis done for the judicial system of India, putting to good use the data that the key stakeholders have been visionary enough to put in the public domain. Needless to say, much more can be done if more data is made available in a usable format.

This diversity also points to one more dimension that can be used to intervene for reduced pendency: balancing of loads across courts. Balancing load among various resources is an all-pervasive mechanism to improve efficiency across all sectors of the economy. The same basic principle can also be used for the judiciary, not as a final solution, since that will involve a much detailed analysis that only be conducted by the judiciary. Not only is data to move further not available to external stakeholders such as educational institutions and the private sector, but they also lack the wide-based understanding and the wisdom that comes with it to contextualise the outcomes of Operations Research methods. Nevertheless, an OR-based analysis can provide pointers to possibilities that can be explored further with the cooperation and involvement of key judicial stakeholders. Section 5 performs such an analysis for the reallocation of cases among judges to reduce their disposal times. The findings presented here, again, are the first time such results have been obtained for the Indian judiciary, to the best of our knowledge. As we reiterate later, the claim is not that the recommendations coming from these results are ready to implement or definitely going to work as it is, but simply

that this is a direction that all relevant stakeholders can consider, after all due modifications, upgrades, crosschecks and stakeholder consultation. Finally, this is all ongoing work, and so there clearly are lots of directions for future work. Section 6 concludes the chapter with some overall concluding remarks and an agenda for the pursuit of such future work.

We begin with outlining the context with some data. A huge gap is observed between the judge, and the population contrasted with the other countries. Currently, in India, the ratio is 21 judges per million of the population, which is less when compared to the US, where it is 100 judges. The Indian judiciary is facing an increase in cases being adjudicated and numerous vacancies at all levels[3]. This states that the judicial burden of courts has increased, and many jurisdictions are short of judges. The Supreme Court of India, the apex court of India, has approximately 68847 cases as of 01.04.2023, covering 49823 of the admission and 19024 regular hearing matters[4]. Independence and fairness in adjudication are the dimensions focused on the economic point as well as the proper functioning of the courts. So, the timely resolution of the cases will help in not suffering from huge costs that undermine the spirit of the judiciary[5]. The revenue loss associated with fixed or specific court fees from the appeals and filing delays results in the longer trial length of the cases and, in turn, results in dismissals or disposal delays. The time spent on an individual case and the cost associated with the resources utilised for filing, pleas, and judgment enforcement for various proceedings are summed to understand the economic effect. The mobilisation of resources and wealth, the rate of growth, and economic quality are all significantly influenced by sociopolitical issues. It is crucial to view social justice as a quadratic equation of economic growth. Understanding the monetary value of justice as a parameter, the United States is one-fifth of the GDP[6]. So, in comparison with the developed countries in terms of economic stability and monetary value, India, as a developing nation, needs to focus on the gaps in delivering social justice. The development process will be detoured if social justice imbalances constrain developing countries.[7] There is a necessity for providing directions to the judges of a court through which the delay times can be brought down, and it can change the course of the trial[8].

Table 1 adds the time dimension to this story and shows that the pendency in the courts at various levels of the hierarchy is increasing[9].

As discussed earlier, the pendency picture is not the same everywhere and for all categories. Depending on attributes such as district/state, litigant type, and case type, there is a difference in the effect of pendency. Next, we consider this in more detail in the subsequent sections.

Table 1: Details of the pendency cases[10]

Between 2010-2020	Pendency of cases grew annually by 2.8 per cent
Between 2019-2020	Pendency increased by 20 per cent in high courts and 13 per cent in subordinate courts.

Judicial Datasets

The judicial system is privy to enormous amounts of data that can be processed and used for a thorough analysis of pendency across various categorisations as we will see below. The 2 phases of ecourts have enabled case-level data to be publicly available on the ecourts website as summarised in figure 1.

The individual judgments for different cases and from various states and districts have much to consider during the analysis. As seen in Figure 1, the data from individual cases refers to a case in the Ananthapur district court. It has details on the filing as well as the registration date and number and the case type as identified by the court. It also has details on the hearings, including the dates of the hearings so far and the next hearing of the case, as well as the current stage of the case, which in Figure 1 is indicated as "SUMMONS".

It also mentions the litigants, including the petitioner(s) and the respondent(s) as also the act relevant to the case. Finally, it also mentions the relevant judge, understandably not by name but by designation. This is an instance of a case that is not disposed of yet. Figure 2 provides information for cases that are already disposed of, it includes the details of all hearings and the status of the case. Thus, it really is a comprehensive summary of the case through its lifecycle in the court:

i) jurisdiction,
ii) registration followed by hearings through various stages leading to eventual disposal where relevant,
iii) details of all stakeholders including the litigants and the attributes assigned to them by the judicial system such as its case type, relevant act and more.

Thus, the objective of this chapter is to analyse the diversity of cases in terms of their i) litigant category and ii) geography/jurisdiction that can be served through this dataset. The other kinds of data available in similar public domain resources can also enable the development of optimisation models discussed in this chapter.

However, the ecourts website has all this data in the form of HTML pages. The fields corresponding to the detailed information alluded to earlier in the section need to be extracted and stored in a form ready for analysis. Data Science and Operations Research tools such as Python and SQL are used for the extraction and storage of this information. These steps ensured the readiness of the data for the subsequent analysis of Sections 3, 4 and 5.

While performing this exercise of data collection, we also realised certain issues with the way data is being collected. This has led to some insights for the data collection process and database template design on making the data more usable by both researchers and practitioners such as lawyers and judges. The insights are:

a. Case label section: The backend database should have checks enabled to detect any obvious mistakes in entering the filing number, registration number, and CNR number. For example, if the registration number corre-

District Courts, Ananthapur
Case Details

Case Type	: CC - CALENDAR CASE	
Filing Number	: 4/2017	Filing Date: 01-07-2017
Registration Number	: 4/2017	Registration Date: 01-07-2017
CNR Number	: **APAN00-001569-2017**	

Case Status

First Hearing Date	**: 01st July 2017**
Next Hearing Date	**: 19th September 2017**
Stage of Case	**: SUMMONS**
Court Number and Judge	**: 6-SC/ST Court Cum Addl. District Judge**

Petitioner and Advocate

1) The SHO Hindupur Police station

Respondent and Advocate

1) H. Blappa

2) H. Gangadharappa

Acts

Under Act(s)	Under Section(s)
INDIAN PENAL CODE. 1860	447

FIR Details

Police Station	: II.Town P.S, H Indupur
FIR Number	: 233
Year	: 2014

History of Case Hearing

Registration Number	Judge	Business On Date	Hearing Date	Purpose of hearing
4/2017	SC/ST Court Cum Addl. District Judge	01-07-2017	26-07-2017	SUMMONS
4/2017	SC/ST Court Cum Addl. District Judge	26-07-2017	22-08-2017	SUMMONS
4/2017	SC/ST Court Cum Addl. District Judge	22-08-2017	19-09-2017	SUMMONS

Figure 1: Case summary from the ecourts website[11]

sponds to a date earlier than the filing number, it should raise a warning and ask for correction. Or, if the CNR number has segments that are obviously incorrect and can be detected, for instance in the state code, year and so on;

b. Case type: A major issue with the dataset is that of case types which are not standardised at all in the ecourts database. The Supreme Court has standardisation a list of case types, and so have high courts in various jurisdictions. One of them must be followed while entering case types instead of arbitrary ones based on the preference of the data entry operator or ones that emerge from abbreviations. For this, this field can have an auto-complete feature with the overall dictionary being already populated in the backend, requiring the data entry operator to only choose from among the ones that show up once they start typing. Currently, in the absence of such a feature, any case type-wise analysis is fraught with inaccuracies;

District Courts, Ananthapur Case Details

Case Type	: CC - CALENDAR CASE	
Filing Number	: 1/2017	Filing Date: 06-04-2017
Registration Number	: 1/2017	Registration Date: 07-04-2017
CNR Number	: **APAN00-000628-2017**	

Case Status

First Hearing Date	**: 07th April 2017**
Decision Date	**: 13th June 2018**
Case Status	**: Case disposed**
Nature of Disposal	**: Contested-ACQUITTAL**
Court Number and Judge	**: 6-SC/ST Court Cum Addl. District Judge**

Petitioner and Advocate

1) The Sub-Inspector of Police, Yadiki P.S.
Advocate- Spl. P.P

Respondent and Advocate

1) Darla Venkataramanaish.

2) D. Ramanaish.

3) Darla Bala Kotharayudu @ Bala Kothanna.

4) Darla Pullanna.

Acts

Under Act(s)	Under Section(s)
INDIAN PENAL CODE	341,355,34

Subordinate Court Information

Court Number and Name : JFCM, Tadipatri
Case Number and Year : CC - 0000202 - 2015
Case Decision Date : 30-03-2017

FIR Details

Police Station	: SHO. Yadiki P.S
FIR Number	: 163
Year	: 2014

Case History

Registration Number	Judge	Business On Date	Hearing Date	Purpose of Hearing
1/2017	SC/ST Court Cum Addl. District Judge	07-04-2017	09-05-2017	SUMMONS
1/2017	SC/ST Court Cum Addl. District Judge	09-05-2017	02-06-2017	SUMMONS
1/2017	SC/ST Court Cum Addl. District Judge	02-06-2017	19-06-2017	SUMMONS
1/2017	SC/ST Court Cum Addl. District Judge	19-06-2017	29-06-2017	SUMMONS
1/2017	SC/ST Court Cum Addl. District Judge	29-06-2017	25-07-2017	SUMMONS
1/2017	SC/ST Court Cum Addl. District Judge	25-07-2017	24-08-2017	SUMMONS
1/2017	SC/ST Court Cum Addl. District Judge	24-08-2017	20-09-2017	SUMMONS
1/2017	SC/ST Court Cum Addl. District Judge	20-09-2017	05-10-2017	HEARING
1/2017	SC/ST Court Cum Addl. District Judge	05-10-2017	03-11-2017	HEARING
1/2017	SC/ST Court Cum Addl. District Judge	03-11-2017	21-11-2017	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	21-11-2017	29-12-2017	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	29-12-2017	08-01-2018	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	08-01-2018	14-02-2018	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	14-02-2018	14-03-2018	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	14-03-2018	20-04-2018	ISSUE BW/NBW
1/2017	SC/ST Court Cum Addl. District Judge	20-04-2018	03-05-2018	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	03-05-2018	05-06-2018	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	05-06-2018	06-06-2018	SCHEDULE
1/2017	SC/ST Court Cum Addl. District Judge	06-06-2018	07-06-2018	PART HEARD TRIAL
1/2017	SC/ST Court Cum Addl. District Judge	07-06-2018	08-06-2018	PART HEARD TRIAL
1/2017	SC/ST Court Cum Addl. District Judge	08-06-2018	11-06-2018	FOR ARGUMENTS
1/2017	SC/ST Court Cum Addl. District Judge	11-06-2018	13-06-2018	JUDGMENT
1/2017	SC/ST Court Cum Addl. District Judge	13-06-2018		Disposed

Figure 2: Case summary from the ecourts website[12]

c. Case act and section: Again, lack of standardisation leads to arbitrariness in this field as well. Using a logic similar to a) and b) above, this can also be standardised and the feature of auto-complete added to make it convenient for data entry. Again, similar to point b) above, in the absence of such a database, any analysis along these lines will be fraught with inaccuracies;

d. Litigant details: This is another field with a high chance for errors, so to the extent possible, full name and address (or even pincode / district) can be added. Further, adding the type of litigant (such as government, corporate, or individual, of course, a more careful and contextual list can be customised for the jurisdiction of each high court) can also be considered since it is likely to have a significant bearing on several other factors and interventions.

Having described the dataset that can be leveraged for analysis, the remaining sections of the chapter will discuss the variations observed with respect to the geography or jurisdiction (district/state) and litigant type. Moving further in the chapter, using such publicly available data, the OR models for efficient resource reallocation are presented along with possibilities for future research.

Performance Variation with Geography

This analysis is based on an undergraduate thesis[13] on the theme of data-driven reforms in the law and justice system. It used large data sets downloaded from the ecourts website and extracted using OR/Data Science tools such as SQL and Python. The data relating to the districts was downloaded and analysis was performed to profile the states on their case disposal (duration) times as well as detect anomalies[14] to generate insights for peer learning. Of course, the analysis can also serve the purpose of sheer monitoring of the progress of district courts across the country, and take corrective measures if and where warranted by the key decision makers.

It also included clustering analysis[15] to determine the dependence of case duration on various attributes of the cases. A predictive model is also developed to estimate the time[16] for a case considering various attributes. However, for the purposes of this chapter, we restrict our attention to the profiling and anomaly detection bit.

The data of all districts wasn't available to download when the analysis was performed. But that doesn't affect the key message being attempted to be delivered here, hence we present the findings. The courts were profiled on the basis of measures of case delays such as mean case duration times, and tail bounds such as the proportion of cases that take more than a given duration. For the purposes of this study, the values chosen for the duration are 3, 6, 12 and 36 months.

The results present useful insights. Consider the mean case durations. The detailed list of districts and states is irrelevant, so we present the results for a small set of 6 districts in Table 2. The districts are chosen such that they represent the entire spectrum of performance: serial numbers 1 and 2 represent what are among

Table 2: Mean case durations of selected districts

S.No	State	District	Mean
1	Sikkim	West Sikkim	28 days
2	West Bengal	Paschim Medinipur	2 months 3 days
3	Punjab	Jalandhar	5 months 27 days
4	West Bengal	Malda	5 months 28 days
5	Telangana	Karimnagar	1 year 3 months 21 days
6	Jammu & Kashmir	Kathua	2 years 1 month 14 days

the best districts across the country, 5 and 6 represent what are among the worst and 3 and 4 represent districts somewhere in between.

Thus there are 2 districts each that are top, bottom and average performers. Note that the values of the mean represent a snapshot, i.e., the case duration as on the date of downloads and would have changed now. However, that is immaterial to our analysis. Several interesting observations emerge:

1. Not all districts are equally good or bad in terms of the average case duration. While we have a district in Sikkim that takes less than a month on average, there is a district in Jammu & Kashmir that takes more than 2 years. At the national level, the Supreme Court can dig deeper and understand if there are any procedural and context-independent measures or factors in Sikkim that can be used by the rest of the country.
2. A district in West Bengal is among the toppers, and another is only an average one when it comes to average case durations. The action item here is even simpler. Both come under the jurisdiction of the same high court, and the high court can do a study to identify any best practices of Paschim Medinipur that the rest of the state can adapt and adopt. Envisaging this is simpler than the action item of 1) since one doesn't even need to go out of the state high court, thus making it easier to explore and convince stakeholders.
3. There is a full range of case durations. The variations emerge across high courts, pointing to the fact that there are bright as well as dark spots everywhere. The implication then is that no jurisdiction is totally disappointing. Across the country, there are potential improvements to leverage.

Now, one can argue that means (averages) do not represent the full picture. What really matters is the performance of the "tail", to borrow from statistics. That is, how are the worst cases, i.e., with the highest case durations doing across the districts. Table 3 presents some relevant data to address this concern. The results represent the percentage of cases with durations of more than 3, 6, 12, and 36 months. So, the higher the percentage, the worse the situation in terms of delays. Again, representations are taken from the entire spectrum. There is some consistency with Table 1 in the sense that Sikkim performs well even on this metric,

Table 3: Tail bounds for districts across the country

State	District	Percentage of cases taking more than			
		3 months (%)	6 months (%)	1 year (%)	3 years (%)
Overall Average		60.2	47.9	31.1	6.3
Telangana	Hyderabad	89.7	80.0	61.7	16.2
Uttar Pradesh	Barabanki	77.8	76.3	71.9	4.8
Jammu & Kashmir	Kathua	82.9	72.9	58.5	25.2
Jammu & Kashmir	Anantnag	18.1	12.1	8.2	2.4
Sikkim	South Sikkim	14.4	8.0	3.3	0.1
Sikkim	West Sikkim	8.5	4.2	2.0	0

and Telangana has representation among the worst performers. However, there are no seeming anomalies of the same high court (state) hosting districts among both the toppers and the laggards. However, the key point of performance varying significantly across districts in the country is still valid. And so is the action item of undertaking studies to dig deeper to explore relevant interventions for the exchange of best practices.

To summarise, the following implications emerge from our analysis that can be utilised for peer learning, exchange of best practices and further exploration of other methods, as indicated later in this chapter:

- Courts with jurisdiction in Uttar Pradesh (UP) and Madhya Pradesh (MP) states perform well overall with respect to the multiple metrics used in the study.
- Maharashtra and Telangana are two states, among the bigger ones, that need improvement on the metrics of this study. For example, Maharashtra districts have high case duration and tail bounds, and all but 2 districts lie in the bottom half of these metrics among all districts of the country.
- Sikkim is a star performer on these metrics, with 4 of its districts among the top 20. To what extent is this due to its small size, however, is a question that needs deeper investigation.
- Among large states, Bihar presents an interesting dichotomy: despite good performance overall in mean case duration, some districts have high tail bounds. This points to the fact that while there are a good number of well-performing districts, some have particularly large challenges. This needs further studies to understand and cull out any useful insights.
- Some States show high variation between districts: UP has at least 1 district in the top 20 from the point of view of mean case duration, and those are in the bottom half. Similarly, Karnataka has districts on both ends of the spectrum. All of this further buttresses one of our key points of the need and potential benefits of peer learning.

We conclude this section by making some important remarks. Case duration is not the only metric to determine well-performing states. They do not really account for judgement quality. However, it is a metric to consider for policymakers, and the results should only be taken in that spirit. Further, the analysis and interpretations are not intended to be conclusive. They only point to directions and potentialities that need to be further explored before any policy or executive changes are made.

Variation with the Litigant Type

This section investigates the relationship between types of litigants and the mean case duration. It is based on the work done during an undergraduate thesis submitted at IIT Delhi[17]. The fundamental premise underlying this work is to analyse if the type of litigants has any bearing on the case durations, and the findings do reveal interesting insights. The overall methodology is as follows:

- **i.** Extract the litigant type from the case summary shared in Figure 1 using Python as shared in section 2,
- **ii.** Place them in one of the 5 classes:
  - *Government (G),*
  - *Private sector entities Domestic (PD),*
  - *Private Entities International (PE),*
  - *Non-profit entities (NP), and*
  - *others,*
- **iii.** compute the mean case duration of each case in each category, and
- **iv.** Through hypothesis testing using ANOVA and Mann-Whitney U Test, infer whether the case duration varies across these classes and whether differences, if any, are also influenced by geographical regions.

The classification into classes using the litigant information as shared in Figure 1 is done using the following categorisation:

- **a.** Government (*G*): includes Police, Public Sector Undertakings (PSUs), Central, State and Local governments through keywords such as *state, prosecutor, police, PS (Police Station)* and *officer*;
- **b.** Private Domestic (*PD*): Publicly and Privately held companies through keywords of the type *corporation, ltd, m/s, Messrs, partnership, firm* and *enterprise*;
- **c.** Private International (*PI*): through keywords such as *LLC, LLP* and *Inc*;
- **d.** Non-Profit Entities (*NP*): through keywords that include *Societies* and *Trusts*.

Further, the categorisation is either based on string matching or basic Natural Language Processing (NLP) methods such as *word2vec*. The analysis reveals that differences in mean case duration across litigant types are statistically significant, and it also depends on whether the litigant type is a responder or a petitioner in

the case. Further, the case disposal time also depends on the region where the case is filed. For instance, the duration for a *PD* or *NP* litigant is likely to be more than that of a *G* litigant. Similarly, the duration for a litigant in the *other* category is likely to be greater than both *G* and *PD*. These findings can be studied further to determine whether the difference is due to the resources that can be mustered by the litigant, due to the relevant acts, or just sheer judicial procedure corresponding to them. In any case, the action item still is to identify best practices, if any, and explore other data-based solutions, an example of one of which is presented in the next section.

Efficient Reallocation

The underlying idea being explored in this section is whether reallocation of resources and redistributing them within the given constraints can improve the system's performance.

A detailed mixed integer linear programming model [18,19] is developed along with an optimisation formulation[20] to identify the required number of judges (optimal) for the respective districts and courts to maximise the number of cases disposed. The model works in two stages, with the following five constraints in the first stage:

- **i.** The disposal of cases for each type cannot exceed the sum of pending and instituted cases for a particular year,
- **ii.** The disposal of cases for each case type is at least a given proportion (Clearance rate. of the instituted cases and cases are picked irrespective of the high or low rates of disposal,
- **iii.** The number of judges across the districts of each category must be equal to the number of judges of the same category,
- **iv.** The total number of judges across the districts must not exceed the permitted number of judges,
- **v.** Every district should have at least one judge for the respective category.

In the second stage, more constraints are added to identify the possible disposals of all case types:

- **i.** Possibility of the judge transfer is verified and checked with the obtained values,
- **ii.** The number of recruits cannot be more than the difference between the required and initial judges, and recruitment takes place when the judge number is more than the initial judges,
- **iii.** Recruitments cannot exceed the sanctioned recruitments in the considered judge category,
- **iv.** New judges are not added if there is a surplus and cannot leave if there is a deficiency,

v. Identify the balance of the flow of judges from each category of district and judge,
vi. No surplus judges in any category of a district,
vii. Ensuring an overall balance for the judges across the districts,
viii. Transfer of judge is only in one direction i.e., if one judge is out, there is no coming in of another judge in the same district,
ix. The transfer of the number of judges in each district is not more than the surplus or deficit,
x. The number of disposals in each district for each case type is not more than the sum of instituted cases and the ratio of cases pending and time to dispose of them.

The annual data of the cases disposed of in the courts with a minimum number of judges is collected from the National Judicial Data Grid (NJDG)21. Considering the real-time data of the courts, an analysis is conducted to improve the case disposals through optimal reallocation of judges to the courts thus potentially improving justice delivery. Table 4 provides information on the current judge strengths from eleven district courts in Delhi, India. The model attempts to determine whether optimal reallocation decisions in the district and session courts can improve performance. The analysis is performed on the 2020 data to avoid the effects of the pandemic.

The objective is to determine the optimal number of judges required for each court under different categories. It is assumed that both transfers within districts and recruitments are possible to achieve the optimal requirements. The results for the model run under various scenarios are presented in Table 5. Scenario 1 represents the "no-recruitments", and scenarios 2 through 4 represent recruitments while still remaining within the sanctioned strength.

Two key points emerge:

- Even without any new recruitments, merely by transferring judges within districts, an improvement in the number of cases disposed is possible. At a strength of 668, well within the sanctioned strength noted in the *Indian Judiciary Annual Report 2018-19* published by the Supreme Court of India, the optimal clearance rate starts touching 1.0, and then there is incremental improvement beyond that as well,
- Further, this is an ongoing project at the DAKSH Centre of Excellence for Law and Technology at IIT Delhi and needs more information and investigation for implementable findings, but points to potential improvements assuming that the snapshot (in terms of case disposal rate) represented by the current numbers can be extended to the situation where the number of judges changes across case types and districts. Thus, taking a cue from the analysis presented in the previous two sections, since not all categories of cases share the same performance and case inputs, balancing the caseload among them can lead to possible improvements.

Table 4: Number of judges in various courts of Delhi before optimisation

Judge category/ district	Central	East	New Delhi	North	North-East	North-west	Shahadara	South	South-East	Sout-west	West	Total
Family	2	2	1	2	2	2	2	1	2	2	3	21
MACT	2	1	1	2	1	1	1	1	1	1	2	14
Civil	71	20	24	20	11	21	18	26	30	32	36	133
Criminal	33	8	11	8	5	9	7	10	14	10	18	309
Total	108	31	37	32	19	33	28	38	47	45	59	477

Table 5: Optimal solution for the scenario with transfers within the districts

Scenario	Maximum strength	% increase in the strength	Disposals (optimal)	Improvement in disposal	Optimal clearance rate
1	477	0	476832	6399	0.78
2	573	20	564930	94497	0.92
3	668	40	609054	138621	0.99
4	764	60	611990	141557	1.00

Conclusion and Future Work

The details in this chapter provide the researchers with an insight into the differences in judicial performance across various categories and its implications as well as a possible way to leverage that through an investigation into judicial resources. Although the findings indicate that potential benefits are using OR methods in response to the picture painted by these datasets, there is a large scope for further investigation into the datasets and models developed here. Accordingly, further studies can consider the following dimensions: legal types that involve acts, case proceedings, and other factors relevant to the case flow process or the overall efficiency of the judicial process. Subsequently, any implementation mechanism once the findings are vetted and found relevant, will necessarily be the key stakeholders of the judicial system.

Editors' Comments

Next, this part of the volume ends with a discussion of some hacks of statistics: All analytics depends on data processing and analysis. Accordingly, a chapter to highlight some key and fundamental concepts while dealing with data is in order. The next chapter serves this purpose by bringing forth the pitfalls that must be avoided while leveraging data for decision-making.

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CHAPTER 18

Mastering the Evidence: The Lawyer's Essential Guide to Data Analytics

Murali Neelakantan and Ashish Kulkarni[1]

"Data is the sword of the 21st century, those who wield it well, the Samurai."

– Jonathan Rosenberg, American technologist

SUMMARY

- There is a long-standing belief in the judicial ecosystem that data is definite and represents the truth;
- One can go a very long way by learning the art of asking the right questions using statistical analysis;
- Averages can be misleading, and dangerously so;
- Sampling is a tricky thing. And nowhere is this more applicable than in the case of DNA testing as evidence;
- An estimate arrived at by studying a sample is never the same as studying the population.

Introduction

This quote may surprise the legal community since the law curriculum completely ignores data analysis. It is almost as if data analysis is mathematics and therefore unnecessary for lawyers. Some would observe that lawyers have been able to get by without any understanding of mathematics and statistics and therefore do not need it. We disagree. We maintain that the lack of a basic understanding of data

analysis causes injustice. The law claims that it deals with facts, and is not concerned with complicated theoretical equations. But that gives rise to an interesting question? When is something a fact? When is a fact said to be proved?

The Indian Evidence Act, 1872 tells us that a fact is "said to be proved when, after considering the matters before it, the court either believes it to exist or considers its existence so probable that a prudent man ought, under the circumstances of the particular case, to act upon the supposition that it exists."[2] Over a 100 years ago, Nathan Isaac said, "... at some point the law must draw a line and say that some sort of ascertainment shall pass for the truth. Thus, even in connection with the visible and tangible facts of a particular case, it is a constructive truth – the verdict of a jury or the findings of some other tribunal – subject to more or less arbitrary rules of evidence, that must pass as the unchallengeable truth. The difference is only in degree, and the only criticism that can be offered against any particular mode of deciding any question of fact is that the arbitrary line is drawn back too far from the realm of realities."

We believe that data analytics using rudimentary statistics can help us understand where the aforementioned line is and how far away it is from the realm of reality. There is a long-standing belief in the judicial ecosystem that data is definite and represents the truth. The idea that uncertainty pervades every aspect of our existence and that we ought to think probabilistically is absent from the legal system even though the Evidence Act commands us to think about it carefully. But the very process of marshalling facts involves choosing relevant data from observed and relevant reality and interpreting that data into facts that are relevant to the case. This involves an understanding of the principles of statistics and therefore being a student of statistics is crucial for a law student.

Statistics makes this 'construction' of the truth an objective and the 'line' is consistent when it comes to the application of statistics. Wikipedia defines statistics as "...the discipline that concerns the collection, organisation, analysis, interpretation, and presentation of data."[3] Statisticians often ask if their field is art, science or perhaps both.[4] In our opinion, it is more of the former than the latter, but that being said, it is possible to systematise one's approach to working with data. Such systematisation doesn't lead us to a world with no errors, but a world where errors can be understood and minimised[5].

The principles and key ideas of statistics can be taught to and learnt by everybody. While the more arcane calculations are perhaps best left to qualified experts, the principles of statistics require nothing more than common sense. One can go a long way by asking the right questions using statistical analysis when presented with data or analysis based on data. Asking these questions and interpreting the answers can help in minimising the chances of error when arriving at a judgement based on data.

Our goal in this chapter is twofold. First, we outline key principles that underpin statistical theory that can be used for data analysis. We do so using only words, with the occasional sprinkling of equations or diagrams. These principles are easy

to explain, understand, and apply. We build an outline of the principle, explain its importance, and provide examples where the application (or misapplication) of the principle was key to a sound (or otherwise) judgment. These examples are drawn from the field of law and beyond.

Next, we use these principles to recommend a syllabus for the study of data analytics using statistics at law schools across the country. This isn't a radical new idea - "For the rational study of the law the blackletter man may be the man of the present, but the man of the future is the man of statistics and the master of economics."[6] Such a syllabus is easily designed and implemented. More importantly, we hope to be able to prove in the course of this chapter that studying statistics is inevitable as a tool for data analysis for members of the legal profession. We hope that lawyers and judges will be able to use these tools to translate sets of numbers into words and decide if the data presented to them is relevant, proves a fact, or otherwise.

We then outline the 10 principles and explain why they are important with the help of legal cases where these principles were either successfully applied, or unfortunately ignored. Further, we also illustrate examples from outside the legal profession for better comprehension and recollection.

The Hacks

In this section, we build an outline of a syllabus on statistics that can be taught at every law school across the country. The syllabus will require no knowledge of mathematics beyond what has been taught at the high school level. We also explain the urgent need to introduce such a syllabus at the earliest possible opportunity in law school curricula given that we are, in the opinion of Justice Holmes, already late by about a century. The final section concludes with some suggestions of how one may proceed, along with some foreseeable limitations and problems.

1. When is a 'fact' a fact?

The onset of winter in Delhi is a guarantee of three things 1) A gradual but distinct drop in temperatures, 2) The advent of the famed wedding season, 3) Smog. Visibility is non-existent during this season and the smog affects the health of the residents of Delhi. Consequently, the government and courts[7] have taken a keen interest in the matter, though the resolution is not easy.

It is difficult to accurately determine the underlying cause of smog. Reasons put forth include firecrackers during Diwali, air pollution from factories and vehicles, harsher winters, and the burning of crop stubble in Punjab. Stubble burning is a process of setting fire to the straw stubble left after the harvesting of grains, like paddy, wheat, etc. It is usually required in areas that use the combined harvesting method, which leaves crop residue behind. Consequently,

acres of farmland are set on fire at the onset of winters in northern India, with entirely predictable results – heavy smog. Apart from announcing a few schemes, the Punjab government is not enthusiastic about footing the bill for whatever new equipment may be required to get farmers to give up on stubble burning. The Delhi government is naturally chary of footing the bill and so the problem continues to burn.

Eventually, the issue reached the Indian courts and senior Supreme Court counsel and Solicitor General Tushar Mehta informed the court that stubble burning accounted for only 10 per cent of the capital's Particulate Matter (PM) 2.5 pollution.[8] How do we verify whether the Solicitor General's statement is true? How do we ascertain the relevance of this statement to the problem? And finally, how do we determine if the statement can, and should be, modified to make it relevant?

Let's use another example for the sake of clarity. If someone were to tell you that the road outside your house has an average traffic flow of 100 vehicles per hour, would it strike you as a reasonable estimate? Would you therefore assume that 100 vehicles per hour is a good estimate, no matter the time of day? This is in fact, an important exercise, and the data from it forms the basis for drawing up tenders for roads. And then there is electricity demand. Can the electricity demand be the same throughout the day or is it likely to rise and fall depending upon human traffic? Is there a difference between urban and rural areas? The data generated from these answers help compute load factors for power plants and fix electricity tariffs. In fact, there is a separate tribunal for these matters.

Even if one were to assume that the statement about stubble burning contributing to only 10 per cent of PM 2.5 pollution is true, is it relevant? Analysis suggests otherwise.[9] Averages can be misleading and dangerously so. As Nassim Nicholas Taleb is fond of saying, 'Never wade across a river that is on average four feet deep'.

Finally, the report says: "It is like presenting the annual concentration of methyl isocyanate gas in Bhopal's air and then concluding that the leak on the night of 2-3 December 1984 that killed thousands was insignificant and thus, Union Carbide should not be blamed."[10] The simple principle at play when it comes to data analysis is this: Asking about the validity of a statement is only half the battle. Asking about its relevance, and asking if the submitted statement is the best possible description of the underlying data, is the more important question. Ask the right questions, and don't hesitate to keep on asking them.

As any statistician will tell you, there isn't ever a one-size-fits-all correct way of representing data. A person, for example, can at the same time be a mother, a daughter, a friend, a neighbour, a professional at the workplace, a student and a commuter. Which role will she use to describe herself is very much a function of the social setting she finds herself in. It is not sufficient to introduce herself as a commuter when attending a professional conference on behalf of her employers. It is a fact that she commutes daily to work, but is that fact relevant? And so it goes with data. Generating credible data is relatively easy; interpreting

their relevance to help understand the problem at hand, is more difficult to ascertain.

Take the example of the Wholesale Price Index (WPI) and the Consumer Price Index (CPI). We often see that the WPI and the CPI move in opposite directions. To begin with, index numbers are a way to aggregate information about certain phenomena, for instance, price indices aggregate information about the prices of commodities. A lot depends on these factors in index numbers: What information is being aggregated; what is the rule of aggregation; and how is information being collapsed into a single number? Two indices can show very different and distorted information based on these factors. In the case of CPI and WPI, WPI aggregates information about wholesale prices of commodities. The upward movement in CPI was guided by an increase in food costs because these items have a much higher weight in CPI (48% as against 24%). Services are another component of CPI, which is absent in WPI.

Often the price increase indicated by the CPI does not represent the actual increase in all places across India. The food CPI may have increased overall, but it is still possible that milk in Mumbai became cheaper, as compared to Chennai, at the same time. As a result, a national minimum wage linked to national CPI will hurt employees who find that actual inflation is far greater than the CPI. It is for this reason that the minimum wage is set for regions within a state. Since the actual cost of living and the impact of inflation is not uniform across India, or even within a state, linking minimum wage to CPI does not adequately compensate for inflation. This has material implications on the hundreds of cases about the fixing of minimum wage and its applicability to different classes of employees.

All aggregation is based on principles. When we aggregate data, we produce a single value but we also miss out on critical details. We must understand the principles underlying this aggregation in sufficient detail before we judge index numbers.

2. What is sampling all about?

The Statistical Research Group is a name unlikely to arouse much excitement in the minds of most people. However, this team at Columbia University had a crucial role to play during World War II. It was their job to analyse the damage done to allied warplanes in dogfights and suggest suitable reinforcements to increase the chances of survival. The team of analysts had access to planes that had returned from dogfights. These planes had damage patterns as shown in the sample below.

What this image shows us is the damage suffered, on average, by all planes in the sample. Unless you have seen the image before on social media, or have heard of the story elsewhere, the answer by the Statistical Research Group may surprise you. The group recommended that additional armour plating or reinforcements be added to those parts of the plane that had seen the least damage.

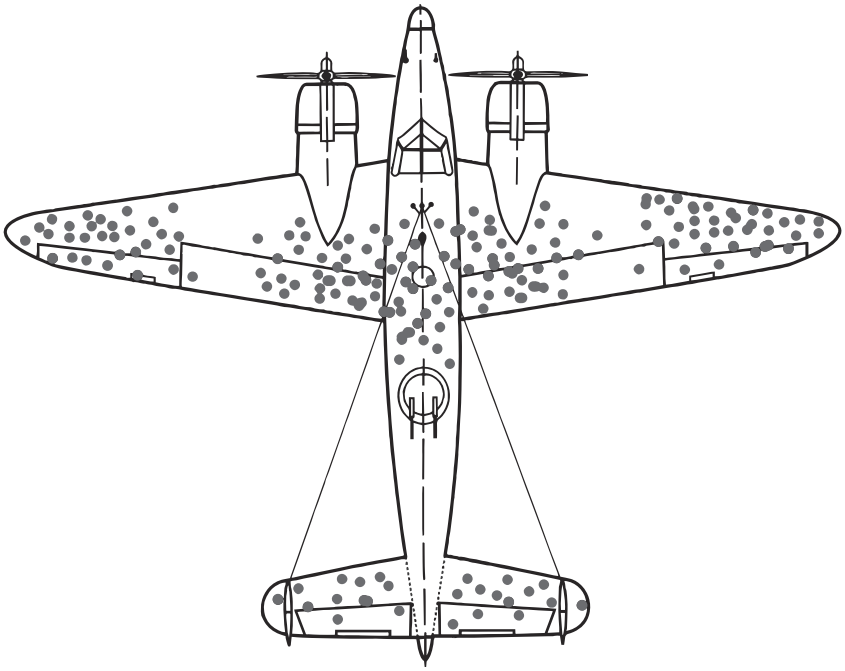

Figure 1: Damage patterns in planes[11]

Abraham Wald, one of the most famous statisticians of the 20th century, and an important member of the Statistical Research Group, had a convincing, if counter-intuitive reason. The core argument was this: Planes that had sustained damage in these parts had not made it back to the base for analysis. They had gone down in the fight. The sample consisted only of planes that had made it back. This means that the planes were able to return despite being hit. If you think carefully, the Statistical Research Group's answer is not surprising.[12]

Another example to consider is what treatment works best in the case of severely ill COVID-19 patients. The question should be answered by taking into account not just survivors, but also those who died. The name given to this phenomenon is called survivorship bias.

Sampling is a tricky thing. And nowhere is this more applicable than in the case of DNA testing as evidence. There is enough research and more, to show that DNA testing is not infallible[13] and cases abound where poor statistical understanding has led to false convictions.[14] These problems could be related to contamination of DNA evidence or a failure to utilise correct statistical reasoning. Incorrect statistical reasoning is not to be taken lightly as it can have horrifying consequences.

In November 1999, for example, an English solicitor named Sally Clark was sentenced to life in prison for two charges of murder.[15] We reproduce the case description: "The cause of death in both cases was first attributed to Sudden Infant Death Syndrome (SIDS), also known as 'cot death' in the UK. We still

do not know about the specific causes of SIDS. But suspicion against the mother rose on account of the unspecified causes for the death of two babies from the same family. Shortly after the demise of her second child, Clark was held, tried and incarcerated.

So what exactly was deemed relevant to the case built against Clark? One important factor was expert testimony provided by the paediatrician. He put the odds of two children from the same family dying of SIDS at 1 in 73 million. How did the doctor arrive at this number? For the level of affluence that Clark's family possessed, it was reasoned that the chance of one infant dying of SIDS was 1 in 8,543. The fact was that 1 out of every 8,500 infants would die of SIDS. What then, were the chances that two children from the same family would die of SIDS?

According to statisticians, the answer is whether the two deaths are independent of each other. If one assumes that they are, then the probability of two deaths in the same family is simply the multiplicative product of the two probabilities.[16] The figure we arrive at is 1 in 8,543 multiplied by itself, which is 1 in 73 million. This figure would be enough to convince any 'reasonable man' that the deaths could not have been a coincidence. On the other hand, if the two events are not independent of each other — for genetic or environmental reasons that we are not aware of just yet — then it is possible that several children from the same family may die of SIDS. In fact, doctors say that the likelihood of another SIDS death increases when the family has already seen one such death.

Clark's conviction was overturned on her second appeal, and she was released from prison. She died four years later". Another example worthy of discussion is the State v. Soto.[17] The defendants, in this case, moved to suppress evidence from traffic stops resulting from discriminatory enforcement of traffic laws. The motions were granted.

Sampling errors

What is the average height of the Indian female? You would soon realise that a definitive answer simply is not possible as it would mean measuring the heights of all women in India, an impossible exercise. Impossible for two major reasons: (i) Even with an army of assistants it would take far too much effort, time, manpower and money, (ii) 'All' women would never be a static list as births and deaths are an ongoing process.

So, statisticians construct a sample. A sample by definition is smaller in number than the entire population, and therefore more easily assembled, measured and verified. What we gain in convenience and tractability, we lose out in terms of thoroughness and surety. An estimate arrived at by studying a sample, no matter how carefully constructed, is never the same as studying the population. And when conclusions from the sample lead us astray about the features of the population, we get what is known as sampling error. No matter how perfect a sample you construct, you will always have sampling errors. The question then is, how big is an error and in which direction?

What are the errors implicit in sampling? The answer lies in two different, but related topics: Specificity and sensitivity. Given the experiences of the last two years or so, almost everybody is familiar with a Rapid Antigen Test (RAT) that can be self-administered at home to find out if one is infected with the COVID-19 virus. If the result of the RAT turns positive does it mean you are infected with the virus? Or is it a false positive? If the result is negative, does it mean you are not infected with the virus? Or again, is it a false negative? Specificity and sensitivity help us in answering these questions. Sensitivity is sometimes referred to as the 'True Positive Rate'. Simply put, it is the probability that the test result turns out to be positive, given that you are infected with the virus.

Specificity, on the other hand, is the probability that the test result turns out to be negative, given that you are not infected with the virus. Consider Figure 2[18]:

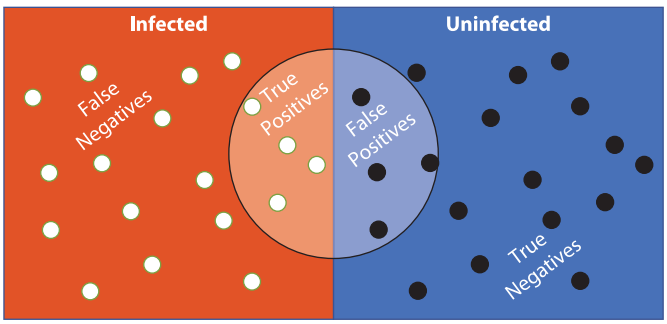

Figure 2: Statistical Errors[19]

Some definitions of the terms in the diagram are:

- A False Negative is when an infected individual returns a negative result.
- A True Positive is when an infected individual returns a positive result.
- A False Positive is when an uninfected individual returns a positive result.
- A True Negative is when an uninfected individual returns a negative result.

One way to make sure that all infected individuals are detected correctly is to ensure that all tests come back positive. Unfortunately, this will also mean that uninfected individuals will show up positive as well (false positives). Specificity therefore implies, how specific is the test in terms of detecting as positive only those who actually have the virus. The True Positive Rate then becomes the following:

$$TPR = \frac{TP}{TP + FN}$$

While the False Positive Rate is:

$$FPR = \frac{FP}{FP + TN}$$

For law students, the concept ought to be very familiar indeed. In *Selvi & Ors v. State Of Karnataka,*[20] it was stated that errors associated with polygraph tests are either 'false positives' or 'false negatives'. In the first case, the results show that a person has been "deceitful" even if the answers to the test are true. A 'false negative' occurs when misleading responses are held as true. "On account of such inherent complexities, the qualifications and competence of the polygraph examiner are of the utmost importance."

From the point of view of statistical theory, it is worth asking some questions in this case. Would repeated sampling have made a material difference? Therefore, should the person have been subjected to multiple lie detector tests and not just one? If so, how should we factor in fatigue on the part of both the subject as well as the person administering the test? If different people are administering the test, to help avoid fatigue, are the results comparable? What about the questions in the test itself? Are they appropriate and suitable and on what basis? Would different questions yield different results, and if so, how should these results be interpreted?

There are no easy answers to these questions, and indeed, some of them may even prove to be indeterminate. Our point is that if a judgement is to be made based on these facts, then one must ask if these are indeed facts 'beyond all reasonable doubt'. In the case of a lie detector test, we would argue that the questions become, if anything, even more pressing than usual. Back to our charts. Now consider the same picture, but with labels that are more familiar in a legal context, in Figure 3:

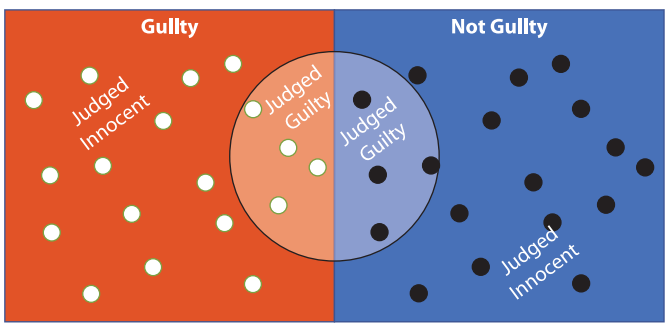

Figure 3: Statistical errors framed in a judicial context[21]

So, a sampling error occurs when an analysis to reach a conclusion about a population is undertaken based on a sample that is not representative of the population. Trying to arrive at the average height of all Indians by measuring the height of basketball players in all Indian cities, for example, will almost certainly result in

sampling error. While there exist ways and means to objectively measure sampling error, the purpose here is to help the reader understand what sampling error is, and how to develop a framework which assesses if a sampling error exists in the dataset. What follows are simple questions about the data.

- Ask for a description of the population for which the data is being collected.
- How has the data been collected? Has it been collected over the telephone,[22] over email, or in person?
- Why was the method used deemed to be the best? Were other methods considered? Have potential biases that may emerge as a consequence of the collection methodology been considered?
- Was the data collected at a particular time of day, a particular day of the week, or during a particular time of the year? Will this lead to a bias? (For example, measuring road traffic density on the weekends is likely to give biased results).
- Always ask to see a copy of the questionnaire, and make sure that the text of the questionnaire does not have a bias.[23]

The feel for whether the data looks right or otherwise develops as you work on it. This may be an imperfect approach, and errors are possible, especially by 'experts' who fail to notice them.[24] A series of checks about the quality of data is always advisable.

Correlation is not Causation

Causation has been the subject of many philosophical treatises, right from the time of Aristotle,[25] if not earlier. David Hume and Emmanuel Kant,[26] among others, have written at length on the subject, but it remains poorly understood among statisticians, philosophers, and others. Consider these charts taken from Tyler Vigen's excellent website dedicated to this topic in Figures 4 and 5:

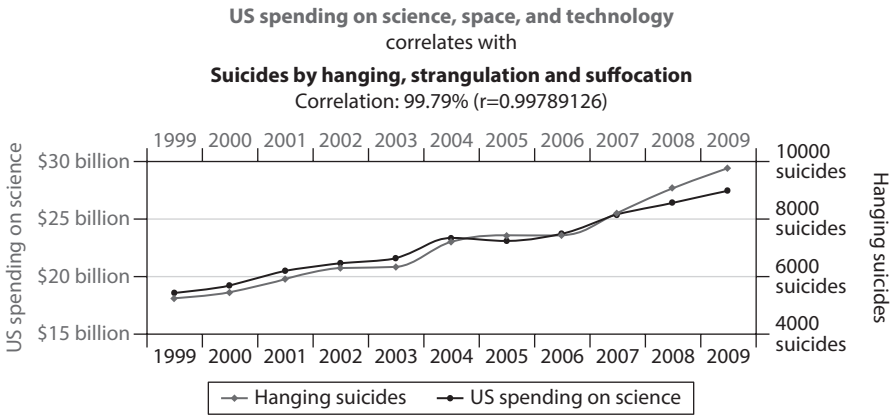

Figure 4: Causation and correlation[27]

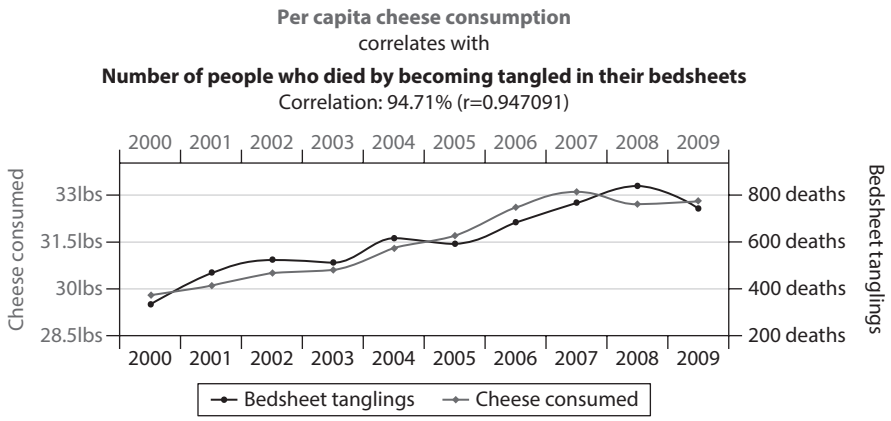

Figure 5: Causation and correlation further explained[28]

As you can see there is near perfect correlation between the two series shown in each chart, and it may be trite to point it out, but one could not possibly cause the other. This is what one means by the title of this section that correlation is not causation. There exist several websites, textbooks, videos and podcasts that explain the many fallacies that can arise as a consequence of poor understanding of causation, and we list some of them in an appendix at the end of this chapter. To reiterate – correlation is not causation.

Consider the legal controversy over Benedictin, the market leader for morning sickness in the 1980s. It was around this time that a substantial number of cases against the manufacturer Merrell Dow Pharmaceuticals surfaced, alleging that the drug caused birth effects. Several studies in the late 1970s and early 1980s affirmed these lawsuits, associating the use of Bendectin with certain birth defects. This is a classic example of correlation not being causation. We borrow from an existing case[29] and reproduce it here: "Bendectin (Doxylamine/Dicyclomine/Pyridoxine) was widely used for the treatment of nausea and vomiting during pregnancy until 1983. A meta-analysis of the 16 cohort and 11 case-control studies gives us an idea of the relative risk of malformation at birth associated with Bendectin exposure. The pooled estimate of the relative risk of any malformation in the first trimester was 0.95 (95 per cent Cl 0.88 to 1.04). For cardiac defects, central nervous system defects, neural tube defects, limb reductions, oral clefts and genital tract malformations, the pooled estimates of relative risk were in the range of 0.81 for oral clefts to 1.11 for limb reductions. Barring two categories, tests for heterogeneity of association showed that all studies were estimating the same odds ratio. In other words, the results show no difference in the risk of birth defects between those babies whose mothers had consumed Bendectin during the first trimester and those babies whose mothers had not".

This kind of analysis is used in drug and vaccine evaluation in clinical trials. How many patients with what kind of diversity would be a representative sample for the trial? What is a significant result and what are the conclusions drawn from

the trial data? If a drug is to be approved for use, what are the risks and how does one mitigate them?

Given the events of the last two years, the statistics associated with clinical trials take on even more urgency than usual. In a recently conducted study,[30] it was found that at least 50 per cent out of 47 randomised clinical trials would have been statistically insignificant if only four events were to be reported differently. In other words, the result is not nearly as significant as one would have thought.

Thinking about Probability

Thinking probabilistically is a tremendously difficult thing to do, but also crucially important. For example, in *Syad Akbar v. State of Karnataka*,[31] "the Supreme Court dealt with, in detail, the distinction between negligence in civil law and in criminal law. It has been held that there is a marked difference as to the effect of evidence, namely, the proof, in civil and criminal proceedings. In civil proceedings, a mere preponderance of probability is sufficient, and the defendant is not necessarily entitled to the benefit of every reasonable doubt. But in criminal proceedings, the persuasion of guilt must amount to such a moral certainty as convinces the mind of the court, as a reasonable man, beyond all reasonable doubt."

The statement has intrinsic clarity and is generally accepted by lawyers to be true. But if this statement were to be expressed in statistical terms, what percentage of probability would be 'beyond reasonable doubt'? Also, does the probability need to be more than 51 per cent for it to be a 'preponderance of probability'? Remember, judgments issued based on these calculations have a chance (by definition, since we are talking about probability here) of being wrong. Should we, as students of the legal system, be satisfied with a 50 per cent chance of being wrong?

The correct answer is that all facts and human experiences cannot be represented by data and cannot be subject to statistical analysis. In addition, all facts and human experiences may not accurately be represented by data. However, the comparison should not be based on some theoretical, Utopian description, which is uncertain. Such a world does not exist, and likely never will. In the world in which we live, risk and uncertainty will always exist. Statistics help reduce this risk and uncertainty, quantify it, and bring an element of objectivity. Relative to the status quo, we argue that it is indeed worth our while to subject the available data to statistical analysis.

Here is a problem to think about:

> *Linda is 31. She is single, outspoken and bright. She majored in Philosophy. As a student of philosophy, she was moved by social discrimination and injustice and joined anti-nuclear protests.*
> *Which is more probable?*
> *Linda is a bank teller.*
> *Linda is a bank teller and is active in the feminist movement.*[32]

This example, perhaps the most famous of its kind, was originally devised by Kahneman and Tversky, and if you chose the second option, you chose the incorrect one. The error is, in some sense, understandable. The description of Linda almost forces one to choose the second option,[33] but a little thinking helps us realise that the second option is always going to be less likely than the first one, for the second one is an intersection event. Recall your high school lessons in drawing Venn diagrams, and try answering the question again.

Consider another very famous example: You are a participant in a game show. There are three doors in front of you and behind one of the doors lies a brand-new sports car, which will be yours, if you choose the correct door. Behind the other two doors are goats. The game show host, who just so happens to be named Monty Hall, asks you to pick a door. Keeping your fingers crossed, you pick (say) Door 1. Monty Hall then proceeds to open one of the other two doors and shows that behind it is a goat. There now remain two unopened doors: the one that you chose, and one other. Monty Hall now asks, 'Do you wish to change your choice, or do you wish to stick with your original choice'? One might think that with two doors remaining, the chance is evenly split between both doors, but you would be wrong. There is only a 1 in 3 chance that your original choice is correct, while there is a 2 in 3 chance that the car is behind the door that you did not originally choose. How is this so?

There exist many possible ways to help resolve the apparent paradox. Here's just one: What if there were a million doors instead of three? The chance that you picked the correct door in the first instance is literally one in a million. That is, it is all but a guarantee that you picked the wrong door. Now, what if Monty Hall opened all of the other doors except one and revealed goats behind all of them? Would you still stick to your original choice, or would you prefer to switch? And if you prefer to switch in this case, well, the original problem with three doors is simply a milder version of the same principle at work.

Both these examples demonstrate that all of us struggle to think systematically about issues related to probability. If it is any consolation, the first time the Monty Hall problem was discussed in a public forum, PhDs in statistics got it wrong and refused to accept the irrefutable logic behind the correct solution.[34] It is only a matter of time before law students either hear or use the phrase 'beyond reasonable doubt', or the other phrase, 'the preponderance of probabilities'.

What exactly do these terms mean? Are they context-dependent, and if so, on what basis do they change? Is our understanding of these phrases the same as yours in a quantitative sense? An understanding of the principles and laws of probability is indispensable.

Keeping a list of simple questions handy is of great help in sidestepping potential pitfalls in issues related to probability. The questions are:

- Are the basic laws of probability[35] being violated?
- Can I visualise the problem I'm trying to solve as a Venn diagram?
- Can I think of a simpler version of the problem?

Probability is not an intuitive subject, and the best among us are prone to the occasional slip-up when dealing with it. But a little reflection does go a very long way in getting answers.

Another point about probability is that a student of statistics needs to understand the intuition behind a seemingly innocuous phrase – probability distributions. Rather than get into the technicalities of what probability distribution is, answer this question: When is the traffic on the street outside your house at its busiest?

Your answer, more likely than not, will be that it is at its peak when people leave for work in the morning and when they return home in the evening. Saturday evenings may also be a little busy. On the other hand, Sunday mornings are likely to have light traffic.

If we had to visualise what we just discussed it would go something like this: Imagine a horizontal axis that starts at midnight and has 24 notches with each notch representing an hour. The vertical axis will represent traffic density. The graph will be fairly flat and low until around 6 am or 7 am, after which it may begin to rise up. The graph may peak at around 11 am and then fall until around 5 pm, at which point it might inch upwards again. After a quiet four to five hours the graphs will fall to their lowest levels around midnight. You may have seen this on Google Maps.

A mathematical description of this phenomenon is referred to as a distribution. These distributions can take many forms, and some of the more typically occurring forms often have entire chapters devoted to them in statistical textbooks. If you have heard of terms such as the bell curve, the Gaussian distribution, the normal distribution, or indeed the chi-square, the t-distribution and the f-distribution, this is what they mean in practice. Of course, statisticians don't stop there. There is a bewildering variety of distributions lying in wait in more advanced courses. But for the moment, it suffices to understand the idea behind what a distribution really is. Distribution is a mathematical description of all possible events and the probability of their occurrence. But what does this mean in practice? Consider the graph in figure 6:

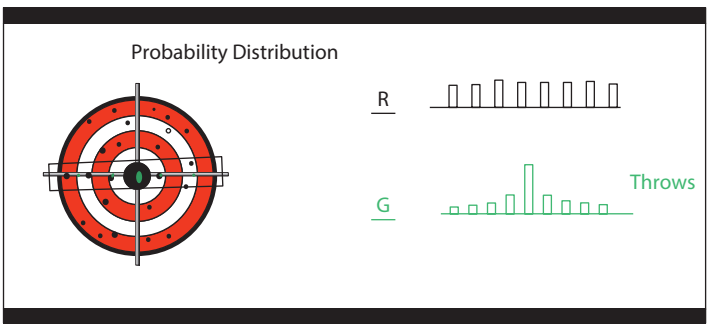

Figure 6: Probability distribution[36]

What you're looking at on the left is a dartboard. Imagine two students who step out for a couple of drinks on the weekend – let's call them Rahul and Girish. Rahul, unfortunately, isn't that good at playing darts; Girish is better. Rahul's darts are shown in black, while Girish's are in green.

As you can see, Rahul's throws are all over the dartboard, rather than being clustered around the bull's eye. In the language of statistics, we say that Rahul's throws have high variance, or high standard deviation.[37] Girish's throws are more tightly clustered or have low variance and low standard deviation.

Now take a look at the figures on the right-hand side in that picture, especially the one in green. These depict Girish's throws, and the bar in the middle is the number of times Girish manages to hit the bullseye. A little away on the left-hand side of the first concentric circle outside of the bullseye is a bar on the left of the bar that represents the bullseye. On the right-hand side of the first concentric circle outside of the bullseye is the bar on the right of the bar that represents the bullseye. What this distribution[38] represents is that Girish is more likely to hit the bullseye and even when he misses, he comes close enough. His wild misses are relatively rare. In the language of statistics, his throws are normally distributed.

Rahul, on the other hand, is likely to hit any part of the board. There is none of the pleasing bell-shaped symmetry in the case of his chart, and we would therefore say that his throws are not normally distributed.[39]

Think intervals, not points

What follows is a little drama enacted in most households in India, and certainly was in mine. The walk back home after the mathematics exam would always be one that involved deep trepidation and marked reluctance on my part, for it was only a matter of time before 'The Conversation' took place:

> My father would ask with studied casualness, "How did the exam go?"
> "Fine," would be my cautiously non-committal response.
> "Hmm," he would say before the heavy artillery was wheeled out. "And how much do you think you will score?"
> How does one answer a question like this if one's aptitude for the subject is not particularly good?
> "I think I'll pass with good marks," would be my weak attempt to let the matter lie, but it has not worked in all of recorded history.

The correct answer – between 0 and 100 – was wholly unsatisfactory. What my father was seeking was a narrower range, and preferably a single number. This, in a nutshell, is the difference between a point estimate and an interval estimate, and the good news is that in statistics, an interval estimate is preferred. An interval estimate is preferred because of the uncertainty involved and a given interval is more likely to have the answer than a single-point estimate.

An oft-repeated adage in statistics is that one must think in terms of intervals rather than point estimates. Readers of detective novels are also likely to be familiar with this approach, for the time of death is usually given in terms of an interval ('no later than 5 pm and no earlier than 1 pm') rather than a point estimate.

Where statistics is concerned, there is a payoff function between accuracy and surety. And this is a point that every single child understands intuitively when it comes to guessing the outcome of an examination. The narrower (more precise) one wants the guess to be, the less certain one will be of the accuracy. And the more tolerant one is of the interval (less accurate), and the surer one is of the accuracy. 'I am 100 per cent sure that I will score between 0 and 100', isn't just a joke, but also happens to be an intuitive way to understand the importance of thinking in terms of intervals.

This point has been made in the context of a case. "On the other hand, although catch-phrases such as "beyond the shadow of a doubt", "innocent until proven guilty", etc., abound in the legal folklore, lawyers are well aware that the legal process is necessarily imperfect in the presence of the confusion and uncertainty which is characteristic of the real world, and that, if the process is to operate at all, small numbers of errors of the first type and the second type must be permitted to occur." It goes on to add that "statistical methods of making decisions and of evaluation of evidence" under uncertainties "should be most appealing and convincing to legal professionals".[40]

Here's a simple checklist in the case of interval estimates vis-a-vis point estimates:

1. If an analysis involves a point estimate, ask if an interval can be constructed around it.
2. If an interval estimate is submitted, ask about the associated confidence level.[41]
3. Appreciate the fact that there is a payoff involved between the first two points – as our example of the mathematics paper makes clear – and that there is almost always no way to optimise both at the same time.
4. The tolerance in either case is a function of the particulars of the case at hand, and this is where the judgement of the statistical expert has to come into play.

The Central Limit Theorem

A very large part of statistics involves the idea that conclusions that can be drawn based on a sample can be extended, within reasonable limits, to the population. That is, studying only a small subset of the population can help us understand the characteristics of the entire population. For instance, exit polls arrive at a result of how an entire population will vote by asking a very limited number of people.[42]

The question that presents itself is how can we possibly justify concluding millions by interviewing only a few hundred? The answer involves one of the most remarkable concepts to be found in statistics: The Central Limit Theorem.

There are many technical definitions of the Central Limit Theorem, but here is one restatement that should suffice.

1. Imagine a population that requires analysis. Say, for example, we would like to find out the weight of all lawyers in Delhi who also happen to play basketball on weekends.
2. We do not assume the nature of the distribution of these folk. It may be bell-shaped, with most people's weight being centred around a particular value, or it may be tilted to one side – skewed.
3. We take a sample of 30 people from this population and calculate their average weight. Let's call this $Average_{1.}$
4. We take another sample of 30 people from this population and calculate their average weight. Let's call this $Average_{2}$.
5. We do this, say, 50 times, with the 50th such exercise giving us an average of 50.
6. The Central Limit Theorem states that these 50 averages, $Average_{1}$ to $Average_{50}$, will be normally distributed.[43] That is to say, regardless of whether the original population of lawyers in Delhi who happen to play basketball is normally distributed or otherwise, the averages of repeated samples taken from this population will be normally distributed.[44]
7. The blue graph for instance shows the distribution of averages of 10 samples (Average1 to Average10) where each sample has 30 randomly chosen people.

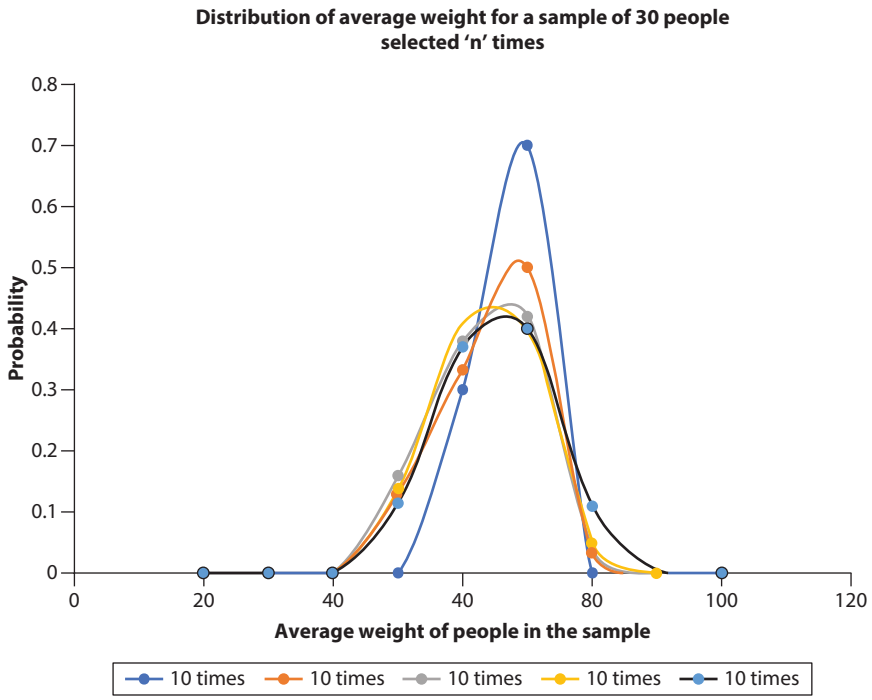

Figure 7: Central Limit Theorem[45]

While this may be easy to understand, it is difficult to explain why this matters so much.

So, let's say you construct a sample of lawyers in Delhi who happen to play basketball on the weekends. Let's say the average height of this sample turns out to be 5'6". How can we be sure that this is representative of the population and therefore can be the basis for us to conclude?

The normal distribution has an extremely useful property. If a given dataset is normally distributed, then 68 per cent of the data lies within one standard deviation[46] of the mean. In other words, if there are 100 lawyers with an average height of 5'6", then 68 of these lawyers will be within one standard deviation of this number. For example, if the standard deviation is 3", then of these 100 engineers, 68 will lie in the interval 5'3" on the one side, and 5'9" on the other. Of these 68, half will lie on the left-hand side of the mean, and half on the right, as can be seen below.

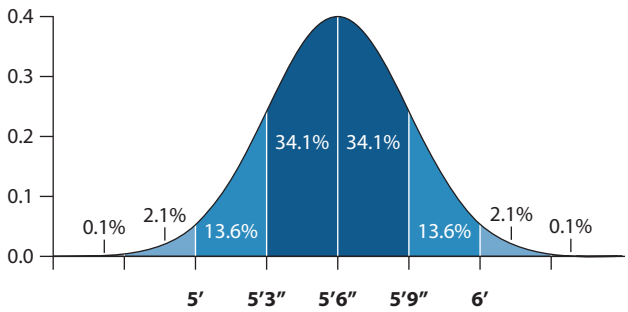

Figure 8: Normal distribution properties[47]

This idea is extendable: 95 per cent of the data will lie within two standard deviations of the mean, while 99.7 per cent of the data will lie within three standard deviations of the mean.[48] How many lawyers out of 100 will lie within two standard deviations of 5'6"? How many lawyers out of 100 will lie within three standard deviations of 5'6"? We are fully aware that this concept is rather elaborate, so take a look at the accompanying diagram, and if necessary, read the preceding paragraphs once again.

And now for the coup de grace: Remember those 50 samples we collected of lawyers who played basketball? There is a statistical property that guarantees that the average of these 50 samples will be equal to the population mean. That is if you take 50 samples of lawyers in Delhi who play basketball, compute their average weight, and take the average of these 50 averages, then that number will be equal to the average of all lawyers who play basketball in Delhi.[49]

To be precise, the mean of the sampling distribution – rigorously proven – is equal to the population mean. If one combines this property with the central limit theorem, it quickly becomes clear that whatever sample has been generated will lie within one standard deviation of the actual mean. This will have a probability of

68 per cent within two standard deviations of the actual mean with a probability of 95 per cent and within three standard deviations of the mean with a probability of 99.7 per cent.

Will the sample mean be exactly equal to the population mean? The answer generally is no. On the other hand, will the sample mean be acceptably close to the population mean? Almost inevitably, the answer is yes. That is how a limited sample making claims about a population works.

And that is the point of studying the central limit theorem. If a dataset does not fit the CLT, one must ask why it does not.

Beware visualisations

Visualisations help since we are a species that relates much more to that which can be seen, rather than thought of in the abstract. But we are also susceptible to being fooled with visuals and in our haste to arrive at an understanding we are prone to simple errors of judgement. Consider a simple visual that shows the relationship between how much wealth a person on average has in a given country, vis-a-vis the average life expectancy for that country, for all countries on earth in Figure 9:

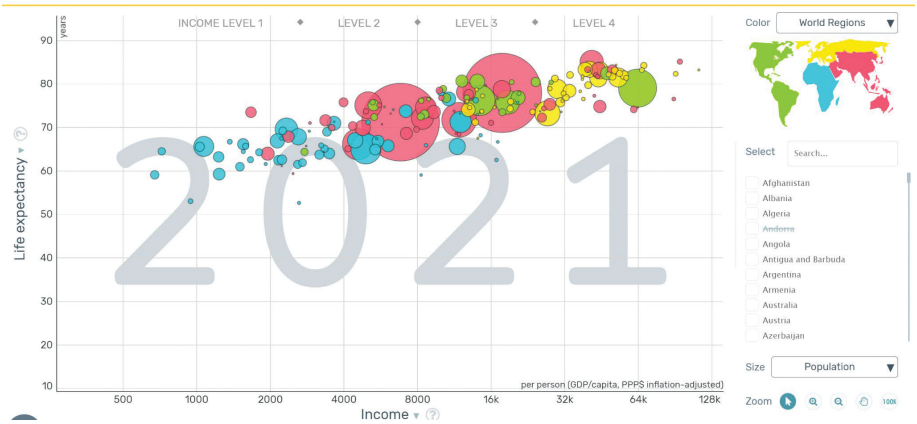

Figure 9: Visualisation and their pitfalls[50]

As it turns out, the countries towards the top right of this chart are not close to each other, although they appear to be. A simple way to be sanguine is by looking at the horizontal axis. Each unit movement to the right represents a doubling. And so while these countries seem to be fairly close to each other, they are not close. The last unit movement (USD 64,000 to USD 1,28,000) is actually the same width as the origin to USD 64,000. And here is the truly mind-boggling bit: One can understand this, agree with it, and make a note of it, and still think of the countries towards the top right as being fairly close to each other. Visualisations, as it turns out, are full of potential surprises and slip-ups.

Consider in Figure 10 one of the most famous examples in statistics: The Anscombe dataset.

Table 1: The Anscombe dataset[51]

I		II		III		IV	
x	y	x	y	x	y	x	y
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	16.77	8	5.76
113	7.58	13	8.74	13	112.74	8	7.71
9.	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.1	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.11	4	5.39	19	12.5
12	10.84	12	9.13	12	8.15	8	5.56
7	4,.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

Their graphs (visualisations) are shown in figure 11:

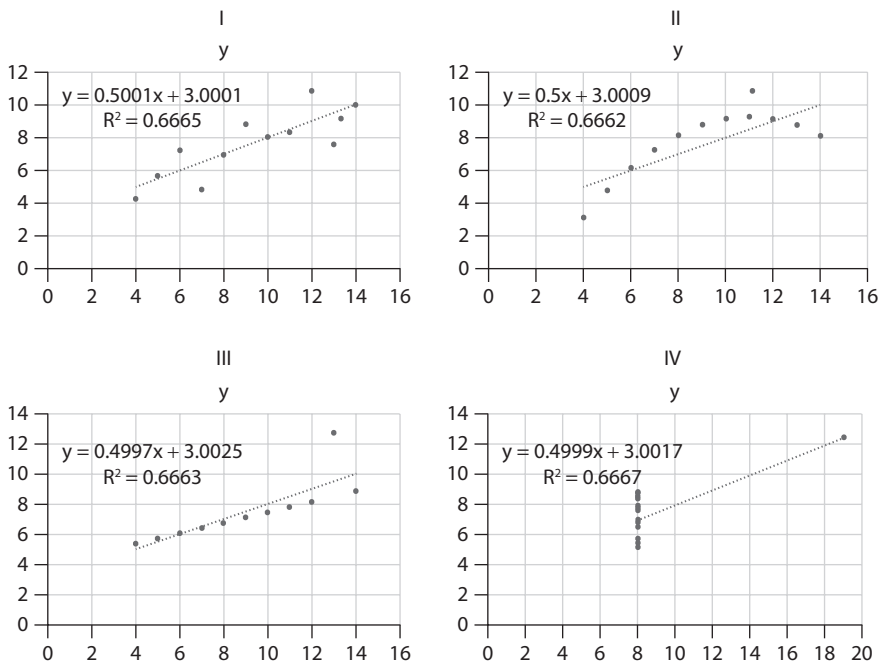

Figure 11: Graph for the Anscombe dataset[52]

As the graphs show, each dataset throws up almost the same regression line,[53] and the same summary statistics,[54] but the datasets themselves look very different.

Is the visualisation descriptive of the data? Is the data as visualised doing a good job describing the facts? What else can we look at? These are questions worth asking every time one is presented with data, the statistical analysis of that data, and the visualisation of any dataset.

Some simple points go a very long way:

1. Refuse to analyse the story that the chart is showing you at first glance
2. First ask: What is on the axes? On what scale (linear, log)?
3. Do both axes begin from zero? If not, why not?
4. Why was this particular form of visualisation chosen? What others were considered and discarded and why?
5. Is the chart in 2-D or 3-D? If 3-D, the tilted perspective makes comparisons across categories difficult. Ask if the same chart can be rendered in 2-D or another format.
6. For the same reason, pie charts make comparisons difficult; the worst chart is a 3-D pie chart.

A Syllabus for Law Students

Adjudicating a case requires some definitive basis and an understanding of facts that all concerned parties can agree upon. These facts are constructed from data made available for all to analyse, and the data itself is selectively picked up from the reality that surrounds us. For the concerned parties to agree upon these datasets, their method of analysis, and the basis on which these data points (and no other) have been selected, requires an understanding of statistics. Lawyers have always been handy with words, but as we have argued throughout this chapter, an understanding of statistics is as important so that facts can be deduced from data.

Statistics, much like mathematics, comes with a lot of baggage. Most of us, even as adults, carry battle scars from dealing with these two subjects in school and are only too glad to be done with them as adults. Statistics and math conjure up images of impenetrable equations, mystifying symbols, impossibly lengthy derivations and very little in terms of meaningful insight at the end of it.

We contend that it need not be. It is possible to teach statistics using nothing more than English. The only accessories we need are open, curious and willing minds and a liberal sprinkling of common sense. Armed with just these readily available tools, it is possible to draw up a syllabus for an introduction to statistics for law students. We outline herein a syllabus for learning the principles of statistics and suggest resources that may be useful for driving home these principles.

The aim of such a course is not to make statisticians out of lawyers but to shape lawyers with the ability to understand data and interrogate the findings using basic, but robust statistical tools and principles, with the same acumen and acuity they bring to bear upon other non-quantitative fields.

We assume here that such a course may stretch to 30 hours. More time is welcome, but not less. No prerequisites would be necessary beyond a grasp of high-school mathematics. We have, in the previous section, outlined 10 'hacks' or statistical principles that one should know. However, a complete syllabus of statistics should contain more material beyond this preliminary outline and should be fleshed out further. Here is what such an outline could look like:

1. What is the purpose of statistical analysis?
   - **a.** What is data?
   - **b.** What are the types of data?
   - **c.** What is 'the population'?
   - **d.** What is a sample and why is it necessary?
   - **e.** How can a sample be constructed and what are the limitations?
   - **f.** What differentiates a sample from a population, and why?
2. What are the descriptors of data?
   - **a.** What are measures of central tendency?
   - **b.** What are measures of dispersion?
   - **c.** How can the two be related?
   - **d.** What are the limitations of measures of central tendency and dispersion?
   - **e.** How does one assess the quality of a dataset? What are outliers, what are missing values and how do they matter?
3. Why does thinking probabilistically matter?
   - **a.** What is probability? What are its principles? What are its laws?
   - **b.** What are frequentist testing and Bayesian testing? When should one use them and why?
   - **c.** How does one think about permutations and combinations?
   - **d.** What are distributions?
   - **e.** What are the common errors one makes while thinking about probability?
4. How does one draw inferences?
   - **a.** What are point estimates, and what are interval estimates? Which is better and why?
   - **b.** Are inferences drawn from a sample valid? On what basis?
   - **c.** What is correlation, what is regression, and what are the pitfalls associated with both?
   - **d.** What is a hypothesis, and what principles should be kept in mind while forming one? Why? What is an alternate hypothesis?
   - **e.** How does one prove, or disprove a hypothesis? When is a hypothesis not proved?
   - **f.** What is a p-value? What is p-hacking?

We maintain that it is possible to speak about each of the concepts outlined above without having to delve into the world of formulae and equations. The idea behind such a course would be to familiarise students with the underlying concepts, ideas and principles of statistics. Interested students could be made familiar with more advanced treatment, but we believe that no student of law should leave university without an introduction to these ideas. They should be equipped to read and interpret data, draw conclusions from it, and at the very least, not be scared of, or indifferent to, data.

Such an introduction may not make it possible for the student to be able to do statistical analysis, but it should certainly be possible for such a student to ask meaningful questions when presented with data and analysis done by others. In much the same way that lawyers are not expected to be experts about forensic DNA analysis, or be able to do DNA analysis themselves, it is unfair to expect lawyers to be statisticians.

That being said, lawyers certainly are expected to know enough about DNA testing, for example, to be able to ask meaningful questions about the opinions of experts. And so it is with statistics. One must know enough about the subject to be able to ask questions that matter. We are sure that statistical experts may have different lists or may go into apoplectic fits about topics we have missed. But if you will allow us to mix our metaphors, may we say, "Let a thousand syllabi bloom!" Our argument isn't so much about the content of the syllabi as it is about how it is taught.

Conclusion

A non-quantitative, principles-based approach to teaching statistics as a tool for data analytics isn't just necessary, we believe that it is the need of the hour. Our intent in this chapter has been to outline three things:

1. That such an approach is necessary
2. That such an approach is possible
3. To suggest an outline that can be adopted, modified and, finally, implemented at the earliest.

Finally, a quote that we agree with wholeheartedly:

> "It is to be hoped that in the future attorneys and judges will become more knowledgeable about chance, uncertainty, probability, statistical procedures, and statistical inference in the presence of uncertainty, so that the instructional phase of the statistician's testimony may be shortened. It is reasonable to expect that more universities, with or without attached law schools, will seize on the need for the understanding of these matters and provide training for future lawyers involving enough statistics and probability to enable them to be better informed and, therefore, more knowledgeable and appreciative consumers of statistical evaluations."[55]

Editors' Comments

With this ends the third part of the volume, and the next chapter starts the fourth part which seeks to focus on the institutional dimension of the law and justice system. The first chapter in the fourth part, i.e., chapter 19, discusses the issue of building capacity for the introduction of technology in justice. In particular, it highlights the role, including the benefits and potential difficulties, of the private sector in this endeavour.

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22. A pictorial representation for purely explanatory purposes
23. https://en.wikipedia.org/wiki/Dewey_Defeats_Truman At least part of the reason for the headline was a telephonic survey, the results of which were overwhelmingly in favor of the Republican candidate (Dewey). Unfortunately, the fact that only reasonably affluent people were likely to own a telephone was not taken into consideration. For further reading, see this: http://mathcenter.oxford.emory.edu/site/math117/historicalBlunders/
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34. "I am particularly fond of this example [the Linda problem] because I know that the [conjoint] statement is least probable, yet a little homunculus in my head continues to jump up and down, shouting at me—"but she can't just be a bank teller; read the description."" - Stephen J. Gould.
35. https://www.nytimes.com/1991/07/21/us/behind-monty-hall-s-doors-puzzle-debate-and-answer.html (Last accessed on 08 January 2022)
36. https://bolt.mph.ufl.edu/6050-6052/unit-3/module-6/
37. https://www.youtube.com/watch?v=YUfUp5DDhWg
38. The latter is the square-root of the former, but you can safely ignore this for the moment. For our purposes, both are currently interchangeable since each is a direct function of the other.
39. The word makes literal sense in this case: how are the throws distributed on the board?

40. The normal distribution, and the standard deviation, are concepts that will come in useful a little later on in this chapter.
41. Katz, L. (1975). Presentation of a Confidence Interval Estimate as Evidence in a Legal Proceeding. *The American Statistician*, *29*(4), 138–142. https://doi.org/10.2307/2683480 (Last accessed on 08 January 2022)
42. https://www.statisticshowto.com/confidence-level/ (Last accessed on 08 January 2022)
43. For an extremely engaging, if slightly involved read on this issue, see https://fiftytwo.in/story/ballot/ (Last accessed on 08 January 2022)44See our discussion in the section "Thinking About Probability" about the normal distribution and the standard deviation
45. An excellent intuitive visualization of the CLT at work can be found here: https://seeing-theory.brown.edu/probability-distributions/index.html# (Last accessed on 08 January 2022) See Also, http://mfviz.com/central-limit/ (Last accessed on 08 January 2022)
46. Dummy data, chart used for explanatory purposes. The numbers were randomly generated using a normal distribution function in order to be able to explain the concept in this section.
47. Recall from our discussion of this subject in the section titled "Thinking About Probability" that the standard deviation is a measure of the dispersion around the mean. Remember Girish's distribution of throws on the dart board?
48. Dummy data, chart used for explanatory purposes. The numbers were randomly generated using a normal distribution function in order to be able to explain the concept in this section
49. The standard deviation is called sigma, and what we have just described is the idea behind a phrase you've likely heard of: six sigma.
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INSTITUTIONALISATION

CHAPTER 19

Sovereignty and financing of technology in justice

Aishani Rai and Ava Haidar

"Take to the path of dharma – the path of truth and justice. Don't misuse your valour. Remain united. March forward in all humility, but fully awake to the situation you face, demanding your rights and firmness."

– Sardar Vallabhbhai Patel

SUMMARY

- The COVID-19 pandemic has highlighted the significant importance of technology in the judicial system;
- Efficiency, innovation and human resource expertise are some of the ways in which private developers can support the government;
- Digital infrastructure creation must, in some ways, guard against the nearly proprietary nature of control over sovereignty;
- Inconsistencies in reporting, missing data and restricted access are common problems that plague judicial data in India, amplifying issues of sovereignty;
- The commercial private sector is adroit in creating technology for mass consumption, but may not submit itself to standards of transparency.

Introduction

This chapter describes the context and unravelling of connections between sovereignty, justice, digitisation and financial development. An efficient justice delivery system is characterised by how easily citizens can access justice. Access to justice is the foundation on which the quality of life of an individual is based. Access determines the singular right of inclusion in a justice system, which has implications for the social and economic future of society as a whole.[1] Noting the criticality of access to justice, Article 39A of the Indian Constitution stipulates that 'the state shall endeavour that the legal system promotes justice and that no citizen is denied justice due to economic or any other disability'. The Supreme Court has recognised access to justice as a fundamental right under Article 21 in the case of *Anita Kushwaha v. Pushap Sadan*.[2]

The COVID-19 pandemic has highlighted the importance of technology in the judicial system. As the justice delivery system came to a standstill, it was technology that came to the rescue of litigants. However, the transition from physical to digital was not smooth given the sheer lack of technological advancement in our judicial infrastructure.[3] For instance, the absence of sophisticated software or hardware impeded the functionality of digital courts. Additionally, litigants, lawyers and judicial officers grapple with structural issues of the digital divide and digital illiteracy, hindering the progress towards digitally delivered justice.

Given the growing support for digital governance in India today and the need to build digital infrastructure for justice, this chapter seeks to highlight the present role of technology in justice, as well as its connection with the values of sovereignty. We also seek to understand the possibilities of creating, funding and management of such technologies in ways that best align with the interests of the state, citizens, and those who can make the publicly-beneficial vision of digital-judicial infrastructure a reality.

The scope for technology deployment in the judicial system is immense. In the case of *Anita Kushwaha*, four facets of access to justice were identified. The state has a duty to provide an effective adjudicatory mechanism. The mechanism so provided must be reasonably accessible to the litigant in terms of distance and must be cost-effective. Finally, the process of adjudication must be speedy.

Technological deployment can equip judicial processes with transparency, accountability and inclusion, which are hallmarks of an efficient judiciary. For instance, e-filing services ensure that every litigant or lawyer from rural and remote areas can file documents digitally, overcoming obstacles of long distances, costs of travel, expenditure on paperwork and other physical barriers. However, in a population with differential access, digital capacity and infrastructural gaps, tech-mediated access to justice is likely to widen inequalities amongst diverse communities.

The private sector can play a very important role in the digital transformation of judicial services. Efficiency, innovation and human resource expertise are

some of the ways in which private developers can support the government. For instance, the overarching Digital India mission recognised the vitality of public-private partnership models, given that the critical infrastructure development programmes in India have been successful with the participation of the private sector.[4] Other examples include widely-used digital public infrastructures such as DIGIT (Digital Infrastructure for Governance, Impact and Transformation), where urban governance services are transformed by non-profit creation and philanthropic base funding.[5]

However, as we move towards digitisation in justice, with increasing involvement of the private sector, the role of the state may seem limited. Justice delivery may witness increased participation of the private sector in multiple avenues – from data collection and categorisation – to case and practice management, and the online resolution of disputes.

DAKSH India has mapped private sector intervention in the law-tech space in India. This can be categorised under four broad areas:

1. Disseminating public information
2. Facilitating self-services
3. Providing value-added services
4. Creating platforms for multiple purposes[6]

In what was previously a state-controlled sphere, digitisation of justice delivery will witness the state and private sector participating and competing with equal fervour. Thus, as justice delivery is a core function of the state, the entry of the private sector opens up questions about the nature of control the state possesses over technological development in India.

To reassert authority over the internet and protect citizens and businesses from the manifold challenges to self-determination in the digital sphere[7], these new aspirations suggest that around the world, modern governance is increasingly mired in the possibilities of an online age.

Specifically, it is a matter of domestic sovereignty that is being renewed through Julia Pohle and Thorsten Thiel's work on 'digital sovereignty'.[8] It is from here that we may begin to open questions about the intersections of governance, digitisation and sovereign self-determination.

Sovereignty, at its heart, is a lever of supremacy. Foreign national forces cannot impose their will over and above that of a state when it comes to its subjects. When faced with this possibility, it is a breach of sovereignty, implying that a state *must* be free to use at its disposal any means to subdue the threat.

In democracies like India, we may unconsciously support this notion by electing those who protect certain ideals, safeguard us against harm, and strengthen our laws and Constitution without prejudice.

These forms of sovereign control can be understood through acts such as deploying soldiers, instating a robust police force, and designing educational policies against unlawful subversion of institutions and ideas.

All these areas have seen considerable technological intervention, where the state has been able to implement digital infrastructure for monitoring, security and even data-sharing for wider knowledge. Thus, sovereignty is enhanced in some areas by the involvement of digitisation. However, 'sovereignty is susceptible to vested interests. This makes it possible to fix ideas of sovereignty that disable true sovereign behaviour and culture. Individual viewpoints of policymakers, state entities and executive bodies carry power in the determination of sovereignty in the digital sphere. However, sovereignty may not always be in line with citizen-formed deliberation. Actions towards state-owned civilian data can also create fears around state surveillance in the name of sovereignty. For instance, breach of personal information without civilian consent or knowledge, like the Edward Snowden case.

Snowden, a former computer intelligence consultant, leaked classified information from the US National Security Agency when he was an employee and revealed the extent of unconstrained exercise of hegemonic power through digital means.[9]

Finally, a static definition of sovereignty can unduly benefit those who are historically dominant in a society, excluding the impact of social, cultural and economic forces upon the definition of true sovereignty over time. This, too, can lead to the breach of a state's internal sovereignty, which is to serve each citizen digitally without prioritising other citizens.

The Pohle and Thorsten definition of digital sovereignty can be interpreted as a combination of infrastructure protection, which enables market competition and enhances individual self-determination.[10] Digital sovereignty over judicial infrastructure must allow for collaboration between the state and private sector and simultaneously propel collaboration amongst litigants, lawyers, judges and court officers, and enhance user experience in the ecosystem.

The state must remain at the centre of digital access to justice with a foothold over judicial digital infrastructure. First, access to justice is a measure of public rectitude with the state at its core. Digital access to justice cannot be isolated from the state. Principles of liberty, equality and non-discrimination enshrined in our Constitution are integral to the concept of digital access to justice.

Second, the absence of state control in intervention or regulation can lead to judicial digital infrastructure being largely operated by the private sector, which can be a conduit for the commodification of justice. This may increase existing structural inequalities while accessing justice and rights, based on socio-economic status and can forsake the marginalised. The strength of a judiciary lies in its ability to maintain order and justice, as well as establish its power against disruption and unjust circumstances.

One may measure the quality of justice from not just its authoritative responsibility, but also the lengths it goes to protect the weakest of society from the strongest.

Indian judiciary, in particular, must account for various differentiators of societal strength such as caste, gender, economic status and disability, in establishing

its authority. It must also protect itself from undue influence, bringing forth the quality of judicial sovereignty.

The technology thus involved in the creation and maintenance of sovereignty-enhancing, judicial-digital interventions, must allay the fears of citizens and must be mindful of the various social differences and the various technological capabilities of Indian citizens.

Technology must prevent the use of data against data principals, or the disempowerment of individuals from the knowledge of data use. Digital infrastructure creation must, in some ways, guard against the nearly proprietary nature of control over sovereignty. Its portals must be designed for intentional self-entry and identification. A digital-judicial infrastructure must be free from volatility, profit motives and misuse.

Sovereign digital systems may need to be accountable, which for this chapter, may be linked to financing. Here, the state is most accountable to its public for the use of its finances, meaning that the state owes transparency to its citizens in the use of funds for the creation of judicial digital infrastructure. The Union Budget 2022-23 allotted INR 3,393 crore to the Ministry of Law and Justice, with little information on the nature of its division.[11] While accountability is fundamental, there are various other functions that financing can serve to make technology viable, should other entities in the private and philanthropic sectors be involved.

Factors such as the distribution of talent in digital creation, the mindset required for the greatest disruptions, the power of connection with communities in need of digital representation, and latent funding capacity can drive the proper use of digital-judicial infrastructure if implemented properly. The ability to serve these individual factors has been demonstrated by out-of-state actors, allowing for funding possibilities.

The following section maps the presence of digital infrastructure in the justice-delivery system and focuses on the reclamation of sovereignty. We deep dive into judicial data as a type of infrastructure, highlighting the roles of the state and private sector concerning concerns of sovereignty. Section III will delve into the strengths and weaknesses of actors in the public, private and philanthropic sectors, and understand the partnerships that can facilitate a healthy digital judicial infrastructure. Section IV concludes the paper and provides further areas of inquiry.

Mapping the presence of digital infrastructure in the justice delivery system

Technology has increasingly been perceived as the key enabler of access to justice in India. The Supreme Court E-Committees draft Vision Document for Phase III lays down the framework for a Justice Stack seeking to integrate technology seamlessly into the justice-delivery system enabling access to justice.

The Justice Stack enables the realisation of sovereignty by enabling state control over digital infrastructure, engaging meaningfully with the private sector and enhancing the rights of citizens. For the state, the Justice Stack envisages the deployment of technology in justice-delivery systems to make justice more accessible, affordable, transparent and accountable.[12] For citizens, the Stack, which is founded on the principles of DEPA, aims at enhancing citizen-centric governance, empowerment with greater control and access to their personal data and defining the scope within which external institutions can seek access to the same.[13]

We must understand how digital sovereignty is operationalised in the judicial realm. Sovereignty in judicial-digital infrastructure should focus on control and protection. Control refers to control over design, and protection infers safeguards against unauthorised access to digital infrastructure or from threats arising out of refusal of service.

In the case of judicial digital infrastructure, exercising control by the state would be tantamount to creating and maintaining the design of the infrastructure, which places the citizen at the centre of services. Private sector intervention can be chalked out by the state through protocol and tools; provided the process is open to private parties and that they are key users and deploy the architecture. Judicial-digital infrastructure must be secure from foreign threats, which translates to an undisrupted availability of information that has not been tampered with. If the private sector controls the flow of judicial information and infrastructure, then it can exercise control by denying services to citizens or bargaining with states.

There are several interventions by the private sector in the law-tech space. This paper relies on judicial data as the primary example to explain how sovereignty is affected due to private sector involvement. The technology surrounding judicial data has the potential to enhance the quality, confidentiality and security of information, as physical artefacts are more susceptible to interference and loss or damage. Judicial data can be wielded to possibly understand judicial exclusion and socio-economic representation on a national scale. Additionally, judicial data is implicated with the question of digital sovereignty, given the involvement of the private sector in producing and managing such data.

We must first understand what comprises judicial data. A broad definition of judicial data must be adopted, not just limited to judicial statistics, but should consist of court judgments, video recordings of court proceedings and legislative texts[14] – data and information that is vital to stakeholders of the judicial ecosystem. We understand judicial data as a critical judicial digital infrastructure with capabilities to affect sovereignty. Free flow of judicial data is vital to a sound judicial system and multiple actors play crucial parts to make this data available to its intended recipients.

Judicial data is a site where different actors like the state, private sector and stakeholders of the judicial ecosystem like litigants and lawyers, interact, creating agreements and terms of engagement, apart from conditions of partnership and governance. Currently, private sector involvement may be low in disseminating public information, as reflected in research conducted by DAKSH India,[15]

however, by providing a direction to the private sector, the state can leverage its capabilities to maximise benefits. For instance, the National Judicial Data Grid was an attempt to disseminate aggregated statistics collected by various e-Courts.

However, the insufficiency of the Grid to fulfil its intended purpose has led to private sector intervention.[16] Several non-profit organisations such as Agami have tried to fill this void in judicial data through interventions such as the Justice Hub that seeks to make open data a reality in justice delivery.[17]

Judicial data forms the building block of the envisioned Justice Stack, which is imagined as a public infrastructure.[18] Access to good quality judicial data can bolster state sovereignty over judicial digital infrastructure by strengthening the access of citizens to justice. It will also create a framework of accountability and transparency in the justice delivery system. For citizens, the Justice Stack 'will enable any litigant or lawyer to file a case from anywhere, at any time, without having to approach multiple windows at courts' and for the state, the quality of justice delivered is enhanced as judicial data provides useful insights to judges on the quality of their work.

Judicial data in India has immense potential to facilitate greater access to justice by enhancing resource allocation and improving judicial efficiency.[19] However, it is still largely unstructured and underutilised. Inconsistencies in reporting, missing data and restricted access are common problems that plague judicial data in India, amplifying issues of sovereignty.[20] For instance, missing data makes it impossible for litigants to access decisions in their own cases, impeding justice.

Intervention by the private sector may help improve the efficiency of the justice delivery system by filling the void through innovative technological advancements. This may enhance the state's capacity to maximise control over digital infrastructure and exercise its sovereignty.

However, private sector deployment is not free from risks posed to sovereignty. Where the private sector begins to compete in the commodification of judicial data, data becomes more easily accessible to some communities as opposed to socio-economically weaker sections of society. When citizens claim constitutional rights against the state, these rights may not be available against private entities. Issues of sovereignty are exacerbated when the state relies on the private sector to make data available. Threats of arbitrary suspension and reduced affordability loom over the state in the absence of regulation.[21]

Without regulation or standard operating procedures governing judicial data, publication of the data compromises personal, sensitive information, leading to privacy concerns. This affects user agency, trust and experience in judicial digital infrastructures. These issues relating to access, affordability, user experience and trust, create friction and reduce utility and value derived from digital infrastructure for users in the judicial ecosystem.

This calls for the intervention of state regulation to set the framework of user rights and guiding principles of judicial data governance and management. Frameworks must stipulate the roles of the state and the private sector in developing judicial-digital infrastructure. They must define the scope for interaction and

collaboration by financing and capacity-building models as a means to reinforce and reclaim sovereignty over judicial data and digital infrastructure.

For instance, sovereignty over judicial-digital infrastructure can be reclaimed by formulating procurement and intake protocols of judicial-digital infrastructure, deploying integrity measures and integrating review and feedback mechanisms.

Financing digitisation with the lens of sovereignty in justice delivery systems

The task of assessing the quality of digital-judicial infrastructure may mirror our relationship with other public systems like roads, transport systems, education and water. What is the quality of the infrastructure? How well does it reproduce outcomes for the individual citizen? Can citizens trust its authority for redressals? Can we safely fall back on our rights as citizens of a sovereign nation to ensure we receive our due?

These are questions that we ask of well-governed and systematised public goods, borne out of our relationship with publicly-arranged and funded infrastructure. We must ask similar questions of our judicial infrastructure. The Department of Justice provides us an understanding of what we can expect, which can be described as: 'adequacy of judicial infrastructure is a prerequisite for reduction of pendency and backlog of cases in courts.'[22] What we have explored in the previous sections are possible challenges posed by the physicality of the judiciary, such as extensive paperwork, travel time and expenditure of the litigant to courts, and additional expenditures to intermediaries for access.

Other problems include social differentiation, for which physical interaction can be pivotal in delivering outcomes. The next step is to identify the intersection between resolving these issues with an adequate digital approach to dedicated judicial infrastructure. Communication, identification, document verification, and evidence, must be combined with the benefits of technology: transparency, efficiency, automation, inclusivity and security to yield a trustworthy and configurable public infrastructure.

In conclusion, there is a need to **recognise judicial digital platforms as infrastructural**, in that they must be envisioned as part of a whole-bodied system of services that the state provides its subjects.

In much the same way that we entrust our civic bodies with ensuring good roads, transport, education and water, we must achieve a relationship with the government as one that provides digital infrastructure that facilitates a healthy system of justice delivery.

Digital infrastructure for welfare must be seen as the work of 'institutions that are persistent and resistant to sectional interests'[23] that are unstoppable in the reproduction of just outcomes as well as shielded by interests that could compromise sovereign judiciary. For such infrastructure to embrace accountable governance, as well as high-quality creation and outcomes, it is important to factor in various indigenous digital talents, and not simply that of the state. With a layered

concept of justice as one that is delivered digitally, we must begin to understand how such an infrastructure can exist, particularly in creating sustainable, sovereignty-led funding.

What do we know about the digital ecosystem of creation? Who creates successful digital works? Who is interested in its maintenance and where can combined intentions of community gains, financing of technology and maintaining judicial order be found? One way to determine this, is to identify different sectors of development – within the state, private corporations, philanthropy, and academia – and understand the different capacities and inclinations they may have towards and against the project of financing sovereign, judicial-digital infrastructure.

A general sense of sectoral funding capacity becomes as crucial as intentions of committing to public welfare. Given the novelty of digital infrastructure, it is important to account for talent and innovative risk. Development of technology must be carried out by experienced hands as well as mindsets geared for creative disruption without fear of failure, which may well occur. These varied parameters can manifest differently in different sectors. For instance, while local philanthropies are capable of carrying the vision for public good, they have limited sources of funding. The state, on the other hand, has the requisite funds and the right intentions towards the masses but may lack the creativity of the private sector in making technological transformations.

The commercial private sector is adroit in creating technology for mass consumption, but may not submit themselves to standards of transparency or true outcomes of justice. Different sectors have their own strengths and weaknesses leading to a more decentralised vision of judicial infrastructure funding.

A more organised picture of their demonstrated capabilities and funder types is provided in Table 1 and Figure 1.

Table 1: Features of Technology and Funder Types

	Public	**Philanthropic**	**Private**		
Feature | Funder Type ->	**State and state-affiliated bodies**	**Foundations and trusts**	**Commercial-tech**	**Academic (legal institutes, law colleges, technological institute)**	**Legal-Private (legal-tech startups)**
Funding	Stable, High	Low, Stable	High	Low	Low
Talent	Low	Can be high	High	High	High
Public Commitment	High	High	Low	Can be high	High
Ability to risk innovation	Low	High	Can be high	High	High

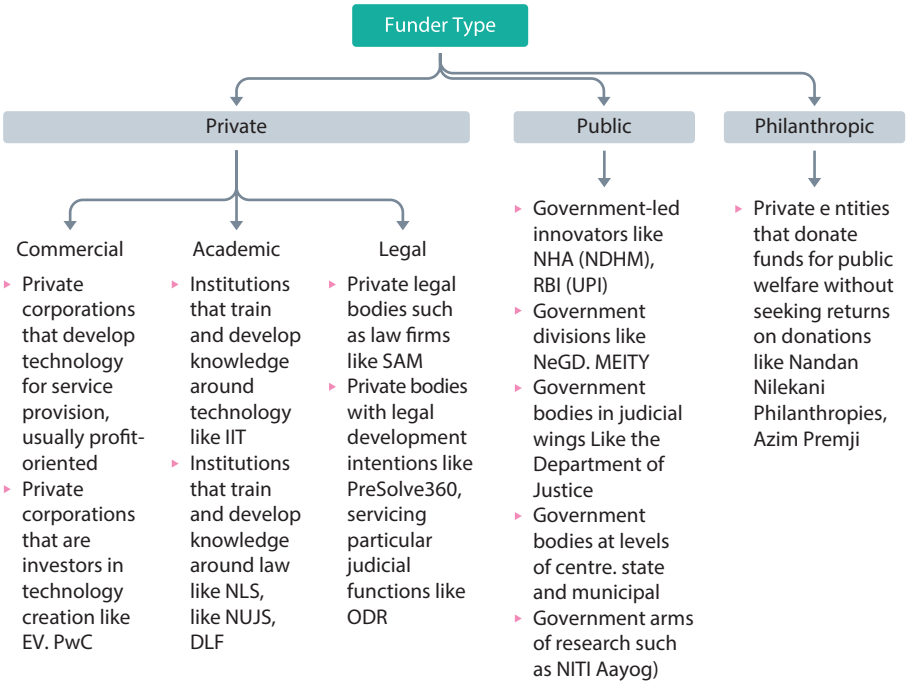

Figure 1. Detailed Overview of Funder Types

Analysis of Table 1:

As observed, no single sector is independently capable of guiding the creation or financing of optimal technologies for population scale. Variations may stem from particular reasons;

1. **State:** The state amasses, and has the authority to amass, adequate funds for infrastructure projects in the public interest. Public funding carries an implicit commitment towards the welfare of citizens, it is trustworthy, valuable, stable, and is not volatile in the long term. However, the state has demonstrated less talent compared to other sectors, in the creation and configuration of smart digital infrastructure. This could be due to the slow speed of capacity-building, bureaucracy-induced stagnation, inexperience and inadequate practice. Furthermore, the state is risk-averse to experiments around technology.
2. **Commercial:** Technological innovation has seen possibly the greatest strides through the work of the private sector, translating into a high availability of latent and active talent. Importantly, such talent is continually geared towards the sharpening and improvement of the technology itself, allowing the sector to address the internal failures of technology. However, the sector's ability to serve the advancement of public goals for all citizens can be uncertain, and funding can be less stable than the state, owing to environmental or market changes.

3. **Academic:** Institutions may have a pool of talented people, a positive attitude towards innovation, may not be risk averse, and can contribute knowledge to the theoretical and technical requirements of judicial technologies. They may work towards social commitments and responsibilities, but independent funding in these institutions may be low. Experience in creation has been demonstrated by institutions like IIIT-B (Modular Open Source Identity Platform - MOSIP), making academic bodies partners, if not funders, in digital infrastructure creation.
4. **Legal-private and civil society:** Players in legal tech and civil society are talented and have a risk appetite for innovation, as well as a commitment towards societal good. Funding from these areas may be limited. Law firms may be induced to consider contributing to the knowledge systems behind judicial technology through research and development, adding to its own repository of knowledge as well as a source for larger public use.
5. **Philanthropic:** Commitments to public welfare, the ability to take risks in financing, and possibly talent, are high on the agenda of Indian philanthropies. While they represent a limited source of funding in India, considerable innovations in the digital-public atmosphere have been made possible by philanthropic funding, such as DIGIT. Funding from this sector is comparatively stable due to the time-bound nature of grants.

The shape and size of funding capacity across sectors are different and are influenced by experiences with digital creation. Infrastructure financing is crucial in trying to match the capabilities of different sectors with the technological need for judicial infrastructure. Additionally, it is necessary for infrastructure financing arrangements to uphold ideals of sovereignty.

Given our constraints and our special focus on judicial data, we look at the possible funding roles for different sectors.

1. **State:** Given the substantial and stable nature of public funding, as well as the demonstrated talent of the state in instituting large-data tasks like registries, for instance, the Healthcare Professionals Registry, the state should be directed towards the creation and maintenance of judicial data repositories. The state may not need to inspire creation but can be the final arbiter on the data collection and presentation model. It should also ensure measures of quality control and monitor the feedback that is produced within the system of players. In essence, public funding must represent base funding for the platforms that carry judicial data, as well as the overall governance of these platforms.
2. **Commercial:** While talent and funding are accounted for, a crucial component of sovereignty may be lost in the commercial crafting of technology for the cause of greater public justice. The intent and priority of commercial actors in building non-proprietary, non-excludable and non-profitable data cannot be guaranteed. Thus, while commercial actors in the private technological sector can service high forms of digital goods and infrastructure, they

may not be ideal for involvement in sovereign and essentially judicial digital infrastructure. More research may be required to understand the positive role that the commercial ecosystem can play.

3. **Academic:** Educational institutions in legal, technological and other spaces can be crucial contributors to design, leverage partnerships with local communities, build capacity, and provide suitable and researched methods of local data collection. In general, academic funders can perform the role of educating the digital-judicial-funding ecosystem.
4. **Legal-private and civil society:** As has been demonstrated by legal-tech firms like PreSolve360, the role that can be played by legal-private entities lies in creating public awareness, offering local solutions, bridging gaps within judicial data, building more dedicated pictures of litigant capacities, language, gender, caste and religion, among other social differentiators. Other demonstrators include Agami, who has worked specifically on judicial data, such as on their Data for Justice (D4J) movement, Budgets for Justice,[24] where tools to educate the public about judicial data have been developed. Private law firms too can participate in similar roles, particularly funding research into areas of pressing concern such as the digital divide in India and the effect it has on judicial data creation.
5. **Philanthropic:** Given the often independent and socially-forward nature of philanthropies, they are well-suited to fund fruitful, risk-friendly and innovative creation of judicial data technologies. With the independence to partner with private developers whose intentions align with their own, and possibly with those of a digital judicial system, philanthropies may be in the best position to create data models for the state and judiciary.

Given a rich ecosystem of digital creators and financiers, an approach to funding technologies like judicial data should work to connect these actors and provide suggestive capacities. This allows a consonance in agendas or a formula for harmonious digital judicial intervention across different sectors. The focus in envisioning a financial network should be on delineating the roles that different actors can play, ensuring that the state sets its boundaries of sovereignty over judicial data and minimises clashes and threats to it. Slovenia's case law portal 'Sodna Praksa' is an example. It produces decisions for selected court cases in Slovenia, where the data is anonymous and public access to the portal is free. Commercial and non-commercial use of the data is entertained as long as credit is given to the Slovenian Supreme Court.[25] Here, the final authority is made explicit while the freedom to utilise judicial data is also clear.

Conclusion, themes for further study and summary

Bringing together the concerns of a sovereign judiciary with funding technologies for its purpose, we arrive at an understanding of the demands of such technologies, as well as a picture of who may best meet those needs. While the state

and philanthropic sectors can be abstractly understood as having the required intentions of social progress, the private sector's expertise in digital innovation must be leveraged with care and caution.

On the other hand, private sector hesitancy may exist where state authority and regulation is strong. The disruptive nature of technological creation rests partly in the ability of creative entities to think limitlessly, which may not serve the interests of the state in creating stable infrastructures, but is crucial to the making of revolutionary digital goods. In the section on funding partners, we understand that an ability to take risks in innovation is crucial to digital disruption. This quality of technological development needs to be safeguarded and backed up by fail-proof methods and requires a deeper understanding of the private sector's inclination towards the state in the collaborative creation of digital infrastructure.

Through sovereignty, both abstract and digital, we explore a wide range of priorities and possibilities when developing and financing technology for the judiciary. We then narrow our inquiry to the treatment of judicial data, where we look at the impact of private sector involvement in the provision and management of judicial data. Within the parameters of financing judicial digital infrastructure, we evaluate the capabilities of various sectors and make arguments for and against the involvement of specific actors in different tasks of digital creation.

Editors' Comments

Having discussed the issue of sovereignty, the volume now moves to the much-talked-about startups. Stories of disruptions heaved upon the economy and society abound, and the next chapter discusses how that same disruptive power can be leveraged to address the first A of this volume: Access.

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CHAPTER 20

Startups as disruptors of legal tech in India: Present landscape and future pathways

Shailaja Shukla and Supriya Sharma

"Thinking is the capital, Enterprise is the way, Hard Work is the solution."

– APJ Abdul Kalam

SUMMARY

- Globally, legal tech is a fast-growing sector. However, the worldwide patterns of growth and expansion of legal tech may not carry over to India;
- Sparse digitisation of records and processes is the biggest challenge for startups building solutions for the judiciary;
- Legal tech startups in India are creating solutions in four major groups—legal service delivery, process efficiency, access to justice and DIY tools;
- The private sector in India has undertaken incubation and support programmes for legal tech startups;
- A decisive step towards enhancing career options for graduating lawyers is an early introduction to entrepreneurship.

Introduction

As of 11 July 2023, there were over 50 million pending cases across the Supreme Court, 25 high courts and over 650 district and taluka courts encompassing about 3,400 court complexes in India.[1,2,3] Considering the pendency, litigants in India

spend about INR 300 billion in litigation costs[4] – roughly 0.3 per cent of India's GDP. There is an additional litigants' productivity loss of about INR 50,000 which adds up to about 0.48 percent of the GDP.

While this gives a sense of the size of the market, the estimates do not include the legal services that are developed and delivered by law firms, and corporate and independent lawyers in the country. Law firms particularly have been known to struggle with operational inefficiencies over their evolution.[5] Such inefficiencies across the value chain create an opportune ground for tech-enabled interventions. The mainstreaming of startups and proof of use cases of novel technologies like blockchain and machine learning in adjacent sectors will create a launchpad for disruptive, tech-driven solutions in India.

In comparison to more evolved legal ecosystems such as the US, India presents a curious case where the legal systems have a rich history, the judicial and legal systems[6] continue to be complex, and the economy is fast digitising. There are several barriers to realising the legal tech opportunity. Sparse digitisation of records and processes is the biggest challenge for the judiciary. There has been some resistance from lawyers about being replaced by machines. Alarie, Cockfield and GPT-3 make a rather ironic point with their paper, authored entirely by the bot GPT-3, on how machines will never replace humans.[7] Finally, the curriculum of over 1,500 Indian law schools is disconnected from market realities,[8] making law graduates difficult to employ. In such a context, we examine the current legal tech startup ecosystem to lay down suggestions on how founders and other participants can overcome these barriers.

We begin with diving into the multiple descriptions of legal tech and related terms like law tech to suggest a customer-centric definition. Next, we briefly touch upon the US and UK legal tech startup ecosystems and then present a landscape of the Indian ecosystem on six themes. These include history, funding, locations, founders, business models, and legal tech on incubation initiatives. Under each theme, we present key insights based on our analyses of over 330 legal tech startups in India that we enlisted by the end of 2021 and share our outlook on the future and/or next steps under respective sub-sections. We close the chapter with our submissions on three promising opportunity areas for startups, incubators and investors.

Taking a customer-centric view of legal tech

In literature, the term 'legal tech' emerged only as recently as 2017.[9] The neologism was originally coined to denote technology used by legal professionals[10] to assist their services as well as the delivery of justice. Parallel narratives also raised questions about legal tech replacing lawyers.[11] Other terms related to law, such as 'reg tech'[12] – technology for regulatory compliance – soon followed. On similar lines, legal tech is often defined as 'all technology used by law firms to improve their processes and increase their efficiency and effectiveness'.[13] This definition,

supported by many from the industry, is narrow in that it only talks about one of the stakeholders of the legal system. A more comprehensive definition takes into consideration the clients and citizens to define legal tech as 'digital tools, software and technology to improve the services provided by the legal industry'.[14]

Much like academia, the industry is populated with definitions of segments such as law tech and even justice tech. While the former is about empowering individuals and small businesses by creating solutions such as Do-It-Yourself (DIY) products or legal services aided by technology,[15] the latter focuses on technology solutions to 'directly scale legal services to the billions of people underserved by the existing markets'.[16] A narrow approach to defining the scope of a sector or industry can come in the way of establishing legitimacy, especially over overlapping boundaries, and competition for attention and resources. This is truer for start-ups and new ventures that are already known to struggle with liabilities of newness and smallness.[17] These definitions often take only a supply-side perspective. Seen from the eyes of a legal professional, it may be natural to distinguish back-end services – legal tech – from front-end ones – law tech. However, when one situates the customer, primarily citizens, businesses, and judiciary, as the central point of reference, legal tech is essentially the overlap of legal services and technology. Depending on the customer's persona, legal services could include, but not be limited to, developing and executing agreements, regulatory compliance, accessing legal advice, or background case research. A wide spectrum of technology could be applied to design, improve, and/or deliver these and many more processes and services related to law.

Thus, taking a comprehensive, as against an exclusionary, customer-focused view, we consider legal tech to be technologies 'that enable and improve access and usage of legal services, including access to justice as well as development and delivery of these solutions by legal service providers'.

Global legal tech ecosystems

In its short history, legal tech has made its presence felt in leading startup ecosystems. Across all metrics, legal tech is a rapidly growing sector, having seen a staggering 484 per cent rise in the number of legal technology patents since 2017.[18] There are over 6,700 legal tech companies in the world[19] with the US, the UK and China being some of the largest legal tech markets. Most of these markets are distinct in their history and growth trajectory.

The US has by far the largest and fastest-growing legal tech market. Some of the biggest names in the legal tech sector globally – LegalZoom, Clio, LexisNexis – were founded in the US. At least 13 of the 23 startups that have made it to the Initial Public Offering (IPO) stage were based in the US.[20] The legal tech market in the US witnessed steep growth in the last decade, going from about 15 startups in 2009 to over 1,400 by the end of December 2020 – a compounded annual growth of over 50 per cent.[21] Much of this growth could be attributed to

the underlying legal services market. The US legal services market was valued at about USD 350 billion and is estimated to account for about half of the global legal services market.[22] In terms of investment, the US legal tech market has been drawing private capital since 2008, reaching a record high of USD 1.5 billion in investments in 2021.[23] At the end of 2021, there were about eight unicorns in the US,[24] the latest being Everlaw, a cloud-based e-discovery software, valued at USD 2 billion.[25] In addition to private equity investments, IPOs and mergers and acquisitions (M&As) are also becoming mainstream in the US legal tech startup ecosystem.[26]

Another active legal tech ecosystem is that of the UK. With over 500 startups, the UK legal tech market or Lawtech, as it is locally referred to, is pegged at about USD 29 billion. While the UK market may be smaller compared to the US, a unique feature of the UK legal tech market is the participation of large consulting firms. Global giants such as Deloitte and PwC have established legal tech incubators in the region. Deloitte announced Deloitte Legal Ventures in 2019 to provide a variety of inputs including access to consulting, technology, and legal and investment experts, to a cohort of 14 companies.[27] PwC's legal arm also launched a programme in London to support legal tech startups in 2019. The 10-week Scale | Law Tech programme.[28] was designed to allow startups to go through specific masterclasses and pitch to a network of industry leaders to obtain commercial support.

Against this global backdrop, we now turn our focus on the fast-growing legal tech ecosystem in India. Taking startups to be the harbingers of innovation, we scope our analysis on legal tech startups. We map the current contours of the ecosystem and highlight emerging opportunities and future pathways.

The landscape of legal tech startups in India

Creating a list of legal tech startups in India was the first step in the landscaping exercise. Over several months, we mined startup databases, undertook extensive internet searches and expanded our list of startups by seeking references from our network of founders and participants in the legal tech ecosystem. We paid attention to excluding law firms and incumbents from our list and used our definition, from above, to identify legal tech startups. By the end of 2021, we were able to add 336 entries to our database of legal tech startups in India.[29]

Next, we undertook a thorough secondary information search on these startups and conducted interviews with over 20 founders and other value chain participants in the legal tech ecosystem. These interviews were predominantly aimed at validating our analysis of the current landscape and outlook on the future. We recorded all interview calls after taking informed consent from participants. We also made extensive notes during the interviews which were used in the analysis.

In the following subsections, we describe the six aspects of the current landscape of legal tech startups in India – growth, investment trends, spatial

spread or location, founder profiles, business models, and start-up incubation initiatives.

Growth of legal tech startups

While the term legal tech caught on in the late 2010s, we find that some of the first legal tech startups in India were founded in the early 2000s. These included companies like PracticeLeague, a law management firm, and Ezzus, an incorporation and compliance firm. From four companies in 2000 to 54 new companies founded in 2020 alone, legal tech startups have grown at an average YoY growth rate of about 30 per cent, with two peaks in 2015-2016 and 2020 (see Figure 1 for growth in legal tech startups).

We posit that the first peak (2015-2016) may be attributed to the launch of the Startup India initiative, which sparked startup activity across industries, sectors and problem statements. The second and slightly higher peak (2020) appears to be influenced by the growth in the legal tech market globally but was amplified by the COVID-19-induced adoption of digital technology by businesses.

Subject to some caveats, we envisage that the growth rate of legal tech startups is likely to become steeper due to multiple reasons. These would predominantly include the digitisation of business and judicial processes, which were activated by the pandemic, and the launching of initiatives like NITI Aayog's ODR Policy Plan.[30] The third reason is proof of concept of technology like Artificial Intelligence/Machine Learning and Blockchain technology in adjacent sectors like fintech.[31] Training law graduates in entrepreneurial thinking and channelling more incubation support for early-stage startups would not only catalyse the founding of legal tech startups but also contribute to their survival and growth.

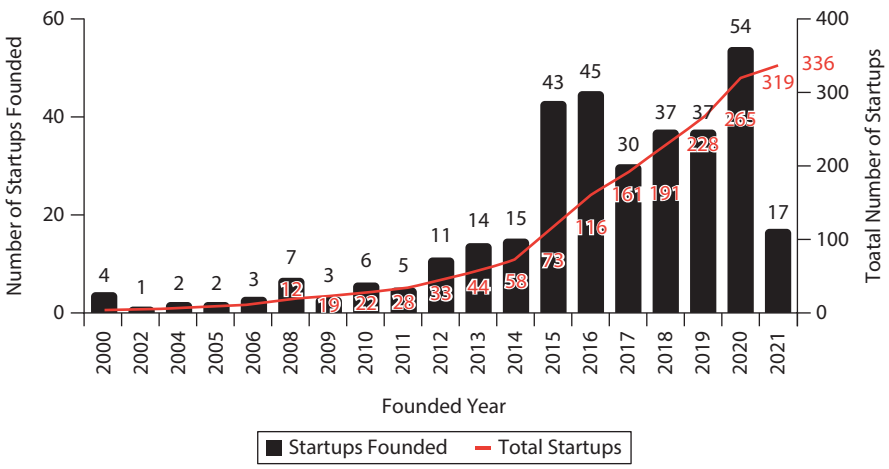

Figure 1: Growth of legal tech startups
Source: Authors' Analysis

Investment trends

Startups in our database received external funding only in the last seven years, between 2014 and 2021 (see Figure 2 for funding raised by legal tech startups). At least 23 startups raised investments of over USD 27 million in 50 funding rounds in early stages – mainly, angel, pre-seed and seed rounds. For perspective, these investment numbers must be seen in comparison to numbers from more prolific startup sectors in India like fintech where over USD 28 billion (about 1000 times that of legal tech) were invested in about 2500 rounds (about 50 times that of legal tech) during the same 2014-2021 time period.[32]

About 10 per cent of the funding (about USD 2 million) was in angel investments. However, we were not able to find any data on grants received by any of the 336 legal tech startups in our database. We see this as a sign of a thin legal tech incubation ecosystem and limited participation from regional and central government agencies – the main sources of grant capital for startups.

Expectedly for this nascent sector, legal tech startups have largely raised seed-stage funding, except between 2020-2021, where we see legal tech startups raising series-A and pre-series-A rounds. While there have not been exceptional exits for investors thus far, there have been several cross-border acquisitions. Table 1 below presents some recent, notable investments and acquisitions in legal tech startups.

In cognisance with a growing domestic and international market, and support interventions from governmental agencies, we posit that more funding in early and growth stages will be available to legal tech startups. However, we expect the growth stage funding will be channelised towards incorporation and compliance products, dispute resolution and law firm operations, as against products for the judiciary (which still requires a defensible proof of concept).

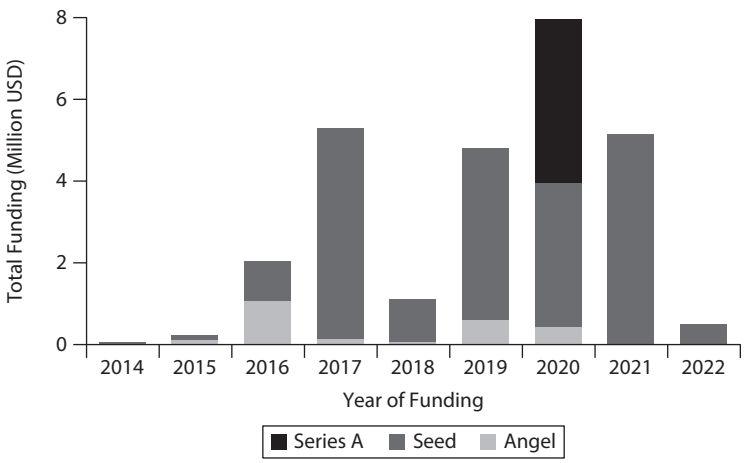

Figure 2: Funding raised by legal tech startups 2014-2021
Source: Authors' Analysis

Table 1: Notable investments in acquisitions in legal tech startups

	Time	Details
Investments	December 2021	Jupitice, ODR focused startup, raised $4M in a Pre-Series A round led by Almas Capital Ltd.[33]
	January 2022	LegalKart, a marketplace, raised $537K in a Pre-Series A round from Mumbai Angels and the Indian Institute of Management (IIM) Udaipur Incubation Centre[34]
	February 2022	Presolv360, also an ODR startup, raised $1M in Seed Funding from MGA Ventures, Omidyar Network India and other individual and institutional angels[35]
Acquisitions	February 2016	Singapore's Lawr.co acqui-hired LawFarm, a service provider marketplace [36]
	May 2016	MyeCA acquired Lawin1, an incorporation management startup, at $584K[37]
	February 2022	Lawyered acquired the compliance management startup Let's Scale Up[38]

Spatial spread of legal tech startups

In landscaping legal tech startups, we paid attention to their location or spatial spread to primarily comment on the future hubs of legal tech in India (see Figure 3 for the geographic spread of legal tech startups). The location of startups may also suggest proximity to their markets/customers whose problems the startups are trying to solve. For instance, a large number of startups founded over the last 20 years are located in the National Capital Territory (NCT), which could be influenced by the proximity to the Supreme Court of India and the socio-political climate of the region.

In addition to the NCT, states such as Maharashtra and Karnataka with prolific business ecosystems, host a large number of legal tech startups. None of the startups in our database were founded in the northeastern states, and very few are from central India, including states such as Chhattisgarh and Madhya Pradesh. We also examined the location of startups in contrast with the presence of the 23 National Law Universities. We see no correlation between the two. Several leading voices in the legal profession have urged Indian legal education to be reoriented towards market realities.[39] We believe that building micro-entrepreneurship ecosystems in and around leading law universities would not only help open entrepreneurship as a career option for graduates but also impart skills that enhance their employability.

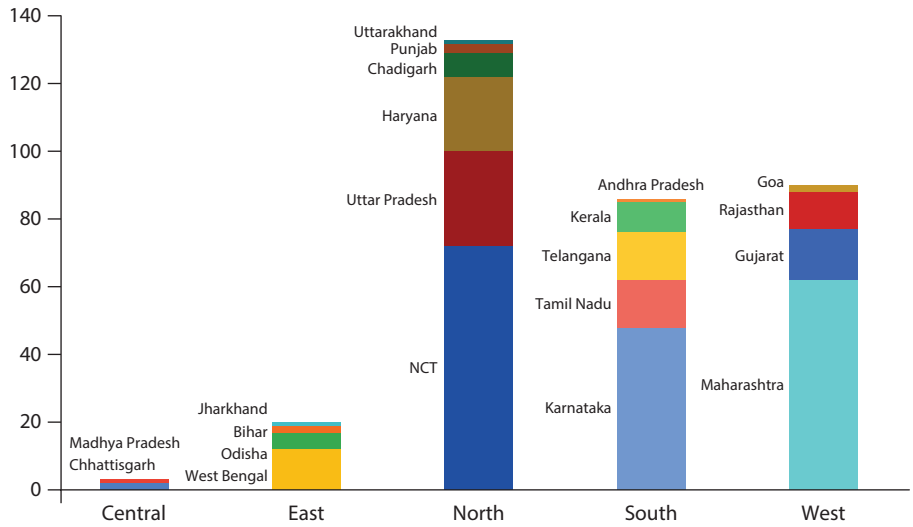

Figure 3: Geographic spread of legal tech startups
Source: Authors' Analysis

Founders' profile

To be able to understand the motivations underlying the founding of legal tech startups, we delved into an analysis of the founders' profiles from our dataset. Towards this, we randomly selected 122 startups – about a third of our sample – to get insights into the background of the founders building legal tech startups. We segmented the background of the founders into three categories:

(i) Legal: Founders with an academic background in law and compliance
(ii) Technology: Founders with education and/or experience in technology
(iii) Others: Founders with non-legal, non-tech background. We applied this segmentation to 183 founders across the 122 startups.

Two key patterns emerged. One, the predominance of solo entrepreneurs and two, the presence of founders with no legal or technology backgrounds. When we look at the combination of co-founders in our data we find that of the 122 startups, 75 (about 61 per cent) have been founded by solo entrepreneurs. There is a common belief in the industry, especially the investing business, that founding pairs and teams are better than solo founders.[40] While evidence to the contrary may be starting to appear,[41] founders in an emerging sector (legal tech) in a fast-growing ecosystem like India may be subject to evaluation on common and perhaps safe metrics such as the need for co-founders, as against solo founders. Thus, solo legal tech founders may consider recruiting co-founders so that investors can assess them favourably, and also build a varied capacity pool. This includes technology, market, operations, and marketing among others, often required in a growing startup.

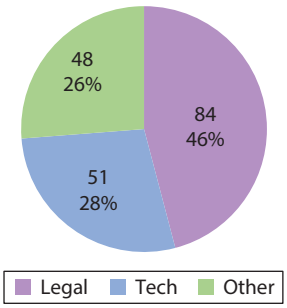

Figure 4: Breakdown of backgrounds of legal tech startup founders
Source: Authors' Analysis

While almost half the founders, around 45.9 per cent, have a legal background and may obviously be attracted to the legal tech sector, it was interesting to find that over 25 per cent of founders, in 61 startups, come from non-legal, non-technology backgrounds (see Figure 4 for a breakdown of founders' backgrounds). This merits further analysis to ascertain the motivations of these founders, so that adequate support systems may be designed for them.

Business models

We find that Indian legal tech startups are adopting a variety of business models and solving a range of problems in the legal services value chain. Taking a problem-centric view, we categorised legal tech startups into four major groups — legal service delivery, process efficiency, access to justice, and DIY tools, with sub-categories therein (see Figure 5 for legal tech business models).

We find most startups build legal services or document marketplaces like Legalkart, Legal Docs, LawRato, or case management and research solutions for lawyers like Legistify, CubicTree, mLeAP. Products in incorporation management include IndiaFilings, LegalRaasta, Company360, while practice management solutions for legal professionals include ProVakil, DigitPrac, THEO. E-signing products include Leegality, SignEasy, and LunarPen among others. In the absence of a validated proof of concept, evolving product market fit, and unclear regulatory framework, we find fewer startups building products for categories that include but are not limited to, succession management and court management.

Of all the business models comprising the legal tech startup landscape, seven business models, in particular, present a significant opportunity for new startups, incubators and investors. These include practice management, case management, research and analytics, contract management, online dispute resolution, incorporation management and digital e-signing. We will elaborate on each of these models taking up an illustrative case of a representative startup.

Figure 5: Legal tech business models (Figures in brackets represent the number of startups
Source: Authors' Analysis

Practice management

Senior lawyers in law firms (particularly those in managerial roles) lose considerable time on administrative tasks. These include HR and payroll-related tasks, invoicing and accounting, client database management, to name a few. Practice Management solutions offer customised Enterprise Resource Planning (ERP) solutions that streamline administrative tasks and facilitate efficient utilisation of executive time. These solutions are often built on top of a case management dashboard, providing legal service providers with an all-in-one platform to manage both legal and operational aspects of their practice.

Case study - ProVakil:[42] Founded in 2015, ProVakil offers a cloud-based practice management software for law firms as one of its proprietary products. Its primary features include:

1. Case management: A collaborative interface for matter, document and task management along with calendar integration and real-time case updates
2. Client management: Facilitates client intake, conflict check and limited access to clients allowing collaboration
3. Billing automation: Includes expense management, time-sheet interface and integration with accounting systems to establish a process flow
4. Reporting and insights: Provides key metrics such as cost management and revenue forecasts to optimise operations.

In its six years of operations, ProVakil has become one of the most prominent names in practice management in India serving 10,000+ legal professionals across organisations, law firms and individual lawyers.

Case management

While case management is part of the larger umbrella of practice management, its centrality in legal services merits a separate mention. Several legal tech startups, for instance, only offer case management products. Legal professionals have to keep track of multiple touch points with the judiciary and clients throughout the journey of each case. Most professionals often deal with multiple cases spread across long timelines for various reasons including delays in the judicial process.

Case management software allows legal professionals to track cases and case minutiae, provides preparation tools in terms of research and taking notes, and sends automatic updates to clients about case progress. Among other attributes, it also creates a calendar-based dashboard to track important dates. While large law firms often onboard legacy software firms to build customised solutions through Software as a Service (SaaS) offerings, startups can bring some level of standardisation and also improve engagement between law firms. They have a higher potential to build an interface with the client, reducing the litigant's sole dependency on lawyers for receiving updates.

Case study - CaseDocker:[43] This startup was founded in 2013 by two founders with strong technology and product management experience. It has four core modules – case management, virtual legal workplace, communication and collaboration, and virtual assistant. Their case management system covers three primary features.

The 'Client Manager' provides a real-time interface to the client allowing faster communication, easier information sharing and efficient administration. The 'Client Case Manager' is a service provider side dashboard that presents a holistic view of the details attached to a case such as relevant documents, associated litigants, advocates and judiciary, and case notes and task lists. The 'Court Notifications and Updates' feature largely imparts legal service providers with updates on cases and the daily cause lists from courts.

Research and analytics

Lawyers spend about a third of their time, roughly 15 hours a week, on legal research.[44] While online databases have existed for some time now, the actual research and analysis process remains largely manual, leaving scope for human error/omission due to the volume of data that needs to be analysed. Artificial Intelligence or A-based analytical tools, aided by Machine Learning (ML) and Natural Language Processing (NLP), applied to past case data including decisions and case proceedings enable legal professionals with comprehensive research, thus enhancing the quality of service to their clients.

Several versions of research and analysis tools are also available to end consumers. The products gather and present volumes of data in a condensed and consumable format to empower the consumers as beneficiaries of the legal system.

Case study - LegitQuest:[45] Founded in 2017, LegitQuest has developed an AI/ML-powered search engine that allows constant improvements to refine search results. It allows users to search through additional sources such as tribunals, acts, articles and other secondary material, apart from the judgements of the Supreme Court and high courts of India. It also presents select information in visual form to make the search more effective and accessible. Its 'iDRAF' feature allows users to navigate through issues in a case, facts, arguments, reasoning, and decision, in a structured manner, thus reducing the time spent in analysing a judgement. According to LegitQuest, the platform is designed for use by a variety of consumers including attorneys, law firms, state judicial officers, law students, corporates, governments, consultants, and litigants, among others. By the end of 2021, the startup had raised over USD 1 million in funding and was registering over 2,00,000 monthly users.

Contract management

One of the major functions of a corporate legal professional is to draft and review contracts. Given the variety in terms, this exercise of drafting and vetting contracts

could require significant customisation and can be time-consuming. Contracts, once enforced, may also need regular hygiene checks. Contract management tools automate the creation and execution of contracts, allow collaboration while drafting, and automate the management of enforced contracts. They save time and resources for legal service providers, customers and businesses in general. Contract management products also pave the way for smart contracts that make arbitration more effective.[46]

Case study - SpotDraft:[47] This startup offers a contract lifecycle management tool for legal and business teams to automate contract flows collaboratively. Starting from custom templates, it allows users to create, edit and generate contracts. Its collaborative feature automatically updates any changes made throughout the document. It also has an e-signature feature that enables teams to execute documents rapidly, and an audit trail that keeps a record of the entire process. Its built-in intelligence performs error checks such as repeated terms and mismatched definitions and also makes contracts search-enabled. A dashboard allows the user a centralised view of all ongoing contracts across teams and departments.

SpotDraft was founded in 2017 by founders with both legal and technology expertise. It has a team of about 80 people and has processed over 1,00,000 contracts. By the end of 2021, SpotDraft had raised about USD 4 million in seed funding.

Online dispute resolution (ODR)

The combination of electronic communication technologies and methods of Alternate Dispute Resolution (ADR), such as negotiation, mediation and arbitration, represent ODR as a product category.[48] With confidence in the e-courts system on the rise, both ODR as a concept and ODR products, have seen overwhelming support from the Indian judiciary.[49] NITI Aayog's expert committee report on ODR also showcases the government's inclination towards supporting ODR initiatives.[50] Typically, the process of ODR begins with the registration of the dispute by one of the parties involved. Subsequently, the other party/parties is/are invited to register on the said platform. The platform provider then ensures timely resolution through their mediation or arbitration experts.

There are several micro and system-level benefits of ODR. At the individual level, ODR can save time and cost for litigants.[51] At the systemic level, ODR products demonstrate the promise of easing the burden on the judicial system. As more and more companies adopt ODR, the room for further innovation in this space keeps expanding.[52]

Case study - Presolv360:[53] Founded in 2017, Presolv360 has been recognised by the Ministry of Law and Justice, Government of India, for its efforts to resolve disputes quickly and in a cost-effective manner. The startup offers end-to-end online resolution of disputes through proprietary arbitration and mediation modules. PreSolv360 is supported by some of the leading incubators in the country,

such as SINE Business Incubator (IIT Bombay) and NSRCEL (IIM Bangalore), which is evidence of industry confidence in ODR. The startup has raised over USD 1 million in funding and was incubated by Prarambh, India's leading legal tech incubator.

Incorporation management

According to the Ministry of Micro, Small and Medium Enterprises (MSME), there are over 63 million MSMEs in India.[54] This indicates the scale of the market for business incorporation and compliance management. Until very recently, legal processes involved in incorporation could dampen the spirit of any entrepreneur. Compliance requirements are getting easier, leading to improvements in Ease of Doing Business rankings for India.[55] Also, the market for end-to-end assistance in IP registration, typically for technology startups, compliance and incorporation, for legal tech startups, is large.

Case study - Companify:[56] Founded in 2020, Companify is a tech platform that provides legal and compliance services associated with the registration of businesses in Delhi. These services include company registration (startup, MSME, section-8) intellectual property registration, GST registration and filing, compliance plan, change in or closure of business and other required certifications, such as ISO. Companify operates through an in-house team of chartered accountants (CA), company secretaries (CS) and certified management accountants (CMA) who interact with customers through the Companify website or mobile application.

DIY e-Signing

Businesses lose significant resources and time while dealing with documentation. These costs could rise proportionately with the volume of operations of a business. In the last two decades, most large and many small businesses globally have moved to digital documentation. The COVID-19 pandemic has also accelerated the regulatory adoption of digital documents. In 2020, the global digital signature market was sized at USD 2.8 billion. E-signing solutions allow businesses and individuals to digitally sign documents in a secure and legally compliant manner. In the financial services sector, e-signing solutions save up to 90 percent costs compared to paper-based documentation.[57]

Case study - Lex-sign:[58] Founded in 2020 by founders with a collective legal experience of over 15 years, Lex-sign is a technology platform that allows users to e-sign and executes documents virtually. It offers additional secure verification in multiple ways including One Time Password (OTP) verification, digital signatures and Aadhaar-based signatures. It has different offerings for startups and larger enterprises customised to their needs.

Apart from marketplace-based models and business models akin to the ones enumerated above, we see nascent activity emerging in spaces like evidence management, due diligence management and court management. For instance, by applying novel technology solutions, startups are trying to disrupt traditional paper-based compliance needs like notarisation. However, high dependency on the approval of, and adoption by, the judiciary could impede notary services. Further, the legal services industry in India has a sizeable need for reliable translation tools that can accurately and rapidly translate legal documents from local and regional languages to English and vice versa. Solutions in this direction will produce multiple additional-use cases across business models including case management, incorporation, compliance, and ODRs.

Incubating legal tech startups

Increasing recognition and validation of legal tech business models in other markets globally, policy thrust (NITI Aayog ODR Policy Plan), and digital transformation of businesses, executive and judiciary, are creating opportunities for founders in legal tech (see Figure 1 for growth in legal tech startups). Similar reasons underlie the flow of private capital towards legal tech startups. However, the sector is still nascent, and strong incubation support for founders and early-stage startups will be critical for these emerging legal tech opportunities to be realised.

There are over 300 incubators in India, nearly all supported by various schemes of the central or state governments.[59] These incubators are designed to support early-stage startups through a variety of services and inputs including capital (equity and grants), mentoring, training, and networking platforms, among others. The incubation needs of legal tech startups may be slightly different, especially for business models around compliance and judiciary. In the last few years, the private sector has undertaken incubation and support programmes for legal tech startups. While the number of startups incubated by these programmes may be small at the moment, there are success stories like PreSolve that validate the need for creating incubation mechanisms for legal tech. We review three legal tech incubation initiatives in India.

Case studies:

1. **Prarambh:**[60] The law firm Cyril Amarchand Mangaldas (CAM) launched India's first legal tech incubator, Prarambh, in 2019. Prarambh's start-up incubation program involves coaching and support across various need areas and challenges including financial management, team building, scalability, and strategic decision-making, among others. In the first two years, Prarambh hosted two cohorts of startups, including notable ones such as Conduct, Presolv360, and PropertyChek. Prarambh looks similar to the UK ecosystem wherein incubators are operated by the private sector, but in the absence of financial support from the government, as is the norm for incubation in India, the viability of Prarambh is still unclear.

2. **Agami Prize:**[61] Founded in 2018, Agami is a not-for-profit platform hosting multiple initiatives on law and justice. Among its other offerings, the platform launched the Agami Prize in the same year to promote 'ideas that make justice more accessible, inclusive and effective by tackling well-known problems in legal and justice systems to achieve bold outcomes'.[62] The prize is awarded to ideas and solutions that aid the process and access to justice, in three categories:
   (i) Proven ideas that empower citizens to access justice
   (ii) Proven ideas being built into solutions by the industry
   (iii) Early-stage ideas that catalyse justice delivery or empower citizens to access justice

   In 2020, the prize included a cumulative cash reward of about INR 4 million across the three categories. Prizes like Agami present the potential to bring attention and legitimacy to legal tech startups, founders and the overall sector. One of the 2020 prize winners – Phoenix Smart ERP Prison Management System founded by a software engineer who was incarcerated for over 13 months[63] – is an example of a product suited for the Indian market (no dependence on the internet, data stored locally and available in real-time). The product can be scaled up on top of the validation extended by the Agami Prize.
3. **Citizen Innovation Lab:**[64] CIIE.CO, one of India's oldest and leading entrepreneurship platforms, launched the Citizen Innovation Lab (CIL) in 2021 as a research and incubation program for startups in legal tech, civic tech, and property rights tech. CIL had two formats for supporting legal tech startups. One is to support founders at the idea stage with inputs on starting up, and the second is to incubate early-stage startups through product sprints. By the end of 2021, CIL had coached and engaged about 500 budding founders, predominantly graduates of higher education institutions, and supported around 20 startups through sprints. The latter included startups across business models including Koncord (smart document drafting), IRO Notary (e-Notary), LicenTech (IP registration and commercialisation), EzyLegal (service provider marketplace), RTI Wala (RTI filing), and DC Legal (enable access to justice for unserved/underserved communities). CIIE.CO has a long history in the startup ecosystem in India, and its entry into the legal tech incubation space could catalyse other incubators, and make government agencies aware of the potential of legal tech startups.

Future pathways

Over the last two decades, the Indian legal tech startup ecosystem has been growing on multiple fronts. While the underlying legal service market is large, the size of legal tech as a sector, in comparison to other predominantly digital tech-enabled

sectors (fintech) remains small. We discuss three areas that can unlock significant scale for the legal tech ecosystem, with caveats for addressing some barriers.

Building for judiciary: hard problem, large market, massive impact potential

Technology-based innovations are available to various customer groups, but startup-building solutions for the judiciary are sparse. The COVID-19 pandemic brought a surge in tech-based innovations and the Supreme Court of India, most high courts, and many district courts moved to a virtual court system. Moreover, courts had a short window of time to deploy e-filing systems for cases and litigation documents. While this has undoubtedly boosted the adoption of technology at a previously unfathomable pace, most technology solutions have come from legacy software companies.[65] In other geographies, however, startups have been able to carve their own space with virtual court offerings. For instance, at the peak of the first global lockdown caused by the COVID-19 pandemic, 60 Tech LLC, a startup founded in San Antonio, Texas, USA, was able to onboard Summit County in Akron, Ohio, Washington, DC Courts, and the Superior Court in Yuma County, Arizona, among its first customers.[66]

At present, there appear to be several challenges facing startups looking to build products for the judiciary. Getting buy-ins, training and onboarding the complete set of actors in the judicial system, including, but not limited to judges, clerks, and courthouse staff, among others, is a daunting task. For startups, the path to scaling up will most likely be by working across multiple courts. However, achieving standardisation and coordination across courts at different levels has been difficult across the world.[67]

The promise for startups is emerging with the Indian judiciary becoming more open to technology interventions like the e-Committee[68], and the Artificial Intelligence Committee.[69] A few startups like Mancorp Innovation Labs are becoming the face of the promise that built SUPACE - Supreme Court Portal for Assistance in Courts Efficiency. SUPACE is an artificial intelligence portal launched by the Supreme Court of India and creates deployable solutions that benefit the judiciary, and by extension, the larger legal and justice systems.[70]

Futuristic use case: Litigation finance

Considering the huge costs of litigation, litigation finance as a form of funding is gathering speed in US markets. A litigation finance company's underwriting would be predominantly based on case data and other relevant signifiers. The loan is repaid when the ruling is made in favour of the said litigant. Litigation financing firms essentially estimate the risk involved to maximise the capital provided by them. An example of this business model is Legalist, founded in 2016, by two Harvard dropouts. Legalist applies AI to run risk analysis of each application. It

was part of the 2016 cohort of Y Combinator and has raised over USD 10 million in funding over seed and series-A rounds.

In India, where court cases typically await judgment for a minimum of three years, the financial drain on litigants can be quite severe.[71] An offering like litigation finance could be lifesaving in some cases. However, existing pendency rates are likely to make underwriting hard and add to the cost of capital, which is ultimately borne by the litigant. The pendency of existing cases significantly impedes the training of AI models.

Addressing historical inefficiencies within the judicial system is a prerequisite for the effective introduction of litigation financing models in India. On the other hand, entrepreneurs could also experiment with alternative underwriting models using other types of data that may be relevant and more easily accessible. Indians spend INR 519 per day of appearance in court.[72] There are about 2,81,000 hearings per year across the Supreme Court[73] and high courts[74] alone, and some estimates point to Indians spending over INR 300 billion in appearances. The figure is roughly 0.3 percent of India's GDP or a little below Singapore's GDP.[75] Evidently, there is a large market for litigation finance in India. Entrepreneurial problem-solving has the potential to transform this latent market into a real opportunity.

Opening pathways into entrepreneurship for graduating lawyers

With the legal industry embracing technological innovations, talent needs have also changed in the same direction. Experts urge prioritising legal skills like research over legal education, to make lawyersmore aligned to the changing fabric of the industry and civil society.[76,77] Law firms now consider research aptitude, analytical skills, and critical thinking while recruiting, over and above the candidates' academic records.[78] Our interviews revealed that a candidate with experience in research and training in relevant technology is more likely to be hired even if their academic performance is marginally poorer than another candidate. The present curricula of leading law schools in India do not paint a promising picture.[79,80] If the National Law Universities are considered as examples of the over 1,500 law colleges in the country, subjects like research and analytical skills, do not feature in undergraduate training. With more than 70,000 graduate students joining the legal profession each year,[81] and most being unemployable,[82] the need for an overhaul of legal education in the country is both critical and urgent.

While steps have been taken to nudge more industry inputs in legal education, a big step towards enhancing career options for graduating lawyers is a close brush with entrepreneurship. Our analysis reveals that founders of nearly half the legal tech startups in our database come from legal backgrounds. Setting up startup incubators and integrating entrepreneurship courses in the curricula would immensely help law colleges expand career opportunities for graduating students. Incubators could focus on catalysing entrepreneurship on campus and support startups founded by students and alumni of respective schools. Graduates who

venture out not only create employment for themselves but also generate openings for other students to take up jobs in these startups or be inspired to venture out themselves. Entrepreneurship courses could also aim at building entrepreneurial thinking amongst students, a valuable skill that could be applied in any role or career path that the student may choose.

Conclusion

This chapter was an attempt to draw the contours of the legal tech startup ecosystem in India to illuminate and perhaps define future growth pathways. Legal tech startups hold immense promise, especially in improving access to justice and legal services for the end consumer. This chapter sketched the landscape of legal tech startups by presenting data on the history, investments, business models, founders, and incubation initiatives. We delved deeper into business models that have not only held the attention of founders but also present significant promise for investors. The chapter also documented three prominent incubation initiatives from India that will lay the groundwork towards more incubation for legal tech startups.

Finally, based on the evolving policy infrastructure, business processes and digital rails, we presented three themes that are marked by large markets and are beginning to bloom towards disruption. On multiple parameters, the legal tech startup ecosystem in India is beginning to expand. Among other forces, the increasing digitalisation of judiciary and business, growth in entrepreneurial aspirations, and mainstreaming of deep technology in adjacent sectors could prove to be some of the catalysts for legal tech startups in India.

Editors' Comments

After a thorough overview of startups, the volume takes a deep dive into a specific institution how one of its core needs, estimating judicial capacity, can be done, and why the whole process of doing that in judicial institutions may need a scientific consideration. The next chapter discusses the estimation of capacity requirements of the National Company Law Tribunal.

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CHAPTER 21

Estimating Capacity Requirements of the National Company Law Tribunal: Notes from the Field

Susan Thomas and Bhargavi Zaveri-Shah

"God may be in the details, but the goddess is in the questions. Once we begin to ask them, there's no turning back."

– Gloria Steinem

SUMMARY

- Policymakers in India have generally used four metrics to estimate the number of judges needed: filings, pendency, disposal and population;
- In 2014, the Law Commission of India dismissed 'population' as an unreliable metric for assessing the judicial capacity;
- A framework for determining the strength of the National Company Law Tribunal (NCLT), a quasi-judicial body, is of utmost importance;
- A critical input is the ability to collect and collate data in a standardised, comprehensive and consistent manner across all NCLT benches;
- The weighted caseload method is a useful framework for estimating the capacity requirements of tribunals.

Introduction

How many judges does a court need to perform its functions? The popular discourse on judicial backlogs in India tends to focus on, and arguably even over-emphasises, the sanctioned strength[1] to vacancy ratio. However, what are the ideal metrics for determining the sanctioned strength? How do we identify whether the sanctioned strength is serving its purpose or is obsolete? As a corollary, if the sanctioned strength is met, what should we assume of the performance standards of courts? How can one keep the sanctioned strength numbers dynamic to take into account the changing needs of a court? These questions are critical not only to ensure that courts meet the needs of the people but also that the sanctioned strength numbers are rational, credible and practical. An estimate of sanctioned strength is 'rational' if it is proportionate not only to the existing but also the projected workload of that court. It is 'credible' if the sanctioned strength is actually filled up on time and the court delivers as per pre-defined expectations. It is 'practical' if it takes cognisance of the finite nature of human and financial resources to fill up judicial vacancies.

In this chapter, we propose the development of an estimation framework for determining the number of members required for the National Companies Law Tribunal (NCLT). While several committees have deliberated a framework for making such a determination for subordinate and higher courts, how the 'sanctioned strength' of tribunals is determined, remains unclear. As the number of tribunals in India increases and as tribunals start administering increasing swathes of Indian laws, the questions of the 'sanctioned strength' of tribunals become significant and even urgent. While we have developed this framework for estimating the optimal sanctioned strength of the NCLT, it could be potentially applied for a similar purpose to other courts and tribunals in India as well.

We begin by taking stock of the methods currently used in India to determine the appropriate strength of courts and describe their advantages and limitations. We argue that the current focus on absolute pendency and disposal numbers provides insufficient information for estimating and planning the capacity required at courts. There is a need to shift the focus from pendency and disposal numbers to the concept of 'judge time' required for achieving an optimal backlog. To estimate the 'judge time' required, three pieces of information, namely, the complexity of cases handled by the court, the time and resources consumed for dealing with different kinds of cases and the projected workload, are critical. We argue that the Weighted Caseload Method (WCM) is a useful framework for estimating the capacity requirements of tribunals as it takes these variables into account.

We propose the deployment of a WCM for estimating the judicial capacity requirements of the NCLT. Currently, the information systems at courts are not designed to capture the information needed to deploy this estimation framework at Indian courts and tribunals. This motivated us to develop proxies of these variables, based on the information available in the public domain.

We share our experience of having deployed this estimation framework to estimate the caseload and the capacity requirements at the NCLT and the limitations and constraints we faced in putting ideas into practice. As part of this, we put in place the NCLT Observation Program, in which researchers were engaged to observe the proceedings and back-end processes of the NCLT, continuously for a period of five working days. We conclude by making a case for augmenting information systems to make a more rational, credible and practical assessment of the judicial capacity.

Estimating Required Judicial Capacity

Policymakers in India have generally used four metrics to estimate the number of judges needed: filings, pendency, disposal and population. These metrics are used either in isolation or combination, in absolute or relative terms, to estimate the number of judges needed. For example, the Law Commission of India (LCI) used the ratio of the number of judges to population to determine the capacity requirements of Indian courts and recommended an increase from 10.5 judges to 50 judges per million Indians.[2]

In 2014, the LCI reversed this recommendation, dismissing 'population' as an unreliable metric for assessing the judicial capacity needed.[3] Instead, the LCI recommended the 'rate of disposal' as the appropriate parameter for making this assessment, while acknowledging that this too may not be an entirely 'scientific' approach. The report prescribed the *Weighted Caseload Method* (WCM) as a more 'scientific' method for assessing the number of judges required in Indian courts. However, the LCI recognised the absence of information required to deploy this framework and determined that the 'rate of disposal' is a more 'pragmatic' metric to make this assessment. It recommended the *ideal disposal ratio* as 1, which meant that for every new case instituted before a judge, the judge ought to have disposed of one case. The intuition was that if this ratio held for a period of one year, the court would not need more judges.

Two years later, a National Court Management Systems (NCMS) Committee submitted a report to the Supreme Court which identified two key weaknesses in the rate of disposal approach.[4] First was that the approach ignored the complexity of different types of cases, and assigned an equal weight to all cases. Second was that the approach implicitly incentivised lower disposals. The NCMS committee also underscored the fact that the High Courts had conventionally used the disposal ratio to determine sanctioned strength for the lower courts without making a significant dent in the capacity of these courts to handle case backlogs. Further, pegging judicial capacity to ideal disposal rates incentivises higher disposals, but not necessarily an improvement in the quality of the disposal. In the same year, the Centre for Research and Planning set up by the Supreme Court of India recommended that distance or proximity of courts to citizens should be used as a benchmark to determine the 'judicial capacity' needed in the country.[5]

Each of these metrics shares some of the same disadvantages as the metrics used earlier. Finally, none of these approaches involves studying the case-flow process or the bottlenecks in each step of the process to improve the marginal efficiency in each such step. As a result, they leave little scope to consider improvements in processes and the adoption of technology, which may reduce the time and resource commitment required of the bench. Having surveyed different approaches used across 50 states in the United States, Flango and Ostrom argue that no single approach has been able to define and estimate the needs of the judicial system with complete accuracy (including the number of judges).[6] However, this feature only underscores the difficulty of carrying out the estimation, and not that it is necessary to do.

The idea of 'judicial time' has increasingly gained traction in developed countries as the basis for determining the sanctioned strength. On any given day, the judiciary performs a complex set of tasks involving a mix of administrative functions and judicial functions. What is visible to the public is usually only one part of the time that the judges spend on deciding cases. The 'back-end' administrative functions involve a series of tasks starting from the case being filed with the court registry, the case papers being checked by the registry officials for completeness and procedural compliance, the case being listed for hearing before a judge, and so on. As an example, consider the process once a case was filed with the Registry at the NCLT. There are *four stages* before it is listed for hearing before a judge. The time taken for each stage may vary. Often, this depends upon the responsiveness of the party filing the case. Since the case is already filed, there is time spent by the Registry in processing and getting it ready for hearing. In addition to the time spent in actually hearing a case, the judge spends time reading the case papers, researching the points of law and facts raised by the parties (with or without the assistance of law clerks) and writing the order.

The WCM can incorporate the difference in time taken for each step of the case while calculating the overall judicial time taken for a case. Underlying the WCM is the classical time and motion approach, widely applied in organisational and efficiency studies.[7] This approach involves a shift away from other metrics such as pendency, population and filings which present an aggregated perspective when conducting a judicial needs assessment exercise. Over the years, the WCM has found growing acceptance across the world as an essential practice in court management. Many state jurisdictions in the United States employ case-weighting either by itself or in combination with other approaches to assess judicial needs. For example, the Judicial Council of California, in its annual Court Statistics Report, describes using WCM to assign or retire judges across its Supreme Court, Court of Appeals as well as Superior Courts.[8] At least 15 other states are estimated to rely on case-weighting including states of Michigan, Wisconsin, North Carolina, and Virginia.[9] The method has also been deployed in several European countries such as Austria, Germany, the Netherlands, Spain and Switzerland.[10]

Methodology

A key intuition underlying the WCM is that all case types are not equal, and need a different amount of time to complete. The weight that is assigned to each case type is the amount of court time it takes to be completed. The attempt is to determine the equivalence of one case type to another in terms of court time. As an analogy: if a traffic violation case takes 10 minutes of court time and a cheque bounce case takes 100 minutes of court time, ten traffic violation cases are deemed to be equal to one cheque bounce case, in terms of court time. This suggests that two key inputs are required to compute the weighted caseload for any court:

1. The mix or fraction of case-type-wise filings in the court,
2. The weights for each case type which is the time that the court is observed to have taken, on average, from the start of a case type to its completion.

This would be measured in units of time (in minutes) that each case of a given type takes aggregated over the number of hearings that it takes to complete the case. Typically, this would be presented as an average of the time taken across all the cases or a sample of the cases, observed at the court.

If there are n case types with corresponding weights W_1, W_2, ... , W_3 and the number of cases of each type is C_1, C_1, ... , C_n then the estimated weighted caseload (WCL) can be calculated as:

$$\text{WCL} = \sum_{i=1}^{n} (W_i \times C_i)$$

This estimated CL may be used as an input to estimate the *required judicial capacity* (J_E) as follows:

$$J_E = \frac{WCL}{\text{JudgeYearValue}}$$

Here, the "Judge Year Value" is the total time (in days) for which a judge hears cases *in a given year*. If there are case types that take a multi-year period to complete, the period over which the weighted caseload method is deployed may need to be adjusted.

Finally, if the current judge's capacity is (J_C), then the incremental judicial capacity required (ΔJ) is calculated, by first calculating what the current judge capacity is and deducting this from the estimated capacity.

$$\Delta J = J_E - J_C$$

Thus, in order to calculate the estimated capacity for a defined workload of a court, which is defined by an observed number of cases (N_i) of a given set of (I) types of cases that are filed at the court, then we would need to know: the weights to use for each case type, W_i, and the "Judge year value" to be used.

Table 1: Case weight of a fictional sample of 10 IBC cases

Task	Freq.	Time spent	Freq.	Task weight
	(a)	(b)	(c)=10/(a)	(d) = b*c
1st hearing	10	10	1	10
2nd hearing	5	30	2	60
Hearing for withdrawal	5	20	2	40
Hearing in the resolution process	3	45	1.9	85.5
Hearing for approval of the plan	3	30	1.9	57
Hearing for liquidation	2	30	2.5	75

Source: Fictional data for demonstration, compiled by authors.

Typically, case-weight calculations require an analysis of the number of hearings in the life cycle of a particular case type. This includes the initial appearance, preliminary hearing, trial and sentencing. The average judge time spent on each hearing is then scaled up or down by how frequently that type of hearing takes place during the period of the analysis, to give us a "task weight". The task weights across a given case type are then aggregated to compute the weight of that case type. Table 1 presents an example of calculating the weight of 10 fictional cases under the Insolvency and Bankruptcy Code (IBC). The Time spent refers to the average time spent by a judge on that task across all cases and all courts, and is recorded in minutes.

Limitations

The biggest challenge with using the WCM approach is the data that is required as input for computation. While collecting data on the number of cases is relatively simple, the collection of information about case types, tasks, the frequency of tasks, and the time spent on these tasks, across different case types, is hard. In general, such information is collected using a sample of cases. It necessarily assumes that either the information systems of the court will capture this data or that the court will allow such information to be captured through a rigorous observation of its proceedings and back-end processes.

More importantly, the WCM defines judicial time in a limited manner. As demonstrated in Table 1, a key input in determining case weights is the estimated time required for each task. The time spent on a task may be defined narrowly to include only the time spent in hearing the case or it may be defined more realistically to include the time spent in preparing for the hearing. This includes, for example, the time taken in:

1. Pre-case and mid-case conferences with parties and their legal representatives to decide on case schedule and other matters,
2. Researching and writing the order.

A more realistic definition of the time taken in a task increases the complexity of data collection. It will necessarily involve estimates, which in turn, affect the precision of computing the case-weights.

Another limitation of the WCM is that it focuses only on judicial time and does not take into account the time taken by the court Registry to process a case and make it ready for judges to hear. Any effort to improve court efficiency will require both judicial capacity and the capacity of the registry to be suitably estimated.

The WCM is often criticised on the ground that it entrenches existing inefficiencies, as it takes into account historical data on the time spent on cases. Court capacity computations must be aspirational. They must be designed to achieve a certain benchmark output. Indeed, the WCM does not set an aspirational goal. But neither do other metrics of judicial capacity such as population, filings, and disposal rates. For each of these metrics, the researcher or policymaker has to design the benchmark or optimal backlog either by using a theoretical framework created as a function of the economic and institutional background or using data from other jurisdictions on a similar matter. A third way to approach the creation of a benchmark is to understand how the measures behave under simulation scenarios of projected workloads. In the following section, we illustrate this approach to assess the required workload for the NCLT.

Applying the Framework to the NCLT

In India, the WCM methodology is not typically used to assess judicial requirements because of data constraints .[11] A few recent studies have sought to use the time and motion studies approach for assessing the total workload of some civil and criminal courts.[12] A recent paper applies the WCM to the Supreme Court to estimate the amount of judge time that will be required to clear the pending cases.[13] The authors of this paper use the daily display board published by the Supreme Court to identify the time spent by judges on cases and triangulate this data with the daily cause list data for a period of one year. They find that it will take 20 years for the Supreme Court, at the then prevailing strength, to clear its backlog.

Sourcing Data from Daily Cause Lists

Since the data required for the WCM calculation does not exist for the NCLT, we identify and use proxies that can be used instead. One source is the daily cause lists published by the NCLT. This information is published regularly, and the information in these cause lists gives us a unique opportunity to study the manner in which this court assigns its time to different types of cases. Each bench of the NCLT has one or more courtrooms and each courtroom has a separate cause-list of the matters to be heard that day. The daily cause lists contain information about the hearings scheduled for any particular working day in each courtroom

and bench of the NCLT. At the end of each day, each courtroom publishes two cause lists:

1. Information about matters that are scheduled for the following day, and
2. The outcome of hearings that were conducted during the day is updated at the end of the day for the cause list.

The first set includes basic information about the matter listed for hearing such as the names of the counter-parties and the section of the Act under which the case has been filed. The NCLT adjudicates three legislations, namely, the Insolvency and Bankruptcy Code, 2016 (IBC), the Companies Act, 2013 (CA 2013) and the Limited Liability Partnership Act, 2008. We develop a dataset to analyse the workload taken up by the courtroom in terms of the intensity of the workload (measured as the number of hearings listed) and the type of cases (which is denoted by the Act under which the case is filed).

For the analysis used in our illustration, we collected data from 23 February 2018 to 23 July 2019. This is a sample period of 515 days (called the "study period" in the following text). Within the study period, cause-list data available across various courtrooms varies depending on two factors. The first was whether the courtroom was functioning on the relevant dates, and the second was whether the registry for that courtroom uploaded the cause list on the website.

We classify cases in the daily cause list into case types based on the legal provisions under which they are generated. This allows us to create hearings-based case weights as follows:

1. For IBC cases,
2. For 'M&A' cases under CA 2013, and
3. For 'Other' cases under the CA 2013.

The Appendix gives a detailed overview of the data and the fields from the cause lists that we used for this analysis.

Summary Statistics

The data set can be used to measure the functioning of the NCLT across three dimensions:

1. At the level of a case,
2. At the level of a courtroom/bench, and
3. The time period of observation started from February 2018 to July 2019.

In this sample, we observe 136,440 hearings. Almost all of these (136,437 of these hearings) can be seen to have 35,952 unique case numbers (Table 6 in the Appendix).[14] This suggests an average of four hearings per case.

Since we are able to see the location of the benches from which the cause-list data is extracted, we can augment our data set as arising from the following set of benches: Mumbai, New Delhi, the Principal Bench,[15] Bengaluru, Chandigarh, and Kolkata.[16] These benches account for 94% of the total hearings and around 91% of the total cases (as can be seen in Table 9 in the Appendix).

We find that the number of daily hearings scheduled varies by each bench. While the Bengaluru, Mumbai and New Delhi benches schedule an average of 35-40 hearings daily, the Chandigarh and Kolkata benches schedule a daily average of 15-25 hearings. On an average, 50 per cent of the hearings and cases are IBC-related matters, 15 per cent are M&A-related matters and the remaining 35 per cent are other categories of matters under CA 2013 (as can be seen in Table 10 in the Appendix).

On average, every unique case in our sample had four hearings irrespective of the classification as IBC, M&A or Other. Further, the benches at Bengaluru and New Delhi conducted, on an average, a higher number of hearings relative to other benches (see Table in the Appendix for hearings to case ratio). We also find that most of the cases had less than four hearings during the study period (Table 9 in the Appendix).

An examination of the trends in these statistics over time, we observe that there has been a change in the mix of matters in the stock of cases within the daily NCLT cause lists. IBC cases have seen a rise, while M&A and other CA 2013 matters have seen a drop. Over time, the NCLT has also been changing its hearing mix in line with its case mix: as IBC cases have increased, the NCLT allocates more hearings to IBC matters. Figure 1 shows a quarterly time series of the number of cases (IBC.c; M&A.c; Other.c) and the number of hearings (IBC.h; M&A.h; Other.h) as a proportion of the total number of cases and hearings respectively for (for three case-types for twelve benches of the NCLT for the period beginning 23 February 2018 and ending on 23 July 2019.

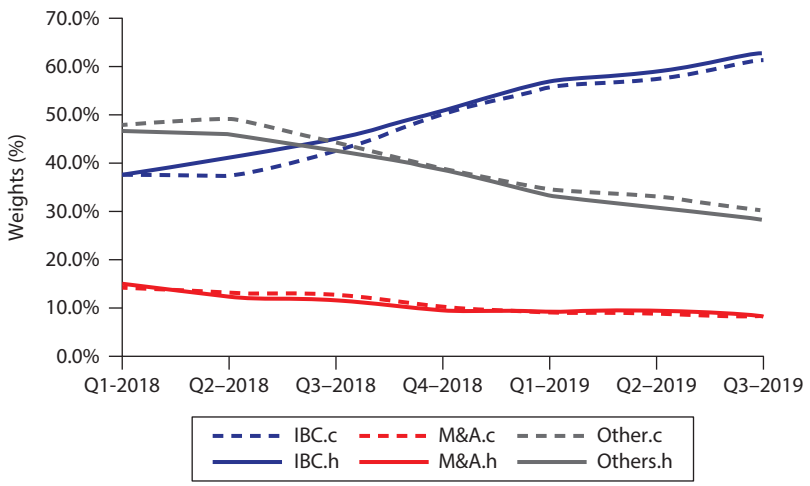

Figure 1: Quarterly case weights for select NCLT benches (Feb 2018-July 2019)

Calculating Case Weights from NCLT Cause Lists Data

We follow a four-step process to compute the weights for the three categories of case types. First, we classify each hearing for each case into these three case types. Next, we define the period over which case weights are to be computed. The period could be daily, monthly, quarterly or annual. Once the period is defined, we next compute the hearings-based weight for each category (HW) by dividing the number of hearings for that category by the total number of hearings during the period. Two assumptions are made when using hearings as a proxy for court time allocation: (1) that all hearings that are scheduled actually take place on the date on which they are scheduled, and (2) every hearing is the same in terms of time per hearing. These assumptions can be relaxed when more information about scheduled versus actual hearings and the time taken for every hearing, becomes available.

A key question in the weighted caseload method is the period over which the weights should be determined. Since the cause-list data is generated at daily frequency, we can choose any period, month, quarter, half-year, full year or full sample, to determine case weights. We use the principal bench, as an illustration, to show how weights vary by type of matter and by time period. Similar analysis for other benches can also be done using the cause-list data.

For example, we can calculate the weights attributable to cases under the IBC, M&A under CA2013 and Other matters under CA2013. In each case, we count the number of hearings under each of these case types during the period specified and divide this by the total number of hearings in the same period. Table 2 shows that for the Principal Bench, weights for IBC cases have increased, while those for M&A and other cases under CA 2013 have gone down. This holds irrespective of whether the period being analysed is a quarter (three months) or half-yearly (six months) or a year. This helps validate the proxy measure that we have used to capture the case weight of IBC vs. M&A under CA2013 or Others under CA2013 at the NCLT.

Once the WCL is calculated, it represents the throughput of the Principal bench with the assumptions about (1) its judicial and administrative capacity, (2) the stock of cases that are heard during the period[17], and (3) the mix of cases across the typology of IBC, M&A and Others. If we assume that this represents a steady-state throughput of the capacity of the Principal Bench, then we can simulate how this capacity will need to change under a change in the number of cases filed or a change in the case mix.

In the following Section, a scenario is a possible change in the workload (for example, an increase in cases of a particular type in the year or a change in the case mix at a bench). Under these change scenarios, our analysis will focus on how the workload at the bench will respond *holding other things constant*. This will help build an understanding of how the NCLT responds to changes in caseload. This, in turn, will help visualise how to structure resources for the NCLT to cope with the change.

Table 2: Hearing-based weights for different time periods for the Principal Bench

	W_{IBC}	W_{IBC}	W_{OTH}
Quarterly			
Q1-18	0.53	0.13	0.34
Q2-18	0.57	0.22	0.21
Q3-18	0.65	0.17	0.17
Q4-18	0.70	0.15	0.15
Q1-19	0.74	0.12	0.14
Q2-19	0.71	0.15	0.13
Q3-19	0.68	0.17	0.14
Half-yearly H1-18	0.56	0.19	0.25
H2-18	0.67	0.16	0.16
H1-19	0.73	0.13	0.14
H2-19	0.68	0.17	0.14
Yearly			
2018	0.63	0.17	0.19
2019	0.72	0.14	0.14
Full sample	0.68	0.16	0.17

Source: Weights estimated by authors using cause list data published on the website of the NCLT for the period 23 February 2018 to 23 July 2019.

Scenario Analysis of Judicial Capacity for the Principal Bench of the NCLT

In the following analysis, we discuss different scenarios using which to understand how the required capacity at the NCLT changes in response to changes in the stock of cases that are heard, the mix of case types and its own administrative capacity. Table 3 presents the case mix of hearings of matters under the IBC,

Table 3: Principal Bench throughput: current scenario

	Cases (C)	Hearings (H)	H/C	H per day	Matter weight
IBC	1,262	9,321	8	30	0.68
M&A	459	2,149	5	7	0.16
Others	566	2,292	5	7	0.17
Total	2,287	13,762	7	45	1.00

Source: Compiled by authors using cause list data published on the website of the NCLT for the period 23 February 2018 to 23 July 2019.

M&A and Other matters under the CA 2013 at the NCLT. This is a sample with daily cause-list data for 306 days.

This shows that the NCLT judicial time is skewed towards hearing IBC matters, which is around 55% compared to matters under the CA 2013. If we think about the NCLT as a system generating the above as a steady-state throughput, we consider what will be the impact on the required judicial time when there are changes in different elements that drive the throughput, such as the rate of hearings per day, the case-mix or the rate of arrival of cases per day. We calculate the new requirement in bench capacity as the ratio of Changed hearings per day in the scenario by the Current hearings per day as seen in Table 3.

We consider the following two scenarios:

Scenario 1: Change the case-mix so that there are double the number of hearings for IBC matters keeping the total number of hearings and the rate of hearings per day the same.

The hearing-based weights reflect the higher allocation for IBC, with the hearing weight in the last column of Table 4 increasing while the other cases see a drop in hearing weight. The table shows that with this change, the bench capacity will need to be increased from 1 to 1.67 benches.

Scenario 2: Change the case mix and change the rate of hearings per day. This scenario is the same as scenario 1 but the total number of hearings are conducted in 250 instead of 306 days.

We find from Table 4 that the ratio of Changed to Previous hearings per day indicates that the bench capacity needs to be increased from 1 to 2.05 benches. This increase in capacity takes place even as the weights remain the same as Scenario 1.

The scenario analysis shows us how information from the cause list implies a future capacity requirement at a court by changing one or the other inputs: number of benches, case flow by category, number of hearings per case for every category, and number of hearings per day. We also see how hearing-based weights change under the scenarios.

Table 4: Principal Bench capacity requirement change in Scenario 1

	Cases (C)	Hearings (H)	H/C	H per day	H weights
IBC	1,262	18,642	15	61	0.81
M&A	459	2,149	5	7	0.09
Others	566	2,292	5	7	0.10
Total	2,287	23,083	11	75	1.00

Source: Authors' calculations

Table 5: Principal Bench capacity requirement under the changes in Scenario 2

	Cases (C)	Hearings (H)	H/C	H per day	H weights
IBC	1,262	18,642	15	75	0.81
M&A	459	2,149	5	9	0.09
Others	566	2,292	5	9	0.10
Total	2,287	23,083	11	92	1.00

Source: Authors' calculations

Limitations of the Scenario Strategy

The limitation of this strategy is that it assumes that the relationship between the input variables remains *as is* and only changes proportionately. This may not be true in reality. One way of addressing this limitation is to measure these inputs periodically and to observe how the relationship between them evolves. Multiple such observations over time can generate data on which empirical techniques may be deployed to model the relationship between the various components that make up the NCLT throughput.

From Ideas to Implementation

The goal of this chapter was to describe and understand the WCM which is regularly used to measure judicial capacity in other jurisdictions. Given the documented data constraints in India, such a method faces massive bottlenecks in its implementation in the Indian environment. The previous sections identify data that is available in the public domain for the Principal bench of the NCLT which can be used as a proxy to calculate the WCM for the court. We are next able to demonstrate a few scenarios of changes in case filing and case mix, under which the WCM can be used to plan for capacity at the Principal Bench of the NCLT.

What will it take to implement such a measurement framework broadly across courts in India? A critical input is the ability to collect and collate data in a standardised, comprehensive and consistent manner across all the courtrooms of a given court. If such an information system can be developed that captures information on workloads, the time spent by judges on each stage of the case life-cycle and allows for estimation of projected workload for each bench, this can then be aggregated to better plan the capacity requirements of courts. Table 5 lists and describes the information needed.

During our efforts to develop such a model on a pilot basis at the NCLT, we found that there are significant problems with the regularity and consistency of cause-list data, making it hard to build precise estimates of a court's needs. For instance, in the case of the NCLT, we found significant gaps in the available cause-list data since every bench did not publish or archive its cause-lists. Even for the

Table 5: Information design for deploying the WCM

Variable	Description
Case types	Types of cases identified based on complexity
Case-events	Stages across each case type
Time	Time spent in case events of different types
Frequency	Frequency of case events across each case type
Volume	Current volume of cases across case-type

same bench, the number of days for which the cause lists were available differed across courtrooms.

Second, while what is required to be presented in the cause list is the same across benches, the manner in which this information is presented is not *standardised*. While it is understandable that the discussions at the hearings and the judgement delivered will be different from hearing to hearing, and case to case, the information required to build the WCM is far more easily regularised. However, there is significant variation in the manner in which the information is entered in the cause lists, both across benches and across courtrooms of the same bench. What can and must be standardised are the names of parties, case number, the identity of the law and the provision under which the case is filed, the purpose of the hearing, dates, and outcomes of a hearing, to make this data amenable to the WCM analysis. We believe that this problem exists across courts in India.

Finally, applying the WCM to assess the NCLT workload has involved working with *proxies* in place of the actual information required to apply the approach fully. The measurement includes various aspects of the functioning of the judiciary along the full path of a case, from the time of its origin to the time that it is closed. Multiple types of information are required to deploy the WCM. This includes the actual time taken from applying to being admitted, the average time taken by the bench at the first hearing, the average number of hearings for different types of cases, the average time taken at subsequent hearings, the average period of disposal across case-types and the time between hearings. Standard MIS systems, that are deployed in the smallest firms, need to be put in place as part of court administration, to be able to calibrate the functioning of the court and identify where the bottlenecks in the process arise so that these can be fixed. There are, by now, several instances of the interface between citizen and the state where such information is captured through regularised systems that minimises the incidence of error at data capture. Common examinations are administered across the length and breadth of the country. Such systems can and should be integrated into the information captured at the interface between parties and the judicial systems as well to make rational, credible and practical assessments of the number of judges and perhaps, even the overall judicial needs of India.

Editors' Comments

In line with the above, the next chapter ends the volume with a look at the possible and desirable future movement of the Indian justice system. It considers the evolution thus far including the first two phases of ecourts and state initiatives before that, analyse the ongoing third phase of the ecourts mission mode project along with its futuristic vision and makes suggestions for effective implementation of the corresponding plan.

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Appendix: Detailed data description

Duration and courtrooms

Table 6 provides bench and courtroom-wise information within the study period. It also presents as well as the number of days for which the cause lists are available. It is noteworthy that cause-list availability through this method of access is low for many benches (examples: Ahmedabad, Chennai, Cuttack and Hyderabad).

Table 6: Courtrooms-wise study period and data availability

Sr. no	Bench	Court	**Start date	End date	Observations
	Ahmedabad	Court I	20 Mar-18	23 Jan-19	24
	Bengaluru	Court I	23 Feb-18	28 Jun-19	277
	Chandigarh	Bench I	7 Mar-18	19 Jul-19	249
	Chennai	Court I	11 Jan-19	30 Apr-19	7
	Chennai	Court II	24 Apr-18	31 May-19	2
	Cuttack	Bench I	18 Mar-19	23 Jul-19	31
	Guwahati	Bench I	28 Feb-18	19 Jul-19	212
	Hyderabad	Court I	23 Feb-18	2 Jan-19	81
	Hyderabad	Court II	28 Feb-18	20 Dec-18	73
	Jaipur	Court I	13 Jul-18	19 Jul-19	79
	Kolkata	Court I	2 Jul-18	22 Jul-19	234
	Kolkata	Court II	23 Feb-18	23 Jul-19	304
	Mumbai	MBC I	6 Mar-18	22 Jul-19	286
	Mumbai	MBC II	23 Feb-18	22 Jul-19	290
	Mumbai	Court III	6 Mar-18	15 Jul-19	300
	New Delhi	Court II	23 Feb-18	23 Jul-19	256
	New Delhi	Court III	23 Feb-18	22 Jul-19	305
	New Delhi	Court IV	5 Apr-18	19 Jul-19	269
	Principal	Principal	23 Feb-18	23 Jul-19	306

Data fields

Table 7 shows the fields of data that are available. Some of these fields are directly extracted from the raw data, some are programmatically coded during the scraping process while others are manually cleaned and hand-coded.

Table 7: Data-fields captured

Sr. No.	Field	Data cleaning
	Sr. No. in cause-list	As is
	Date on which it is scheduled to be heard	Programatically coded
	Bench and courtroom	Programatically coded
	Coram	Programatically coded
	Case number	As is
	Purpose of the hearing	As is
	Act under which case is instituted	Hand-coded
	Section under which the case is instituted	Hand-coded
	Parties involved	As is
	Remarks (outcome of the hearing)	As is
	Representative Advocates	As is

Aggregate hearings and cases

Across our period of study, we observed 136,440 hearings. Of these, 136,437 of these hearings can be mapped to 35,952 unique case numbers. For 3 hearings, there is no unique case number available. Table 8 provides a bench-wise and courtroom-wise break-up of the number of hearings and unique cases.

Table 8: Number of bench and courtroom-wise hearings and unique cases

Courtroom	Data days	Hearings	Unique cases
Ahmedabad Court I	24	353	344
Bengaluru Court I	277	13,143	2,210
Chandigarh Bench	249	6,110	2,979
Chennai Court I	7	44	43
Chennai Court II	2	29	28
Cuttack Bench I	31	817	420
Guwahati Bench I	212	837	316
Hyderabad Court I	81	2,273	1,120
Hyderabad Court I	73	1,868	915
Jaipur Court I	79	2,351	999
Kolkata Court I	304	10,876	3,512
Kolkata Court II	234	8,821	2,390

Mumbai MBC I	286	14,296	4,766
Mumbai MBC II	290	12,346	4,372
Mumbai Court III	300	12,771	3,721
New Delhi Court I	256	14,344	2,482
New Delhi Court I	305	12,829	1,994
New Delhi Court I	269	8,498	1,966
Principal Bench	306	13,831	2,288

Source: Compiled by authors using cause list data published on the website of the NCLT for the period 23 February 2018 to 23 July 2019.

Table 9: Benchwise share of hearings and cases

	Hearings	Cases
New Delhi (including Principal Bench)	36.3	24.3
Mumbai	28.9	35.8
Kolkata	14.4	16.4
Bengaluru	9.6	6.1
Chandigarh	4.5	8.3
Total	93.7	90.1

Source: Compiled by authors using cause list data published on the website of the NCLT for the period 23 February 2018 to 23 July 2019.

Hearings and cases mix across statutes and benches

Table 10: Type of matters heard across benches

Bench/Courtroom	Total	IBC	M&A	Others	Total	IBC	M&A	Others
	(No.)	(%)	(%)	(%)	(No.)	(%)	(%)	(%)
Bengaluru Court I	13,143	42.3	13.5	44.2	2,210	34.6	16.8	48.6
Chandigarh Court I	6,110	63.8	7.7	28.5	2,979	66.4	7.4	19.8
Kolkata Court I	10,876	47.9	18.7	33.4	3,512	47.9	20.6	31.5
Kolkata Court II	8,821	52.1	16.3	31.5	2,390	50.3	16.4	33.3
Mumbai MBC I	14,296	54.6	11.8	33.5	4,766	56.9	12.9	30.1
Mumbai MBC II	12,346	58.8	10.1	31.1	4,372	56.9	12.6	30.3
Mumbai Court III	12,771	59.9	10.7	29.4	3,721	46.2	16.4	37.4
Principal Bench	13,831	67.4	15.5	17.1	2,288	55.0	19.9	24.5
New Delhi Court II	14,344	45.2	2.2	52.6	2,482	38.2	3.2	58.8
New Delhi Court III	12,829	40.1	9.0	50.9	1,994	44.6	9.4	45.9
New Delhi Court IV	8,498	50.2	0.0	49.8	1,966	58.7	0.0	41.3
Total	1,27,865	52.5	10.7	36.8	32,680	51.4	12.9	35.0

Source: Compiled by authors using cause list data published on the website of the NCLT for the period 23 February 2018 to 23 July 2019.

Number of hearings per case

Table 11: Average number of hearings by type of matter and bench

Bench/court	IBC	M&A	Others	Total
Bengaluru Court I	7	5	5	6
Chandigarh Court I	2	2	2	2
Kolkata Court I	3	3	3	3
Kolkata Court II	4	4	3	4
Mumbai MBC I	3	3	3	3
Mumbai MBC II	3	2	3	3
Mumbai Court III	4	2	3	3
Principal Bench	7	5	4	6
New Delhi Court II	7	4	5	6
New Delhi Court III	6	6	7	6
New Court IV	4		5	4
Total	4	4	4	4

Compiled by authors using cause list data published on the website of the NCLT for the period 23 February 2018 to 23 July 2019.

Table 12: Distribution of cases by number of hearings per case

	IBC	M&A	Others
More than 30 hearings	0.2	-	0.0
21 to 30 hearings	1.0	0.2	0.2
11 to 20 hearings	5.9	3.6	6.4
4 to 10 hearings	32.3	19.1	38.8
than 4 hearings	60.6	77.1	54.7

Compiled by authors using cause list data published on the website of the NCLT for the period 23 February 2018 to 23 July 2019.

End Notes

1 The sanctioned strength refers to the total number of positions of judges in a given court. The sanctioned strength of the Supreme Court is determined by the Supreme Court (Number of Judges) Act, 1956. The sanctioned strength of the High Courts is determined by the President. The sanctioned strength of the District Courts is determined by the Governor of the State in consultation with the High Court of that State.
2 The Law Commission report of 1987 prescribed that this five-fold increase should be achieved within a timeframe of ten years.
3 Law Commission, 2014.
4 National Court Management Systems Committee, 2016.
5 Centre for Research and Planning, Supreme Court of India
6 Flango and Ostrom, 1996
7 For example, see Taylor, 1911.
8 *245th Report on Arrears and Backlog: Creating Additional Judicial (Wo)Manpower*, 2014
9 See, for example, Lienhard and Kettiger, 2011.
10 See generally Kleiman et al., 2018; Wittrup & Bogetoft, 2017; Gramckow, 2011; Flango and Ostrom, 1996.
11 Robinson, 2013; Law Commission of India, 2014; National Court Management Systems Committee, 2016.
12 See, for example, Vidyasagar & Narasappa, 2016; and DAKSH, 2016.
13 See, for example, Hemrajani and Agarwal, 2019.
14 There are three hearings 3 hearings that do not have a unique case number available.
15 The Principal bench is located in New Delhi but which publishes a separate cause-list each day.
16 For Ahemdabad, Chennai, Cuttack, Hyderabad and Jaipur benches, the number of days for which we are able to extract a cause-list each day from the bench website is low, and we do not include these locations in our analysis. Similarly, the number of hearings scheduled in the Guwahati bench over the period of study in low and we do not include this location in our analysis.
17 This includes new case flow + prior period cases - cases disposed off

CHAPTER 22

The Future of Indian Justice System: Mapping the challenges and opportunities

Nomesh Bolia, Soham Ghosh and Surya Prakash BS

"It may be true that the law cannot make a man love me, but it can stop him from lynching me, and I think that's pretty important."

– Martin Luther King Jr

SUMMARY

- The journey of India's e-courts mission from 2006 to the current draft of Phase 3 released in 2021 has been commendable;
- Phase 3 aims of the e-courts mission seeks to create a reality that assures judges, lawyers and litigants the advantage of timely and optimal hearings;
- Citizen awareness and proper dissemination of information are crucial to the success of online dispute-resolution mechanisms;
- Another decisive step towards a more responsive judicial system is the introduction of services based on people's stated needs. This is particularly relevant in the case of the most vulnerable sections of the country;
- Start-ups have the potential to identify issues of physical access to courts, use technology to connect stakeholders in the justice delivery system and bridge the yawning gap between courts and people wary of them.

Introduction

Five hundred crore people or approximately 3 out of every 4 people globally do not have meaningful access to the justice delivery system! A report published by a network of international development organisations in partnership with senior government representatives from many countries including industry representatives and civil society organisations defines and quantifies the "justice gap" and states "In total, 5.1 billion people – two-thirds of the world's population – lack meaningful access to justice. While people in all countries are affected, the burden of this injustice is not randomly distributed among people[1]."

Due to the complexity of court proceedings, justice institutions across the world are either costly, physically inaccessible, or culturally and psychologically threatening[2]. Some actually combine all of these blights, preventing even legally empowered residents from gaining access to the services they seek. Also, timely justice delivery is a global problem and courts around the world are struggling in order to address the issue of case pendency which has multiple adverse effects on the citizens, state and private players including huge financial losses for every stakeholder[3]. In spite of Justice being an essential public service, it has not traditionally been designed to cater to the needs of citizens in a user-friendly way. When it comes to our country; where every sixth person in the world is an Indian, the problem aggravates with a huge load on the Indian justice system. Today with more than 4 crore cases pending in Indian courts it amplifies the fact that the issue of access to timely and conclusive justice is a very real and harsh problem. Thus, the problem has always been two-fold at the first level people do not even reach out to the courts for lack of awareness of their rights and other aspects including cost, getting intimidated by the complex processes of the courts and the second is even if they do the problem of case pendency makes the life of litigants miserable.

Even though in India important institutional stakeholders are constantly working collaboratively towards ways to reduce this, the multidimensional nature of this problem and the ever-increasing magnitude of it needs certain immediate disruptive approaches beyond incremental targets to address this. For example, with the exponential increase of internet penetration and availability of smartphones in India along with the advent of social media, there has been a tremendous rise to a variety of crimes which were non-existent even a decade back but the systemic adaption of the justice system to address them needs a lot of agility which is difficult to implement otherwise.

The coronavirus epidemic has prompted a significant shift toward remedies that exclude any physical touch, highlighting the critical role of technology in supporting a flat and seamless form of access to justice. Former Chief Justice of India, Shri S A Bobde has spoken of the exceptional possibilities for technology to contribute to simplifying procedures that are outside the scope of sophisticated decision-making[4].

Comprehensive reforms to reduce the huge burden on Indian courts had been initiated to find innovative solutions much before the pandemic enforced

a nationwide lockdown by the State. The ideation of the e-Courts project, Phase 1 was done based on the National Policy and Action Plan for Implementation of Information and Communication Technology (ICT) in the Indian judicial system in 2005 submitted by the e-Committee of Supreme Court. The vision was to transform the Indian Judiciary by ICT enablement of courts to make the system affordable, accessible and cost-effective. The journey of the e-courts mission from its Phase 1 in 2006 and Phase 2 in 2014 to the current draft of Phase 3 released in 2021 by the e-committee of the Supreme Court of India has been commendable and we would structurally understand the learnings, challenges and unprecedented opportunities a bit later in the chapter[5]. Forward-thinking solutions and to some extent at times disruptive were, and definitely even more so now, are quite urgently required with multi-pronged and diverse stakeholder participation where we should facilitate ownership in building a culture of innovation to address large-scale public problems. Some targeted measures which are being taken already are quite encouraging but an implementation roadmap of the e-courts Phase 3 vision document will be discussed in this chapter to realise the vision realistically[6].

What are responsive Justice Pathways?

The OECD has developed a framework for ensuring that justice pathways and services are responsive to the changing and fast-evolving needs of people. The framework consists of four stages, each stage addressing key questions[7]

- *Who* experiences legal needs and *what* legal needs do they have?
- *Where* and when are these needs experienced?
- *What works* to meet these needs most effectively?
- *How* should these services be delivered and evaluated?

This framework establishes a collection of people-centred service design and execution standards that apply to the complete legal and justice system. "Evidence-based planning, equity and inclusion; availability, accessibility, prevention, proactivity, and timeliness; appropriateness and responsiveness; outcome focus and fairness collaboration; and integration and efficacy are some of the service factors"[8]. They are a springboard for further research and the creation of evidence-based best practices to ensure that all people can find the legal and judicial support they require. The infographic presented in Figure 1[9] and published in the OECD report encapsulates the framework.

Getting a one-stop international precedent that covers all the aspects is not possible and replicability without effective contextualisation can cause systemic implementation challenges like isomorphic mimicry (wherein the outward functional states and organisations elsewhere are adopted to camouflage a persistent lack of *function*[10]). Though similar problems are faced to facilitate the adoption of solutions amongst all relevant stakeholders a dedicated effort to contextualisation has to be given. Nevertheless, some international case studies that we can use to reflect upon and modify as per the needs of India are listed below.

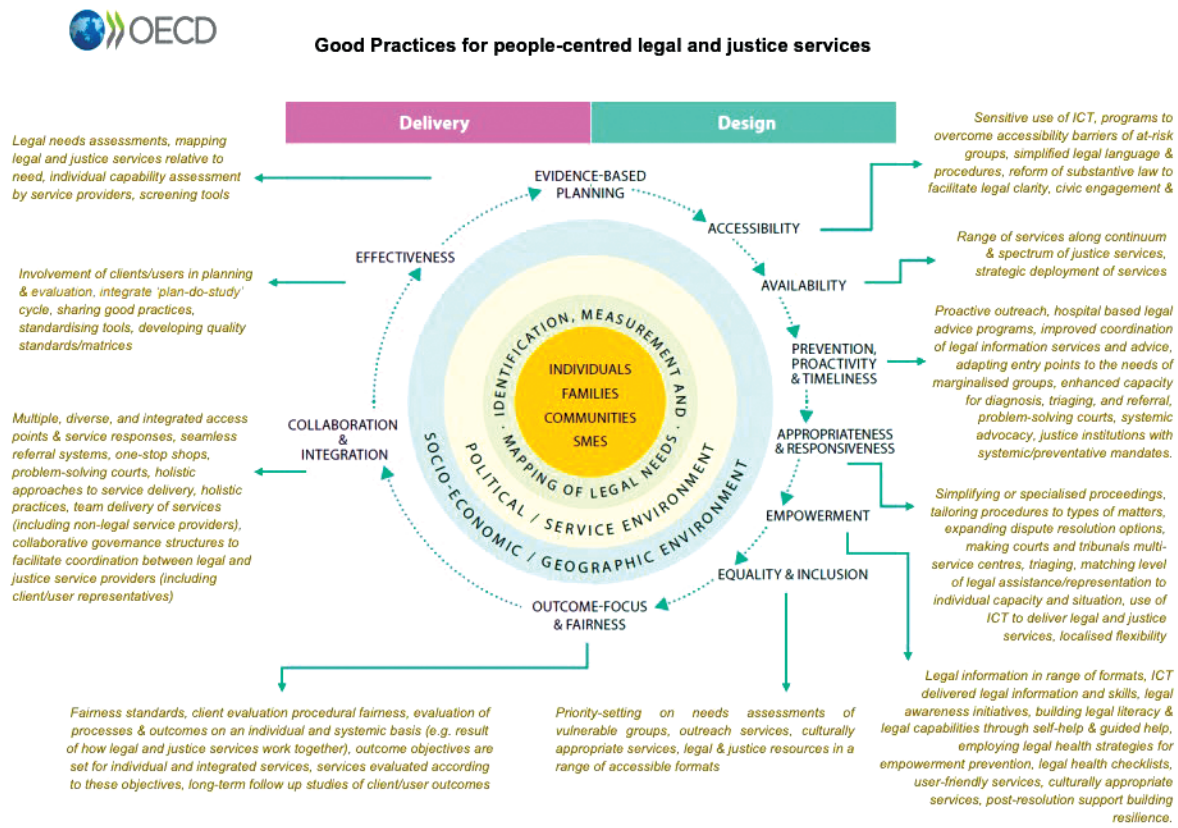

Figure 1: Justice pathways[11]

I. Some Examples Globally

The examples presented in this section have components of citizen access as a core component, making them highly relevant to the context of India.

- **a.** The Courts of New Zealand[12] is a user-friendly portal that brings together the district courts, high courts and supreme court on one platform and has an ease of access for litigants, related parties and even researchers. The user interface of the portal is welcoming and a lot of attention to curating a seamless navigation experience for anyone visiting the portal is given.
- **b.** A Point d'Accès au Droit[13] (Access Point to Law) an initiative by the Ministry of France is a free and permanent place of reception, mainly providing local information on the rights and duties of people having to deal with legal or administrative problems. The PAD brings together various offices of local legal information associations and welcomes legal professionals (lawyers, notaries, bailiffs). It is led by a permanent lawyer acting as an Access to Law Officer.
- **c.** The finish judicial system[14] has a comprehensive portal where various court matters are structured for ease of access meticulously. Not only does it bring all the courts together on one platform listing different court matters(giving information on various case types and clubbing them under different categories) but also brings other arms of the state including enforcement agencies into one integrated platform.
- **d.** The Irish court[15] has an interesting calendar feature on its website and has something called the legal diary which has online booking appointment options like Pleadings, Judgments and Attested Orders.

Latent Potential for Private Stakeholders

Though legal tech business models range from varied products and services ranging from domains like Practice Management, Research & Analytics, Workflow Automation, Due Diligence Solutions, Document Management, Contract Management, Do-It-Yourself (DIY) Tools, IP management and more we discuss those in details in a dedicated chapter later in this book focussed on mapping the start-up ecosystem in the legal tech industry. Here in this chapter, we focus specifically on solutions that augment access to justice for citizens and aggrieved corporations directly. When we focus on disruptive solutions to expedite our justice delivery mechanisms outside of the courtrooms, the crucial role of innovation and technology vis-a-vis the private sector will become significant. Indian start-ups have a huge potential in identifying pressing issues of physical access to courts, the promising potential of technology to connect stakeholders in the justice delivery system, and curating solutions that are efficient and affordable, more importantly by bridging the trust deficit of citizens who are often wary of courts.

One such key area where Indian start-ups can possibly disrupt the current system is through user-friendly technology-augmented solutions in online/remote

dispute resolution. Online dispute resolution (ODR) has untapped potential to bring exponential scale and broad-based access targeted towards corporations having a consumer interface including banks, NBFCs, and Microfinance Institutions along with disputes with regards to the e-commerce and the burgeoning digital economy of B2B (business to business), B2C (business to consumer), and C2C (Consumer to Consumer) industries and related e-contracts.

Especially in the Indian rural hinterland, ODR could be a real game changer by eliminating the need for litigants' physical presence and actually doing away with the additional costs that court appearances impose on them along with daily wages that many litigants need to let go of for this. A tech Czar of India and a visionary, Mr. Nandan Nilekani, the man behind the Aadhar revolution and who has been part of multiple bodies and committees of Govt. of India for Govtech solutions stated in a closed-door meeting organised by NITI Ayog with the Supreme Court Judges and private players including industries and Civil Society Organisations (CSOs) that, "I think using the data and AI as a feedback loop to improve the quality of law making is a huge opportunity. There is value in the ODR system in itself and as an adjunct to the large regal system, and something that will help us to get the overall legal system forward[16].".

I. Lessons from International ODR initiatives

This section presents a glimpse of a few initiatives across the world where third-party stakeholders outside the traditional judicial system came forward to resolve certain issues before they came to the courts. All the initiatives had either the judiciary or the Law and Justice Ministry involved in some capacity but mapping the success and failure stories gives us some key insights into replicability and improvisations needed for doing effective contextualisation in other countries to harness sustainability of the initiatives in particular contexts.

A. Success Story Of British Columbia CRTA

British Columbia approved the Civil Resolution Tribunal Act (CRTA) in 2012, clearing the path for the use of technology and alternative dispute resolution to settle condominium (strata) disputes. The CRT was made the mandatory institution for the resolution of these issues through a 2015 change to the CRTA. Prior to the establishment of the Tribunal, condominium issues had to be heard by the Supreme Court of British Columbia, which is an extremely costly procedure that ensured few ever filed a complaint. At every level of development, the citizens at large, law practitioners and community activists participated actively. The system went online in the middle of 2016 and, by all accounts, is exceeding the goals of CRTA, with an increasing number of users routinely using the platform to resolve condominium property issues in a manner that is "accessible, fast, affordable, informal, and adaptable[17]."

The electronic Tribunal does not substitute adjudicators with technology. Instead, the method employs technology, i.e., a SalesForce adaptation, to give

notice of the disagreement, promote discussion sans the court, and forward, when necessary, to mediate through a facilitator. Small initiatives' success helped pave the necessary path for CRT, which was introduced for a particular case type (strata) and later increased its mandate to include Small Claims. Continuously the public's engagement was prioritised in curating the design and development of the system and subsequent iterations and improvement. User experience testing is crucial to the success of the system.

B. Success story of UK Ministry of Justice Personal Injury (PI) Claims Portal

This portal is the United Kingdom's mechanism for managing the PI claims between £1,000 and £25,000. The goal of the Portal is to offer a secure computer-based system for information or paper transfer to support the mandated "Pre Action-Protocol" for 3 categories of cases: automobile accident-related personal injury, employer's responsibility, and public liability claims. The technology streamlines communication, offers a safe means for uploading and authenticating documents, expedites discussions, imposes time limitations, and guarantees that victims are compensated. If the aggrieved party is not satisfied with the negotiated settlement, he or she may seek additional legal action in a regular court setting. The Ministry of Justice is in charge of the personal injury compensation claims procedure. The Claims Portal, on the other hand, is managed by a non-profit privately held corporation comprised of representatives of the "insurance company ("compensators") and claimant community representatives" in equal proportions. The thirteen board members (one independent member and six members each from the "compensator and claimant" groups) provide continuous direction. Insurance companies funded the portal making, expecting substantial savings as a result of enhanced claims processing efficiency[18].

The portal actively supports third-party innovation by prominently displaying a relevant option on the homepage which links to relevant notes, documentation, and other portal integration details. In the beginning, the developers are given necessary free technical assistance. Participants' case management systems have been linked, but the Ministry of Justice's official record remains on paper. User training is available for both compensators as well as representatives via a separate but functionally identical website that replicates process flows.

C. Failure Story of New York State Unified Court System Consumer Debt

New York consumer debt collectors rely on state courts to recover debt. In recent times, consumer debt lawsuits have accounted for thirty-five per cent of all limited jurisdiction caseloads in New York State. These cases constitute a disproportionately significant proportion, which[19] strains courts, overwhelms the professional capacity, and burdens consumers, who frequently agree to unfavourable judgments and settlements without comprehending their choices. In 2013, the New York State Permanent Commission on Access to Justice suggested that the New York State Unified Court System implement an Online Dispute Resolution

(ODR) system for situations involving consumer debts to solve the problem[20]. Legal service providers launched a full-scale attack on the initiative, arguing that the procedure would expose people already at risk to the danger of thoughtless credit givers. The level of opposition was so great that it was decided to abandon these attempts to create ODR for consumer debt and instead investigate an alternative domain to pilot ODRs.

D. Failure to Success story of Netherlands Rechtwijzer

Rechtwijzer (literally "signpost to justice" or "path to justice") was introduced by the Dutch Legal Aid Board (LAB) and HiiL in 2007 to enable self-mediated resolution in certain types of issues[21]. Then, the Dutch Ministry of Justice developed "a network of law "counters" (juridische loketten)" to give information about legal matters and comprehensive self-help assistance instead of representation. The initial version of Rechtwijzer (the so-called version 0.0 as labelled by LAB personnel) guided users to relevant documents. In response to diagnostic inquiries, the system generates recommendations for the user in the form of a table identifying various interventions and people qualified to give them. Focus group testing revealed that end-users had little comprehension of the advice table. This resulted in the creation of Rechtwijzer 1.0 which was released in 2012. Later, it utilised communicative features to enable customers for attorney consultations. Rechtwijzer 1.0 was a technological "game-changer" because it revealed that websites could be interactive and serve content suited to the specific requirements of individual users.

Rechtwijzer 2.0 added resolving the challenge as a feature of the portal in 2014, using the software of Modria for addressing private sector retail disputes. The technology directed users through sample agreements, and structured problems, and provided an accommodating environment to develop and assess solutions. Its ambition led it to concurrently attempt a resolution to divorce and separation, landlord-tenant, and job concerns, among other complicated relationship challenges. The integration of advice and information into online resolution methods.

The project was found financially untenable after three years, and the partnership was terminated. Despite this unfortunate end, the "failure" is an illustration of "fail forward." In 2017, a startup formerly affiliated with HiiL rebuilt the divorce component of the portal targeting the entire Dutch citizenry and then rebranded and launched as Uitelkaar.nl, thus attracting several impact-based investments.

II. Key Takeaways

To summarise, given the sensitivity of the judicial sector, the following insights from the above-listed global examples can be gleaned from failures as well as successes:

A. Continuous stakeholder engagement

It is well known that taking input from all concerned stakeholders is a critical component of the recipe for the success of any public or large-scale initiative. In the same way, ineffective stakeholder management strategies can make an otherwise perfect policy fail and the same is captured in the following two examples.

For engagement to deliver its full promise, it has to be continuous, and not just at the beginning or end of an initiative. For example, the British Columbia CRT project prioritised public engagement not just in taking feedback on the designed solution, but in curating the design and development from the beginning. Even subsequent iterations and improvements, including user experience testing, the aspect that is the most concrete and often missed, had an ingrained component of public engagement.

At times we see even in places with advanced economies such as that of New York City where most residents are under high-paying tax slabs and supposed to be well informed of their rights, the justice delivery system is far from optimal. A decision by policymakers of the New York State Permanent Commission on Access to Justice in 2013 haphazardly tried to launch an ODR system to tackle consumer debt lawsuits but failed badly due to inadequate stakeholder management strategies. In this example of the **New York State Unified Court System Consumer Debt**, it is seen that legal service providers launched a full-scale assault on the initiative, arguing that an ODR procedure would expose vulnerable people to the danger of thoughtless or unscrupulous creditors and the initiative could not even be launched. This indicates that policy decisions cannot be taken in silos to avoid being limited to a great grand idea and being far from effective implementation to realise the policy goals.

B. Open-Source Digital Infrastructure and Interportability

Again, as we see more and more emphasis on open-source digital infrastructures and the importance of making various digital systems interportable for seamless integration, the example of the **UK Ministry of Justice Personal Injury Claims Portal** gives us good insights on scalable initiatives. The Portal website aggressively promotes co-innovation and co-creation through relevant features. Along with this, the user training arrangements are also done meticulously so that the mission is not limited to creating a tech solution but also ensuring effective adoption by the end users is taken care of.

C. Effective Iterations

Learnings from failures are important and the Rechtwijzer story of Netherlands from its journey from Rechtwijzer 0.0 to 2.0 maps how gradually, through pilots and user demand, it continued the overall feature additions catering to a larger base of citizens to address the access to justice problem. Though this project was found financially untenable after three years, and the partnership was terminated

with the concerned stakeholders who came together to build the citizen-facing portal, the "failure" helped some other entities succeed. A startup relaunched it and attracted a good amount of social impact investments and the primary motive to handle divorce and separation-related matters was successfully addressed via an ODR initiative though the initial product went through a continuum of changes till the successful market fit was established.

Further, citizen awareness of the existence of online dispute resolution mechanisms has to be disseminated well. This is typically challenging but considering the huge impact it can have in ensuring access to seamless justice outside traditional courtrooms and in turn reducing the burden on courts, it cannot be overdone. The Govt, judiciary and the business community, along with CSOs must come together to ensure not only an increase in awareness but also trust in it from the beginning. This is crucial since only then can successful adoption be ensured. Needless to say, important aspects such as data security and privacy must be taken seriously. For example, proper encryption techniques and digital signatures must be used by all ODR portals. It should also include the fundamental fairness principles for ensuring access to justice especially as it is delivered online outside traditional courtrooms including visibility, ready access, timeliness and very low or no cost of online dispute resolution.

Technology and the Indian Justice System

The Indian state has recognised the importance of Technology for an effective Justice System over the last 3 decades and has taken gradual steps towards realising its full potential. Computerisation and digitisation of the judiciary in India have been undertaken under several schemes and projects since at least 1990.

The National Informatics Centre (NIC) began computerising Indian courts with the Supreme Court of India in 1990. Specifically built programmes developed as part of the COURTIS (Court Information System) project allowed for the computerisation of regular processes such as case filing, compilation of cause lists and order sheets, and issue of orders and judgements. JUDIS (Judgement Information System), for example, gives the full text of all reported court judgements, while COURTNIC makes pending case information information accessible to litigants and advocates. Along the same lines, the NIC launched the computerisation of High Courts. The LOBIS (List of Business Information System) database generates daily and weekly cause lists for the Supreme Courts and offers current information on new, disposed, and outstanding cases. One of the key contributions was eliminating the task of generating manual cause listing helping registries of high courts streamline this important regular activity.

Yet, due to failed or incomplete initiatives, the benefits of ICT adoption in the Indian judiciary in its entirety have been severely limited. With a focus on lower courts, the eCourts project was developed to address this limitation. The learnings from earlier initiatives culminated in the introduction of the mission mode project termed e-courts. A mission mode project (MMP) implies that projects have

clearly defined objectives, scopes, and implementation timelines and milestones, as well as measurable outcomes and service levels.

Introduced in 2005, the sustained nature of the e-courts project and successive introduction of new phases indicates the deep buy-in on the importance of Technology for the justice system. With the announcement of a significant amount of Rs. 7000 crore as the outlay, the Budget 2023 has firmly kickstarted the onset of e-courts Phase 3 whereas the budget for Phase 2 was only Rs 1670 crore. This section recapitulates the outcomes of Phases 1 and 2, and the game-changing opportunities of Phase 3.

I. Reflecting on achievements from Phase 1 & Phase 2 of e-Courts

The importance of the role of technology in enabling our lives and the smooth functioning of institutions was made clear to the entire world during the Covid-19 pandemic. Through e-courts Phases 1 and 2, however, leveraging technology to reduce the huge burden on Indian courts had been initiated to find innovative solutions much before the pandemic enforced a nationwide lockdown by the Indian State in 2020.

The e-Courts project is a pan-India initiative monitored and funded by the Department of Justice, Ministry of Law and Justice, Government of India. Phase 1 was conceived and designed based on the National Policy and Action Plan for Implementation of Information and Communication Technology (ICT) in the judiciary. It was anchored and developed by the e-Committee of the Supreme Court. The vision was to transform the Indian Judiciary by ICT readiness to render the courts affordable, accessible and efficient in terms of cost. Phase 2 was launched in 2014 and the current draft of vision document of Phase 3 was released in 2021.

Stakeholders until Phase 2 are listed in Table 1 with their respective roles and responsibilities.

Table 1: e-Courts Stakeholders Table (Source: Allahabad High Court Website[22])

Stakeholder Institutions	Functions
e-Committee of the Supreme Court	High level design, strategic direction, policy planning, specification, and certifications fall under their purview.
National Informatics Centre (NIC)	In charge of technological innovation and offering assistance to high court.
Computer Committees of the High Courts	In charge of the execution at the state level.
Department of Justice (DoJ)	Accountable for generating budgetary permits, dispersing funds, and keeping tracks of how they're being used throughout the project's execution.

The Phase 1 and Phase 2 of this project have created the "infrastructural backbone, systems, and services for judges, lawyers, and litigants with an overall budget of INR 639.411 crores and INR 1670 crores, respectively"[23]. The key achievements of e-courts Phase 1 and 2 are listed and described in table 2.

Table 2: Key Achievements of Phases 1 & 2 of e-courts (Allahabad High Court[24])

Key Achievements	Description
Public Infrastructure	3,477 court complexes can now conduct hearings online mode, installation of hardware and software for video conferencing facility across 13,500 courts, ensuring BSNL-MPLS WAN connectivity through OFC in 13,606 courts.
CIS (Case Information System)	To enable wider utility and access, open source and free software for case management is used.
Case number record (CNR)	Each case is assigned a unique number making it quite amenable for the processing of case-related data and linkages with other services associated with a case (such as video conferencing, e-filing, tagging, or scheduling).
Judicial officer code	This creates an identity for each judge that is unique. Enables the monitoring of case progress for officers and effectively augment the capacity for judicial evaluation.
National codes for case types and legislations across all districts	To standardise back-end for the various High Courts' case classification systems, allowing for the collection of relevant meta-data at the various levels.
Interoperable Criminal Justice System	Aims to connect data from various institutions relevant to the criminal justice system, such as courts, police and prisons.
National Judicial Data Grid (NJDG)	Transparent and accessible summarised information of all cases across High Courts and District Courts.
National Service and Tracking of Electronic Processes	To enhance accountability and transparency in procedures for summons service, tracking process service by bailiffs using a global GPS based programme.
Digitisation of case records including old ones	This is important because it lays the groundwork and creates the capacity for the complete of all judicial administrative procedures.
JustIS Mobile App	For all District judges. It gives information about cases, and has case management features such as calendaring.
Training programmes	Developed for court masters, court staff, registrars & associated clerks to advocates, District-High Court judges, judicial officers on training, and technical staff such as system managers. The strategy adopted involved establishment of a pool of master trainers to train other officials through programmes designed by the e-Committee with inputs and collaboration with state judicial academies.

II. Learnings from Phase 1 & Phase 2

The listed achievements in the last section are indicative of their establishment and do not imply adoption by concerned stakeholders or a thorough implementation. The roll out of Phase 1 and Phase 2 has in fact empowered the judicial ecosystem in the country with crucial learnings to implement the vision of Phase 3 navigating the challenges faced on the ground as highlighted in the draft vision document for Phase 3 of e-courts[25]. This section draws from and summarises the key ideas from this report in the context of this chapter.

Although a lot of work has been put into leveraging the use of technology, it has still not been accepted by all relevant stakeholders. Integrating data is still a challenge. One reason for this is the inadequate feedback process or system usage at various stages of system development and usage. This meant that neither design enhancement nor a close follow-up on design implementation could happen effectively. In the absence of distinct indicators to follow up on the implementation aspects, for instance, the supply of solutions was prioritised over their adoption[26].

III. Phase 3 Vision & Implementation Roadmap

Phase 3 intends to leverage the infrastructural backbone of Phase 1 and Phase 2 to lead to a fundamental transformation in justice delivery is done in the country. Ultimately, Phase 3 aims to enable the creation of an ecosystem where both lawyers and judges can play their roles seamlessly, viz., fighting cases without worrying about the timings of hearings, and fair adjudication without overburdening. In keeping with the contemporary requirements, these processes need to be seamlessly enabled irrespective of the mode such as audio/video or in-person. It also aspires to create an adaptive system where regular administrative tasks can be smoothly taken over or streamlined through the use of technology.

Importantly, it also aspires to design and develop an intelligent system that leverages technology for data and modelling-driven decision-making including court procedures of calendaring, predictability and optimal usage of the capacity of judges and lawyers. The vision is to create a "smart" system in which stakeholders such as registries don't feed or validate information repeatedly, that role should be eased out by technology by linking appropriate databases. The smartness should extend to other aspects such as alternate dispute resolution mechanisms which can be accessed from the court platforms for monitoring if needed, thus effectively making them efficiency enhancers of the courts. Overall, a platform that leverages the "big- data" coming from the judicial system for the promotion of law-based knowledge and pointers to possible interventions for people, making it as simple as accessing the internet[27].

The key building blocks of Phase 3 are:

1. **Process Re-engineering:** By leveraging digital technology, we can do away with or greatly simplify many of the tedious, time-consuming, and

antiquated procedures developed before the widespread adoption of computers. The high courts should make user time, money, and effort savings a top priority by prioritising process re-engineering.

2. **Creating a foundational Digital Infrastructure:** Phase 3 will concentrate on developing Digital Infrastructure and capabilities (rather than services or solutions) that will allow non-judicial stakeholders to develop as many solutions as needed. To do that, it envisages open APIs (to let systems talk to each other) and the development of appropriate standards and specifications to smoothen the process of appropriate integration of innovations made outside the judiciary or other state actors. This will inevitably need modular systems for all regular processes such as electronic filing & delivery of summons, all the way to digital courts. The vision is also to allow for agility in changing aspects based on input or the availability of the latest technologies[28].
3. **A Revamped Institutional and Governance Framework:** None of this is possible without engaging personnel with the required skills and expertise. As an example, Phase 3 envisions a "Digital Courts Technology Office" in the short term and possibly a "National Judicial Technology Council" eventually. The chief goal of these entities would be to focus on the development and upgrade of the digital infrastructure while the conventional court stakeholders continue with their judicial duties.

The journey from Phase 1 to what Phase 3 wants to achieve is encapsulated in Figure 2.

To that end, clearly, Phase 3 needs to evolve to engage all relevant organisations such as courts, investigation agencies, and prosecution to seamlessly collaborate and develop usable solutions. By breaking down silos between organisations, avoiding effort duplication, and realising the benefits of economies of scale, efficiency and productivity can both increase like never before. Consider this as an example: if records and corresponding information on FIR and bail are available to the court (once generated by the police) on their platform, they wouldn't need to search for it or make digital or hard copies. Such data exchange between entities can also contribute to better statistics, legislation, and contextual services.

This approach and vision is clearly different and a big leap from phases 1 and 2. Rather than focusing on generating all solutions, the court can create the necessary culture and digital public goods that facilitate the emergence of solutions through private and public collaboration. The approach thus is to promote and prioritise innovation through an ecosystem approach that helps develop and integrate the key building blocks[29].

Ecosystem Approach

This ecosystem approach is more about creating a facilitating system, including foundational digital infrastructure and process reengineering, for different stakeholders through open standards specifications & APIs to create opportunities for

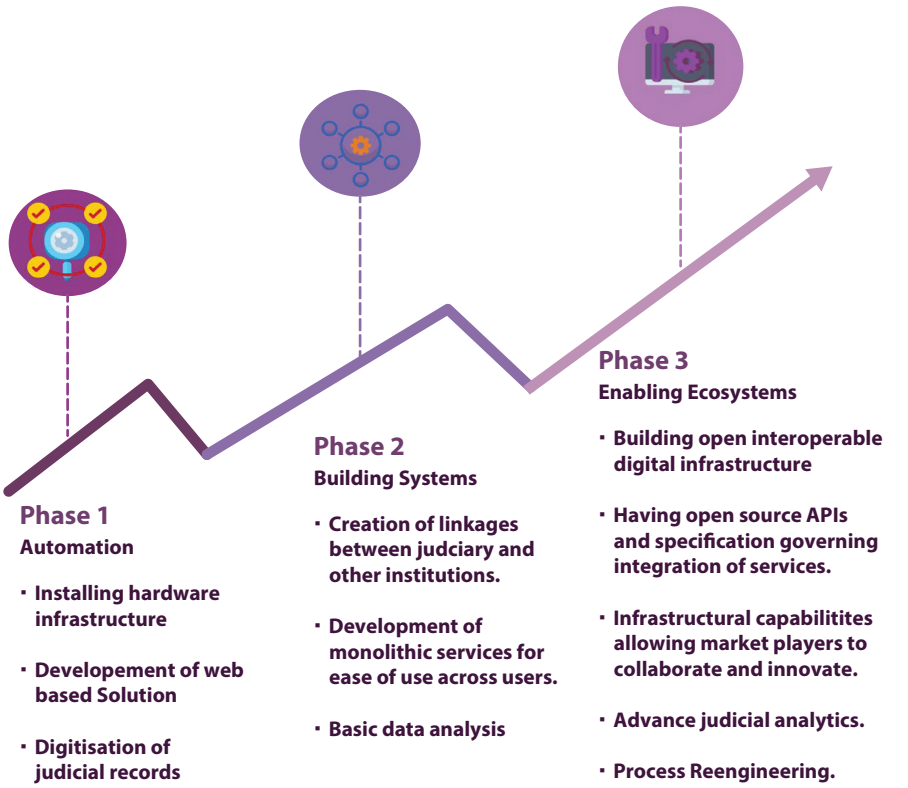

Figure 2: eCourts Journey from Phase 1 to Phase 3

multiple parties. The concerned parties cover the entire gamut of stakeholders including start-ups, governments, law chambers, prisons, legal aid authorities and police to innovate the digital infrastructure. The user-friendly design of an integrated platform will ensure ease of access to multiple ecosystem actors simultaneously such as court registry officials, judges and litigants. This kind of system, as presented in Figure 3, also envisages embedding analytics-led data-driven insights to improve accountability and feedback. To enable all of this a robust governance framework to set rules around platform usage including concerns about data privacy and security is prioritised to enable access to open data which obviously are subject to privacy regulations.

First, it is imperative that the installation of relevant hardware in all district courts along with the high courts across the length and breadth of the country is completed. Clearly, without this basic infrastructure, no other technological interventions can be conceived.

Next, to operationalise the ecosystem approach, the key focus should be on the following five pillars (see Figure 4):

a. Building open, interoperable digital infrastructure
b. Creating standards and specifications governing the integration of services and capabilities

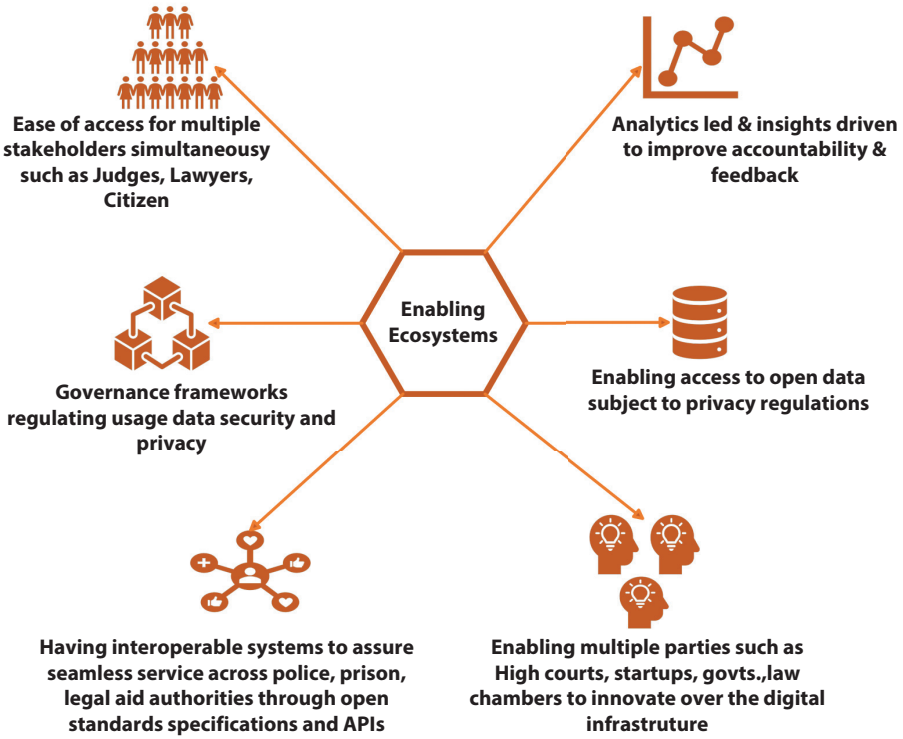

Figure 3: Enabling Ecosystems

c. Curating infrastructural capabilities to allow market players to collaborate and innovate
d. Building a system leveraging judicial data to embed analytics-led data-driven insights to improve accountability and feedback
e. Building reimagined processes leveraging new capabilities.

The pillars a) through c) are the most basic requirements for different actors to participate in a reality where all relevant stakeholders interact and function well. The pillars d) through e) add more power and efficiency to make this reality effective in dispensing justice.

Delving into more details, the following specific features and capabilities need to be developed for pillars a) and b):

1. Digital case registry: Unique case locator (CNR) linked to every case through data standards
2. Comprehensive & Updated Repository of Case Law: Free and easy-to-access database of indexed case information with appropriate standards specifications and open APIs
3. Making documents Machine-readable and secure: Adoption of OCR (optical character recognition) to increase the machine readability of

documents. Digital signatures and blockchain to ensure authentication and security.

4. Intelligent Scheduling: Using artificial intelligence to intelligently recommend hearing schedules by optimising and organising the calendars and available times of numerous actors.
5. SUVAS: Scale adoption of the AI-based tool SUVAS for translating judicial documents.
6. Interoperable Criminal Justice System: Enable sharing of data between Police, prison cells, courts etc. by developing data standards, specifications, protocols and certifications.

This list is based on the experience so far and as the platform develops more, more foundational features can potentially be identified. The structural design of the platform/digital infrastructure must enable such addition.

Further, to operationalise points c), d) and e), the following functionalities can be added[30]:

1. Digital Case Management Systems: Enabling seamless access and sharing of documents in a secured manner between different stakeholders like lawyers, registry, clients and judges.
2. E-filings: Building a process leveraging smart forms eliminating physical duplication of e-filings and enabling integrated payments. Also, these services are being extended to private complaints in front of magistrates and subsequent filings.
3. Open Digital Hearings: Enabling different forms of digitally enabled hearings; in-person, asynchronous hearings, online or audio-only linkages.
4. Transcriptions: Transcribing court proceedings from an audio format to a textual digital version soon after receiving the order for lawyers and litigants.
5. Service of Notice: Automatically enable notice to parties with email/SMS wherever possible, along with a built-in system confirming its receipt, proactive alerts and integrated payments.
6. Administration of Legal Aid: Enable more equitable and efficient allotment of cases to legal aid lawyers aided by structured data analysis
7. Virtual Courts: Setting up properly equipped virtual courts across the country for speedy proceedings.

Figure 4 summarises how to operationalise the ecosystem approach in Phase 3. Digital Courts (i.e., courts empowered with technology solutions in conjunction with streamlined and process reengineering based upgrade of administration) can set the groundwork for a futuristic system when most people use and adopt digital services. Adoption will result from a growing, open-for-access and collaboration-focused technology infrastructure that allows for addressing challenges contextualised to the varied and distinct requirements of attorneys, residents, government organisations, businesses, court employees, and judges.

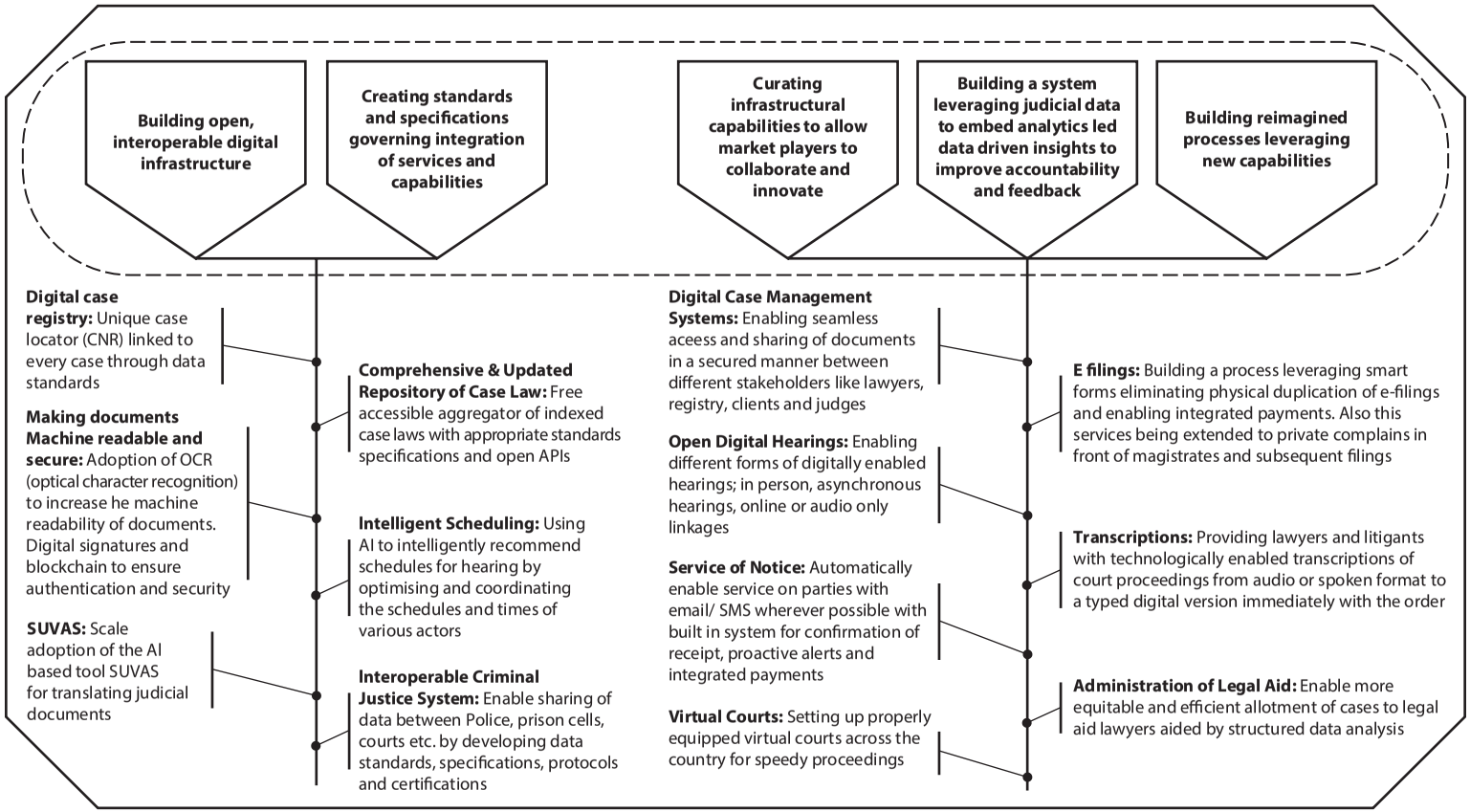

Figure 4: Operationalising Ecosystem Approach

IV. Benefits for Stakeholders

Through a holistic take, technology availability and access for all relevant users, and a commensurate, facilitating administrative-governance framework, Phase 3 aims to touch the life of and be useful to every stakeholder.

The successful implementation of these Phase 3 objectives will necessitate careful planning in terms of scheduling, funding, procurement, acceptance and managing the transformation, along with a strong monitoring and evaluation framework. Although Digital Courts' full potential won't be realised right away, some illustrative advantages that will occur during Phase 3 are outlined in Table 3[31].

Table 3: Potential Benefits on Successful Implementation of Phase 3[32]

Stakeholders	Possible benefits
Citizens	◆ Intelligent scheduling will optimise timely justice access ◆ Digital orders in several languages will vastly enhance procedural comprehension and justice access ◆ The cost of obtaining justice will be reduced by e-filings/virtual hearings ◆ Proactive notifications and information, real-time case streaming, and continuously updated open data ◆ Uniform structure of case information across various courts
Lawyers	◆ Streamlined filings, summons/prior notice to the opposing camp, and proceedings will increase the cost-effectiveness of their practice ◆ Provide the same file records that the courts have, because case details accessible to the lawyers/litigants will be similar to that of the court. Furthermore, real-time modifications will remove the need for attorneys to examine new changes ◆ Improved calendaring will bring more efficiency and time value ◆ Executing court orders accessible in regional languages will allow for a more seamless transfer of cases across courts ◆ Digital procedures will make the profession of law more accessible, especially to women ◆ More information for a given instance will be available, which will aid in developing legal arguments and tactics
Judges	◆ More data, knowledge, and assistance for decision-making regarding case flow management ◆ A uniform digital platform will allow judges to monitor the development of court cases from the initial authority to the courts of appeal ◆ Better case prioritisation/time management due to intelligent organising ◆ Greater simplicity of searching, tracking, and indexing digital papers will facilitate real-time access to facts and judicial precedents ◆ Improved access to knowledge and research tools

Stakeholders	Possible benefits
Judicial and Legal System	◆ The judiciary will be able to focus its actions and allocate its resources more effectively with improved data transparency on the types of cases that make up the majority of caseloads as well as how they develop ◆ Seamless merging of the court system with that of the police, prisons, prosecutors, and so on, to improve the speed of information exchange, make processes more effective, and eliminate process duplication ◆ Having open data available will allow scholars, educators, and civic society to better comprehend how the judicial system works
Court Staff	◆ Digital automation of procedures including scrutinising and reviewing filings & papers will save time, reduce mistakes, and improve the Registry's effectiveness ◆ Reduce dependency on the tangible registry ◆ Digital order templates and the creation of case management systems can significantly reduce judicial staff burden

Conclusion

A growing body of evidence demonstrates that expenditure on people-centred justice can deliver a high return on investment. Increased justice reduces the risk of conflict and instability. "Every dollar invested in justice is likely to return at least $16 in benefits from reduced conflict[33]." A more responsive judicial system would provide services based on people's stated needs. All groups, especially the most vulnerable, would find it open, accessible, and welcoming. It would make certain that individuals were aware of their alternatives at each level of the judicial process, and it would employ triage and signposting to direct them to the most suitable component of the system at each stage. It would also employ technology to reach out to more individuals and streamline the judicial process. These difficulties include a lack of coordination, poor interdepartmental communication, inadequate employee training, an acute lack of quality technical staff in the courts, and a lack of understanding among litigants, advocates, and those who would use the new system.

The emergence of mathematical modelling including from technical areas such as Operations Research, Artificial Intelligence and Machine Learning has now provided us with a glimpse of the future of law. Today, predictive analytics can predict the result of US Supreme Court judgments with an accuracy of over 70% - significantly better than skilled legal experts (Katz, Bommarito, Blackman 2017). In addition, it plays a growing role in predictive policing, tax evasion and tax results, recidivism rates of criminal offenders, and lawsuit funding (Vogl 2018: 57). As proven by Skopos Labs in 2017, intelligent robots can even predict the passage of legislation (Hutson 2017).

Implementation of e-courts Phase 3: Now that a grand vision and funds are laid out, all attention should focus on effective implementation. We propose a framework that addresses the access to justice challenges through a systems-driven approach as opposed to fragmented, piecemeal interventions. Further, we suggest an outline of the approach for effective technology implementation.

In the previous section inspired by the draft vision document of Phase 3 for e-courts, we lay out the overall idea to build a digital public infrastructure for Phase 3 and also highlight the importance of stakeholder participation along with the potential benefits of all stakeholders. However, how exactly will stakeholders' engagement happen and the key questions to answer from the system development perspective are unclear.

Accordingly, from the point of view of robust implementation, a framework is proposed below where we suggest key guidelines on collecting and incorporating user feedback along with some key insights from a product development viewpoint to make it relevant for end users.

Hexa-Access Framework

We propose the *Hexa-Access Framework* in Figure 5 that maps access to justice challenges in 6 key ways to address these issues in a systems-driven approach. The six steps to consider in the pursuit of developing a strategic roadmap for

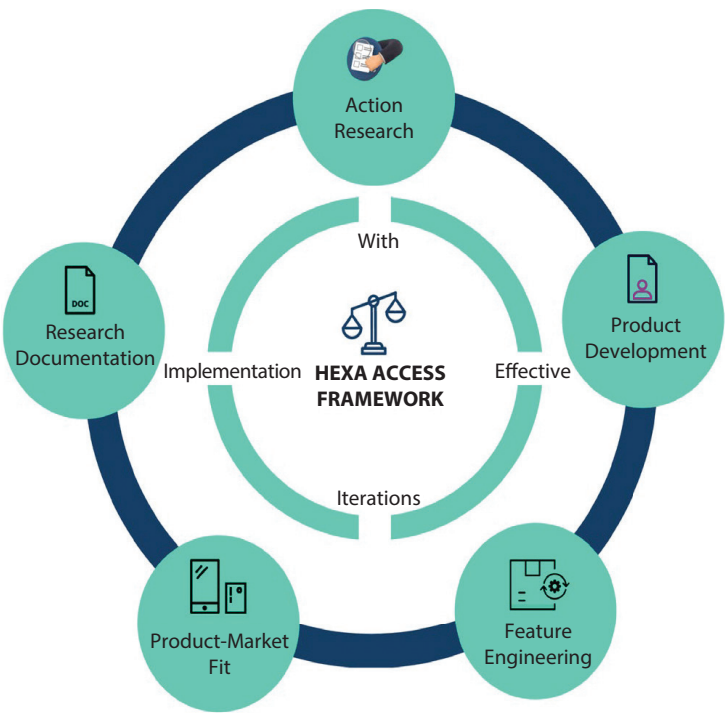

Figure 5: Hexa-Access Framework

overcoming the obstacles to access to justice in the wake of dynamic technological advancement and innovation are listed below.

1. **Action Research:** Mapping and incorporating within the platform the information around the typical range of problems citizens face in accessing timely justice which includes but is not limited to
   - lack of idea about the legal provisions & scope to avail alternate dispute resolution options,
   - difficulty in locating best-fit lawyers as per client needs & inability to afford legal services,
   - asymmetry of information between lawyers and clients,
   - challenge in getting dates of hearings in courts and adjournments.

   A robust survey needs to be conducted at district levels to have an idea of the magnitude and variation of each of these problems based on demographic variation. A dynamic FAQ section should be developed including in regional languages for users to access important information around answers to the questions listed above at the click of a button on the envisaged integrated platform.
2. **Research Documentation:** Identifying broad trends about technology advances in various domains such as the private & public sectors and legal education through a thorough mapping with relevant stakeholders and documenting case studies of successful adaption and impact along with learnings from failed initiatives and more specifically understanding why it failed the way it did in a particular context across geographies.
3. **Product-Market Fit:** If the starting point of this reimagination of the justice system beyond the sovereign service aspect it is usually perceived to be, is imagining access to justice as a service that ought to be provided seamlessly to all citizens for which the digital infrastructure is built, the envisaged platform must be a good fit to address the issues it is meant to solve. Understanding the implications of these technological changes for a variety of issues is crucial. These issues could be around access to technology, cost-effectiveness, transparency, and accountability. Just the sheer question of acceptability (and therefore uptake) is another question that must be answered. An example of what happens when this is not addressed properly is narrated earlier in this chapter.
4. **Feature Engineering:** This refers to systematically engineering relevant features on the platform so the navigation time for the users to fetch the information they are looking for is minimised. This can enable users to address sector-specific access to justice questions such as those specific to commercial disputes, criminal cases and civil cases and learn as we go forward from the perspectives of different litigants ranging from citizens, and corporations to the government. Queries should be categorised in the FAQ section using NLP (Natural Language Processing) methods and techniques such as

Lemmatization, Padding, and Word Embedding to dynamically club the questions under different case types.

5. **Product Development:** For mainstreaming the use of this technology platform for citizen empowerment and enhanced access to justice, it should be able to answer the following questions in the affirmative: (a) Did the product cause the outcomes for the user to improve? Did it provide any solution for the dispute in question? and (b) Is the product design responsive and reflexive such that it can adapt and iterate based on user needs?
6. **Implementation with Iterations:** For the five elements of the framework listed above to inform the product development and its enhanced usage, iterations to incorporate stakeholder feedback for sector-specific challenges is crucial. This sixth element can ensure a meaningful redesigning of the processes to effectively target efficiency gains in a continuum approach.

Effective Technology Implementation

The Hexa-Access Framework (HAF) can lead to effective gains in access to justice only if it is combined with an effective technology implementation. While some elements of the HAF do include technology aspects, given its centrality, we believe it is essential to further detail some key insights around technology implementation:

- **Overwhelming Complexity:** The envisaged integrated technology platform is clearly complex and, unless care is taken, may often come at the cost of the user perspective. It is thus crucial that the front end be made user-friendly in a way that adoption by end users including different stakeholders such as court registry officials, police, prison officials, judges, lawyers and litigants can be expedited. Intuitive designing techniques need to be leveraged to build a platform that offers a seamless experience.
- **Best Practices in Technology Architecture:** Develop a detailed technological architecture taking inputs from the best experts available. The architecture can learn from UIADI and other relevant digital public goods to facilitate technology mechanisms that allow further innovation and development connected to this platform for continuous improvement in access to justice. A key element of this is providing open APIs, a reusable and extensible modular architecture which are equipped with open and interoperable source codes with security features having essential guardrails in place. This would mean having the required controls in place that allow developers the flexibility to innovate within the boundaries of defined security policies.
- **Design Feedback:** Open the architecture up for inputs from key stakeholders such as technology enthusiasts, developers, researchers, youth or broadly people who are technology savvy and willing to contribute towards building a more responsive judicial system with constant improvements keeping up

with the rapidly evolving technological advancements globally. This is a crucial step for taking feedback at the ideas stage itself, generating new ideas hitherto missed by the core development team and appropriate outreach and ownership development among potential users.

- **User Journey Simulations:** Once the platform is developed, before its formal launch, keep the draft version available for user journey simulations and conduct alpha users test, initially piloting with chosen users from all stakeholder categories such as judges, lawyers, court registry officials, citizens and researchers. This will collect feedback for appropriate iterations, before a formal launch for a beta test with a wider network of users. Finally, a robust mechanism to collect feedback for effective iterations to facilitate constant improvements and maximise adoption by end users should be a key feature of both the product as well as its outreach strategy.

We conclude this section and the chapter with some final remarks for the effective adoption of the proposed solution. While technological transformation is key to increasing access to justice and improving the efficiency in operations, a key to its success is successful adoption by the end users and initiatives beyond technological innovations need to be focussed on to ensure that. We describe two such initiatives taken in other countries to leverage the power of effective stakeholder awareness and engagement.

The 90 Centros de Acceso a la Justicia (Access to Justice Centers) in Argentina offer extensive judicial and community services to local communities. Each centre has a staff of attorneys, psychiatrists, social workers, and community advocates who work together to provide a comprehensive solution to justice-related issues by providing additional services and similar initiatives can be focussed on in the Indian context, especially in the rural hinterland which can significantly contribute to mitigating the overwhelming burden on the district courts. These centres can also potentially become centres not only for disseminating relevant legal knowledge to the potential litigant and diverting for ODR solutions but also become nudge units for people to use the online portal of the courts for adopting user-friendly technology.

The National Action Committee on Access to Justice in Civil and Family Matters of Canada has stressed the significance of the justice system's "front end," which assists individuals in developing "a preventive set of knowledge, skills, and attitudes before specific legal problems are encountered." A system like this relies on a diverse network of intermediaries, such as women's and community groups, schools and youth organisations, religious groups, hotlines, and libraries.

How the public sector should use its ability to bring people together to create an environment that encourages innovation, how the private sector, which has the ability to be flexible and creative in how it works, should look for ways to increase its impact, how civil society can give views on people's needs and wants, while academia can provide the knowledge on how to connect these different strands (HiiL 2019). Thus, we recognise that leveraging the power of collaborative initiatives

allows for the pooling of resources; more importantly, it is the conscious advancement of a mindset that recognises that the multifaceted challenges of access to justice can only be addressed through large-scale cross-sectoral partnerships.

Editors' Comments

This volume ends on this note: the future of the justice system is indeed bright when it can foster such cross-sectoral partnerships, taking all stakeholders along. The ecosystems approach of e-courts Phase 3, along with the proposed digital public goods are key enablers of the same. While the plan and vision therein are aligned well, the question, as with all major projects always is: will the implementation do justice to the plan? The last section with its Hexa-Access Framework and pointers on effective implementation attempts to provide some inputs, with hopes that the bright future will indeed be realised.

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