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About National Communications Academy- Finance

The National Communications Academy–Finance (NCA-F), formerly known as NICF, is a premier Central Training Institute (CTI) under the Department of Telecommunications (DoT), Ministry of Communications (MoC). Located on a 53-acre campus in Delhi NCR, it offers modern infrastructure, including a 220-room hostel, sports facilities, computer labs, and a well-stocked library. NCA-F trained 12,130 officers last year, generating 30,279 training man-days. Under Mission Karmayogi, it has published 78 courses on the iGOT platform, attracting over 422,131 learners, with 349,916 course completions.

As the designated cadre training institute for the Indian Posts and Telecommunications Accounts and Finance Service (IP&TAFS), NCA-F provides training to civil servants of the MoC. Its 2-year Induction Training for IP&TAFS Group 'A' probationers blends classroom sessions, on-the-job learning, and field visits. The Academy also conducts Mid-Career and Induction Training for AAOs and JAs, addressing the training needs of around 4,000 Group B and C personnel across DoT, DoP, and MoC.

NCA-F collaborates with global and national institutions, including ITU, NLSIU, IIMs, IITs, IISc, NSIC, and Capacity Building Commission (CBC), for joint research and training in Telecom Manufacturing, IPR Policy, Spectrum Economics, and 6G Standards. It actively integrates Indian Knowledge Systems (IKS) into its training curricula through specialized modules and initiatives. NCA-F also organizes workshops, seminars, and webinars, and delivers demand-based training on Corporate and Project Finance for MDOs and PSUs. Through its Centre for Policy Studies & Research (CPSR), NCA-F aspires to be a leading think tank and Centre of Excellence in Communications Policy, licensing, and regulation.

About Centre for Policy Studies and Research (CPSR)

The Centre for Policy Studies & Research (CPSR), established by the National Communications Academy–Finance (NCA-F), aims to enhance expertise in communications policy through joint research and capacity-building initiatives. CPSR envisions evolving into a leading think tank addressing key challenges in the telecommunications and postal sectors, including communications finance, spectrum management, telecom regulation, and digital inclusion. It also explores policy dimensions of emerging technologies such as AI, cloud computing, and satellite broadband.

CPSR's objectives include generating high-quality, evidence-based research to inform policymaking, grounded in ethical values of equity and inclusivity. The Centre works with government bodies, think tanks, and academic institutions to deliver actionable insights for both public and private stakeholders.

In addition to publishing this journal to disseminate research on timely policy issues, CPSR has contributed feasibility reports and case studies for various government schemes. To deepen its impact, CPSR organizes its work into focused research units tackling core areas such as the evolving telecom licensing framework, Digital Bharat initiatives, and spectrum allocation methodologies. Recent CPSR studies have examined the impact of data consumption on India's economy, explored innovative infrastructure investment tools in the telecom sector such as Infrastructure Investment Trusts (InvITs), and analysed the implications of tariff hikes on the Indian telecom industry, including their effects on market dynamics and consumer behaviour.

About Journal of Communications Finance

The *Journal of Communications Finance* is an initiative by the Centre for Policy Studies and Research (CPSR) under the National Communications Academy-Finance (NCA-F), which operates under the Ministry of Communications. NCA-F plays a pivotal role in capacity building for IP&TAFS cadre officers and provides specialized training in accounts, finance, and Communication policy. The CPSR was established to further enhance expertise in these areas, fostering collaboration between government officials and private sector professionals through joint research and training programs.

The journal seeks to publish high-quality research papers and articles that contribute to the evolving landscape of postal and telecommunications sectors. It will serve as a valuable resource for academicians, policymakers, and industry professionals, addressing contemporary challenges and opportunities. The research topics span across areas such as Communication policy, spectrum economics, telecom licensing, postal finance, public and corporate finance, and related legal frameworks.

With a focus on relevant and actionable insights, the journal addresses emerging areas and challenges in the postal and telecommunications sectors. It also includes research on other relevant topics such as artificial intelligence and digital literacy. These contributions aim to shape future policies and inform decisions in both the public and private sectors, ensuring the journal plays a significant role in the development of Communication finance.

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Message from Secretary (DoT)

I welcome the publication of the second edition of the Journal of Communications Finance. The launch of this journal last year marked a significant milestone, and the rapid development and release of its second edition is a testament to the dedication and hard work of everyone involved.

In an increasingly interconnected world, the nexus between communication and financing is more critical. The Journal of Communications Finance serves as an important platform for academics, practitioners and policymakers to exchange ideas, foster collaboration, and collectively address the complex challenges and opportunities that lie at the intersection of the two domains. I am confident that this edition, will stimulate thoughtful discussion, inspire further research, and contribute significantly to the academic and professional discourse.

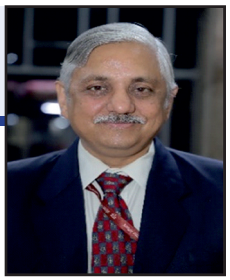
The inaugural edition laid the foundation by exploring nascent ideas and emerging trends. This edition continues to build upon that, delving deeper into the dynamics that shape our digital economy and societal interactions. It offers insightful analysis and diverse perspectives on a wide spectrum of themes -covering decolonization of policy and the reclamation of indigenous wisdom, regulatory innovations in digital and telecommunications governance; evolving intersections of technology, society, and governance, and emerging conversations around ethics, equity, and resilience in the digital age.

I commend the editorial board for their meticulous efforts in curating high-quality research, the reviewers for their invaluable expertise, and most importantly, the authors for their scholarly contributions.

I look forward to seeing the continued growth and impact of this journal in the years to come.

Dr. Neeraj Mittal
Secretary
Department of Telecommunications

Message from Member (Finance)



It gives me immense satisfaction to witness the release of Volume II of the Journal of Communications Finance, a testament to the continued commitment of the National Communications Academy–Finance (NCA-F) and the Centre for Policy Studies and Research (CPSR) to fostering rigorous thinking, policy dialogue, and meaningful innovation in India's communications and financial ecosystems.

As digital transformation reshapes how we communicate, govern, and deliver financial services, this journal serves as a vital bridge between academic insight and real-world practice. The themes explored—ranging from spectrum economics to postal financial inclusion and regulatory innovation—are timely, relevant, and aligned with India's evolving communication landscape. The lead article, *"Reclaiming the Future: Indian Knowledge Systems and the Decolonisation of Policy and Capacity Building,"* powerfully anchors this edition, offering a bold and necessary reimagining of how indigenous thought can enrich contemporary governance and capacity building.

NCA-F, through CPSR, has taken an important step in ensuring that our officers and stakeholders engage with contemporary challenges not just through training, but through informed inquiry, reflection, and collaborative learning. This journal is a key part of that journey.

I commend all contributors and the editorial team for their commitment to excellence. I invite readers across government, academia, and the communications industry to engage with this volume, not merely as a publication, but as a shared space for advancing dialogue, research, and practice in communications finance.

Let us continue to deepen our understanding and strengthen our resolve to build a more connected, inclusive, and forward-looking India.
Best wishes.

Shri Manish Sinha
Member (Finance)
Digital Communications Commission
Department of Telecommunications

From the Chief Editor's Desk

It is with immense pleasure that we present the Second Edition (Volume II, Issue I) of our Journal of Communications-Finance. Building on the vision set forth in our Inaugural Edition, the Second Edition of our Journal continues to serve as a platform for advancing dialogue at the intersection of research, training, and policy insights in communications and finance.

This issue opens with the thought-provoking article *"Reclaiming the Future: Indian Knowledge Systems and the Decolonisation of Policy and Capacity Building,"* which invites us to reflect on how traditional wisdom can shape future policy frameworks. I thank Shri Balasubramaniam, Member (HR), CBC and his team for this lead article, which serves as a beacon for all CTIs to work towards decolonisation of our thoughts and action. Across this edition, we explore themes of regulatory compliance in telecommunications, responsive grievance redressal in public governance, social welfare innovation through institutional platform, gender and technology dynamics, regulatory frameworks for emerging spectrum technologies, cybersecurity and digital resilience, along with critical reflections on digital culture and attention economies.

Our special thanks to Secretary (Telecom) for his continued guidance and support in all our endeavours. I would like to express my sincere thanks to our Patron, our contributors, peer reviewers, and the editorial team, whose dedication and collaboration continue to strengthen the Journal's quality and impact.

Our aim is to foster critical inquiry, encourage cross-sector collaboration, and contribute to building resilient, inclusive, and future-oriented communications ecosystems. Through each volume, we seek to provide policymakers, practitioners, academics, and industry professionals with well-grounded insights that inform actionable solutions and spark innovative thinking. Moving forward, we hope this journal will serve as a trusted reference and a catalyst for informed debate and transformative policy development in the sector.

Happy Reading!

Ms. Madhavi Das
Director General
National Communications Academy-Finance

Lead Article

4. Reclaiming the Future: Indian Knowledge Systems and the Decolonization of Policy and Capacity Building

Shri Ramaswami Balasubramaniam, Ms. Tanushree Bhat and Dr. Sakshi Pandey

Abstract

For over two centuries, India's governance and public policy have been shaped by colonial paradigms that prioritized control, abstraction, and hierarchy. Despite political independence, administrative frameworks have largely remained tethered to Western rationalist models. This article argues for a shift toward a decolonial and dharmic governance model grounded in Indian Knowledge Systems (IKS)—a diverse, dynamic body of indigenous wisdom spanning disciplines from statecraft and ethics to ecology and psychology. By integrating principles such as Svadharma (contextual responsibility), Sahakaryata (collaborative action), and Yogakshema (collective welfare), IKS can reshape policy design, leadership, and capacity building in India. This essay proposes embedding IKS across public administration curricula, institutional research, and community engagement, thereby enabling governance that is context-sensitive, inclusive, and future-ready. Through experiential learning and a revalorization of India's civilizational heritage, this model aspires to reclaim cognitive sovereignty and foster Swaraj in thinking-laying the foundation for a regenerative and ethically anchored approach to national development.

Keywords

Capacity Building, Civil Servants, Decolonization, Indian Knowledge Systems (IKS), Mission Karmayogi, Policy Design, Policy Innovation, Sahakaryata, Svadharma, Swaraj, Traditional Knowledge, Training, Governance, Viksit Bharat.

Introduction

For over two centuries, the foundations of public policy and governance in India have been shaped by colonial knowledge systems and approaches that privileged abstraction over context, control over care, and hierarchy over harmony. In the aftermath of independence, although the political apparatus shifted, the paradigms that informed planning, administration, and leadership remained tethered to a Western rationalist worldview. Today, as India confronts complex

challenges of climate change, institutional legitimacy, cultural erosion, and socio-economic growth demands, it is imperative to revisit the development and public administration paradigms of the land. In this context, one should look at how indigenous and civilizational knowledge can help frame sustainable approaches to problem-solving.

Indian Knowledge Systems (IKS), encompassing a wide array of scientific, philosophical, artistic, and traditional knowledge, have evolved in the Indian subcontinent over several millennia. Rooted in the indigenous civilizational wisdom, IKS offers a framework that is not merely historical or symbolic but deeply pragmatic, contextually relevant, culturally appropriate, and future-ready. When consciously embedded into the policy design and capacity-building initiatives, IKS can catalyze a decolonial and dharmic governance model that is inclusive, sustainable, and authentically Indian.

This essay seeks to promote a transformative and future-oriented approach to public policy, governance, and capacity building in India by integrating the principles and values of Indian Knowledge Systems. By drawing upon the dynamic and holistic nature of IKS, the essay aims to inform policy design that is inclusive, sustainable, and responsive to contemporary challenges.

IKS as a Shift in How We Learn and Understand

Indian Knowledge Systems are not monolithic or frozen in time; they are dynamic, diverse, and dialogic. Encompassing disciplines ranging from agriculture, astronomy, mathematics, linguistics, and architecture to psychology, ethics, ecology, and statecraft, IKS emerges from a holistic understanding of life (jīvana darśana[1]) and relationality. It sees knowledge not as the conquest of nature but as a co-evolution with it; not as commodified information but as wisdom in action (vidya[2] leading to karma[3]).

A decolonial turn, therefore, requires more than inserting Sanskrit terms into curricula or showcasing temples as heritage. It involves recovering India's cognitive sovereignty and reclaiming how we define truth, reason, value, and progress. IKS invites us to shift from a paradigm that takes from people and nature

[1]Jīvana Darśana (Sanskrit: जीवन दर्शन) means "philosophy of life" or "vision of life." It refers to the underlying worldview, values, and principles that guide how one understands and lives life. In the Indian tradition, jīvana darśana is not just abstract philosophy—it is deeply lived, experiential, and holistic

[2]Knowledge

[3]Action

for gain to one guided by inner responsibility, ethics, and harmony with society and the environment. In other words, one that is rooted in *Svadharma* (contextual responsibility), *Sahakaryata* (collaborative action), and *Yogakshema* (welfare and security of all beings).

Policy Design Through a Dharmic Lens

Contemporary policy frameworks are predominantly shaped by Western traditions, liberal-democratic ideals, utilitarian logic, and technocratic models. These tend to universalize solutions and abstract problems from their cultural and ecological contexts. A policy approach informed by IKS would be grounded in:

1. **Contextual Ethics:** Policies would arise from *desha-kala-paristhithi*[4], the awareness of time, place, and social fabric. For example, environmental laws prioritize sacred ecology and intergenerational custodianship over extractive developmentalism.

2. **Duty-centric Governance:** Inspired by *kartavya* (duty) rather than *adhikara* (rights) alone, policies would emphasize responsibilities of all stakeholders, not just entitlements, thus fostering civic co-responsibility

3. **Plural Epistemologies:** Indigenous and community knowledge about architecture, agriculture, water systems, dispute resolution, and medicinal practices would be legitimized and integrated into mainstream governance rather than seen as "informal" or "traditional."

4. **Integral Human Development:** Drawing from the *Panchakosha*[5] model and Indic psychology, human well-being would be seen as multi-dimensional, combining physical, mental, emotional, social, and spiritual development.

[4]Desh-Kala-Paristhiti (देश–काल– परिस्थति) is a Sanskrit phrase commonly used in Indian thought to refer to contextual wisdom. It emphasizes that any action, decision, or understanding must be situated within the realities of:

Desh (देश) – Place or space: the geographic, cultural, and social setting

Kala (काल) – Time: the historical moment, temporal conditions, or timing of an event

Paristhiti (परिस्थति) – Situation or circumstance: the specific conditions, challenges, or environment in which something occurs

[5]The Pañcakosha (Sanskrit: पञ्चकोश) is a profound concept from Indian philosophy—especially the Taittiriya Upanishad— that describes the five layers or sheaths of human existence, moving from the outermost physical layer to the innermost essence (Ātman or Self). It offers a holistic model of the human being, emphasizing that we are not just body or mind, but composed of multiple, interconnected dimensions.

Capacity Building as Inner Re-orientation

Training institutions for civil servants, teachers, and grassroots workers must go beyond skill transfer and technocratic efficiency. Capacity building in a decolonial mode entails a deep inner re-orientation, from information to introspection, **from performance to purpose.**

A few key principles to guide such transformation:

- ***Swadhyay* (Self-knowledge) as Foundation:** Programs must begin with the process of building inner capacity through self-driven learning, reflection, and self-awareness, and their evolving *Svadharma*–one's own duty, responsibility, or path, aligned with their nature, role, and context in life.
- **Revalorization of *Bharatiya Niti* (Statecraft):** Study of texts like the Mahabharata, *Arthashastra*[6], and *Thirukkural*[7] should not be museumized but translated into living templates for learning, leadership, ethics, and collective decision making.
- **Experimental and Reflective Pedagogy:** Even in digital environments, learning should be grounded in lived experiences, virtual community engagements, and interactive case studies, e.g., IKS-based courses provided on iGOT[8].
- **Indic Diagnostics and Tools:** Tools and assessments rooted in IKS that shed light on one's *Svabhava*[9] i.e., helping individuals understand their inner dispositions, temperaments, e.g., *guna* and *panchamahabhuta*-based models, can personalize learning and deepen internalization.

[6]Arthashastra (Sanskrit: अथ शास्त्र) is an ancient Indian treatise on statecraft, economics, military strategy, and governance, traditionally attributed to Kautilya (also known as Chanakya or Vishnugupta), the advisor to Chandragupta Maurya, the founder of the Mauryan Empire (~4th century BCE). The name "Arthashastra" translates to "the science of artha," where artha means material well-being, prosperity, or purpose—including wealth, power, and state interests.

[7]The Thirukkural (also spelled Tirukkural) is one of the most revered and ancient works of Tamil literature. It is a classic t ext composed by the Tamil poet-philosopher Thiruvalluvar, believed to have lived sometime between the 3rd century BCE and 5th century CE. It is considered a universal ethical guide, comparable to works like the Bible, Quran, or Confucius's Analects.Remarkably secular and inclusive, it avoids direct references to specific religions, making its wisdom accessible to people of all faiths.

[8]https://igotkarmayogi.gov.in/

[9]Svabhāva (Sanskrit:स्वभाव) means one's intrinsic nature or essential character—the inborn tendencies, dispositions, and qualities that shape who a person (or thing) is.

Pathways for Institutional Integration

To enable this systemic transformation, a multi-pronged strategy is needed:

1. **Policy Alignment:** IKS values must be embedded across flagship national frameworks as demonstrated by the National Education Policy (NEP), the Karmayogi Competency Model, courses on Karmayogi Bharat[10], and Amrit Kaal Viksit Bharat. These platforms offer not just symbolic recognition but also serve as foundational paradigms to mainstream Bharatiya perspectives in governance and development.

2. **Curriculum Redesign:** Public administration curricula should integrate IKS-based frameworks for ethics, leadership, governance, and well-being. The Capacity Building Commission (CBC), along with the Central Training Academies (CTA's), plays a vital role by reimagining civil service training through Mission Karmayogi, ensuring that civil servants are equipped with contextually rooted, values-based approaches drawn from India's own intellectual traditions.

3. **Research and Knowledge Production:** Establish IKS Chairs, fellowships, and Centres of Excellence across academic institutions to critically engage, translate, and apply Indic wisdom to contemporary governance challenges. The IKS Cell at the CBC exemplifies this approach. It actively works to integrate India's civilizational knowledge into public administration through policy research, learning modules, and strategic collaborations.

4. **Community Co-Creation:** Indigenous communities, grassroots movements, and field practitioners must be treated not just as informants but as co-owners of knowledge, ensuring that lived realities and traditional ecologies of wisdom enrich institutional frameworks.

5. **Long-Term Immersions:** Promote **"*yatras*[11]" and immersive field experiences** where civil servants, educators, and students engage with communities practicing Indic models of sustainability, equity, and self-governance. These experiences foster embodied learning and cultivate empathy, humility, and deeper insight into alternative development paradigms.

[10]https://igotkarmayogi.gov.in/

[11]Sanskrit *yātrā* meaning 'journey'

Conclusion: Toward Swaraj in Thinking

The decolonial project in India must move beyond critique to reconstruction. IKS offers not a romantic past but a regenerative future; an opportunity to reimagine policy and leadership as moral, contextual, and rooted in the well-being of all beings. When civil servants and policy designers begin with self- awareness and act with *dharmic* clarity, governance transforms from a mechanistic system to a living ethic.

When we reconnect with our own ways of knowing through Indian Knowledge Systems, we are not turning our backs on modern ideas; we reframe them through an Indic lens of wisdom, integration, and responsibility. This is the swaraj of the 21st century, not just political autonomy, but cognitive and civilizational self-rule. The time has come not merely to teach IKS but to live it. Through policies that care, leaders who reflect, and systems that embody the soul of India.

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Author's Profile

Dr. R. Balasubramaniam (Balu) is a widely respected development activist, leadership trainer, thinker and writer. After his MBBS, he earned his MPhil in Hospital Administration & Health Systems Management from BITS, Pilani. He has a Master's in Public Administration from the Harvard Kennedy School, Harvard University. He has spent more than three decades of his life in the service of the rural and tribal poor in the forests of India. He is also the Founder and Chairman of Grassroots Research and Advocacy Movement, a public policy thinktank in India. He is a Tata Scholar, a Mason Fellow of the Harvard Kennedy School and a Fellow at the Hauser Center for Civil Society, Harvard University. He was the Head and Visiting Professor of the Vivekananda Chair, University of Mysore twice.

He is a former professor at Cornell University, USA and at IIT-Delhi, India where he taught courses on Leadership and Human Development. He coaches and mentors senior leaders in the non-profit, corporate, government and educational sectors globally, apart from running leadership workshops for people from these sectors. He is the Chairman of the Social Stock Exchange Advisory Committee set up by SEBI. He is currently the Member-HR in the Capacity Building Commission of the Government of India.

He has authored nine books, both in Kannada and English. More about him, his work and books are at www.drrbalu.com

Ms. Tanushree Bhat is a design-thinking professional who now leads the Indigenous Knowledge Systems (IKS) mandate at India's Capacity Building Commission. Armed with a master's in Design Planning from the Institute of Design at Illinois Institute of Technology, Chicago, she blends rigorous systems thinking with a deep empathy for end-users. Before returning to India in 2021, Tanushree spent more than a decade in the United States as a senior consultant with WorkSpace Futures at Steelcase Inc.'s global headquarters in Michigan. Her portfolio spans education, healthcare, banking, HR, manufacturing, and product development, consistently uncovering human-centred insights that unlock growth and social impact. Through her leadership of the IKS Cell, she works to ensure that indigenous wisdom is not just acknowledged but meaningfully integrated into capacity-building initiatives, making them more contextually grounded, inclusive, and responsive to the lived experiences of both citizens and civil servants

Dr. Sakshi Pandey serves as the Research Lead at the Capacity Building Commission of India. With a Ph.D. in Food and Nutrition Policy from the University of Tokyo, Dr. Pandey is a MEXT Scholar with a technical background in Civil Engineering (B.Tech.) and Rural Development (M.Tech. from IIT Bombay). Her career spans work with UNICEF India, and later, academic and policy roles as a postdoctoral fellow and capacity-building associate at the Asian Development Bank Institute in Japan. Her research portfolio includes peer-reviewed articles, policy briefs, and edited volumes on topics ranging from malnutrition and sanitation to climate change and women's livelihoods. At the Commission, she contributes to evidence-based research that informs national capacity-building strategies, with a strong emphasis on sustainability, public health, and inclusive policy frameworks.

Papers/ Articles

5.1 Compliance Scoring Framework for Telecom Service Providers in India

Shri Nikhil Srivas

Abstract

The telecom ecosystem in India presents a vibrant landscape with over 3,500 operators providing a wide range of telecom services. These operators, predominantly small to medium enterprises, are essential for last-mile connectivity. However, during recent Telecom Outreach Programs (TOP) conducted by field units of the Department of Telecommunications (DoT), several service providers voiced concerns over their limited access to finance. A significant factor attributed to this challenge is the absence of a standardized and credible telecom compliance index to demonstrate their regulatory reliability, which unfairly influence financial decisions across the sector.

Regulatory compliance is critical to ensuring integrity, sustainability, and equitable growth in the telecom sector. This paper introduces a novel, multidimensional Compliance Scoring Framework for Telecom Service Providers (TSPs) in India. The framework consolidates key regulatory performance indicators—including timeliness of license fee payments, proportion and recurrence of financial defaults, document submission behavior, and health of financial and performance bank guarantees—into a comprehensive 0–100 score. The score includes innovative elements such as decay weighting for older defaults, to ensure the impact of non- compliance fades with time and override provisions for severe infractions (e.g., PBG encashment or termination proceedings).

This scoring tool addresses regulatory, institutional, and financial challenges identified by TRAI, ITU, RBI and feedback received during DoT's stakeholder consultations (Press Information Bureau [PIB], 2023). It provides a credible, regulator-driven benchmark that enhances financial accessibility, allows risk-based supervision, and bridges information asymmetry for lenders and investors. Designed to be scalable and replicable across sectors, this scoring framework offers a timely and efficient solution for comprehensive compliance monitoring.

Keywords

Telecom Compliance, Risk Scoring, Bank Guarantee, Regulatory Monitoring, Financial Accessibility.

Introduction

Effective regulatory compliance is the cornerstone of competitive, reliable, and consumer-centric telecommunications markets. In India, the Department of Telecommunications (DoT) under the Ministry of Communications oversees licensing, fee collection, and enforcement of performance guarantees, ensuring that service providers adhere to prescribed norms (DOT, 2023). Despite extensive regulations, current supervisory practices lack a standardized way to measure compliance performance and differentiate high- from low-risk licensees. This gap complicates both regulatory prioritization and financial decision-making by banks and investors.

Recent insights from outreach programs by DoT as published in the Press Information Bureau (PIB, 2023) reveal that many TSPs struggle to secure financing due to the absence of credible, standardized compliance ratings. National and International bodies such as the Telecom Regulatory Authority of India (TRAI) and the International Telecommunication Union (ITU) have advocated for risk-based, data-driven monitoring frameworks to modernize telecom regulation (TRAI, ITU). Likewise, the Reserve Bank of India (RBI) underscores the importance of structured compliance data in informing credit risk assessments (RBI) while the World Bank highlights the role of transparent metrics in promoting financial inclusion in capital- intensive sectors (World Bank, 2023).

In response, this paper proposes a Compliance Scoring Framework that synthesizes multiple compliance dimensions into a single quantitative score. The framework's objectives are to:

1. Standardize compliance evaluation across all telecom circles in India.
2. Enable DoT to adopt risk-based supervision, earmarking resource allocation for high-risk entities.
3. Facilitate financial institutions in distinguishing creditworthy operators from those requiring remediation.

By enabling practical, scalable, and cost-efficient compliance benchmarking, this scoring framework empowers stakeholders—including regulators, investors, and operators—with enhanced decision-making tools grounded in data.

Literature Review

Composite scoring models are extensively applied across financial services, environmental regulation, and taxation compliance to capture multidimensional behavior through quantifiable indices (Kumar et al; 2020, Kumar & Gupta, 2020). In sectors where regulatory oversight involves continuous data submission and financial discipline—such as banking and insurance—compliance scores help allocate supervisory attention, inform credit ratings, and guide investor decisions. However, the telecom sector, especially in emerging economies like India, has lagged in the development of similarly structured indices.

Nationally, TRAI (TRAI, 2022) and the International Telecommunication Union (ITU) (ITU, 2021) have emphasized the importance of building risk-informed regulatory strategies. They recommend developing frameworks that synthesize both quantitative indicators (e.g., timelines of fee and guarantee submissions) and qualitative red flags (e.g., encashment or termination events). The Reserve Bank of India (RBI, 2022) also recognizes that such indices are instrumental in reducing information asymmetry between creditors and borrowers.

Gupta and Reddy (2020) proposed a basic scoring model for telecom licensees based on frequency of defaults and document compliance, which influenced this framework's parameter selection. Similarly, Kumar and Gupta (2020) advocated for temporal decay weighting, a method wherein the penalty of non-compliance reduces progressively over time—balancing the need for accountability with an incentive to improve behavior. This principle is adopted in our proposed scoring logic.

From an international perspective, regulatory agencies such as the Federal Communications Commission (FCC) in the United States and Ofcom in the United Kingdom have experimented with Supervision systems based on risk levels. For instance, FCC's "High-Cost Program Compliance Measures" assesses Universal Service Fund recipients using financial and reporting compliance data. Ofcom's enforcement prioritization relies on submission punctuality and complaint metrics. However, neither provides a publicly

unified score that can be independently used by financial institutions or cross-referenced for inter-circle performance evaluation.

This paper distinguishes itself by proposing a publicly shareable, standardized compliance score that can serve both regulatory and financial oversight purposes. Unlike opaque audit-based ratings, this model operates on a quantitative, formula-based structure that is adaptable to India's licensing and revenue assessment ecosystem. Its novelty lies in the cross-circle comparability and modular weighting structure—enabling a unified compliance profile for entities operating in multiple jurisdictions.

Methodology

Component Selection and Weighting

The Compliance Score aggregates seven regulatory performance components, each weighted to reflect its relative importance based on regulatory risk exposure and supervisory priorities set by the Department of Telecommunications:

Component	Weight (%)
Quarterly License Fee Compliance	30
Financial Bank Guarantee (FBG) Compliance	20
Performance Bank Guarantee (PBG) Compliance	20
Quarterly Document Compliance	15
License Age	10
Multiple Licenses	5
Termination Proceed	–50

Notes:

- ***Quarterly License Fee Compliance (30%):*** This carries the highest weight as timely revenue remittance is essential for government finances and sectoral stability.
- ***FBG and PBG Compliance (20% each):*** Bank guarantees are risk mitigation tools ensuring financial and performance accountability, hence their high significance.
- ***Document Compliance (15%):*** Ensures transparency and regulatory traceability.

- ***License Age (10%):*** Older licenses typically reflect operational maturity and stability.
- ***Multiple Licenses (5%):*** More licenses indicate broader operational presence; scoring is positive, not punitive—1 license scores 0; 2 licenses score 3; 3 or more licenses score 5.
- ***Termination Proceed:*** A penalty override subtracting 50 points if termination has been initiated, reflecting the most severe non-compliance.

Scoring Logic

The scoring logic emphasizes the temporal decay of default impact—allowing adverse effects to fade over time when compliance resumes—as well as the proportional severity and recurrence of defaults across quarters. Each component is converted into a sub-score, then weighted and summed to produce the final 0–100 Compliance Score. Details of individual parameters are provided below:

1. Years of spread of impact is taken as 4 years, thus quarterly decay accounts for 6.25% per quarter. This is taken with the consideration that a balance between penalty for a non-compliance and an opportunity to improve score exists.
2. For non-payment of license fee, the maximum tolerance is taken as 4 quarters, which is in line with the financial compliances prescribed under Unified license agreement wherein the final assessments, dues and actions are prescribed on submission of audited annual financial statements i.e., after completion of 4 complete quarters.
3. For proportions defaulted, a table of proportions along with Penal impact in % is considered, wherein impact of 40% or more of total payment due is treated as with 100% of penalty prescribed in the specific index.
4. Licensees which follow all compliances, as time progresses are observed to remain compliant and thus the score considers temporal advantage for the compliance. This is in line with the credit scoring frameworks adopted by credit agencies where a longer credit score is favoured.

Temporal Decay and Recency Adjustment Temporal Decay and Recency Adjustment

To ensure recent defaults carry greater weight, each defaulted quarter is adjusted by a decay factor over a four-year horizon (16 quarters):

- Decay per Quarter: 100% – (n–1)×6.25%, for n = 1 to 16.
- Beyond 16 quarters → 0% impact.

Example Decay Table

Quarter since Default	Decay Weight (%)
1	100.00
2	93.75
3	87.50
4	81.25
…	…
16	6.25
≥17	0.00

Default counts used in the Quarterly License Fee and Document compliance sub- scores should be multiplied by the corresponding decay weight before computing the penalty.

Proportional Default Impact

License Fee defaults also incur a proportional penalty based on the percentage of dues unpaid:

Default % of Fee	Penal Impact %
0–10	25
10–20	50
20–30	75
≥30	100

Applied as: Sub-score = Weight × (1 – Penal Impact%) (e.g., 15% default → 15 × (1–0.50) = 7.5).

Final Score Aggregation

The final Compliance Score is the sum of all weighted sub-scores (after decay and proportional adjustments), offset by any termination override. Scores are floored at zero and capped at 100.

Score Interpretation

To facilitate actionable insights, Compliance Scores are categorized as follows:

Score Range	Rating
90 – 100	Excellent (AA)
80 – 89	Very Good (A)
70 – 79	Good (B)
60 – 69	Moderate (C)
50 – 59	Satisfactory (D)
0 – 49	Poor (E)

Illustrative Example

The final Compliance Score is the sum of all weighted sub-scores (after decay and proportional adjustments), offset by any termination override. Scores are floored at zero and capped at 100.

A hypothetical telecom operator which has taken license 4 years ago, has multiple licenses of Department of Telecommunications and is not recommended for termination at any stage, is represented below with following particulars:

1. Licensee defaulted 7 quarters ago in license fee submission for 2 consecutive quarters.
2. Licensee also defaulted 7 quarters ago and had not submitted its quarterly documents for 2 consecutive quarters.
3. However, the licensee was compliant with its bank gurantees.

The calculation of compliance score, based on the prescribed framework, is:

Telecom history card	Weightage	Quarter of last default	No. of quarters defaulted	Proportion of default	Age of license (In years)	Multiple license	Termination requested	Score
Quarterly license fee compliance	30%	7	2	20%				25.31
FBG Compliance	20%	0						20
PBG Compliance	20%	0						20
Quarterly document compliance	15%	7	2					10.31
License Age	10%				4			8
Multiple license	5%					yes		5
Termination recommended	-50%						no	0

Telecom Compliance Score	88.63

Telecom Compliance Score is calculated to be 88.63 i.e. Very Good (A) and thus may be considered with high reliability by the financial institutions and the Department.

Discussion and Relevance

The proposed Compliance Scoring Framework delivers a robust, transparent, and scalable solution for quantifying regulatory adherence across India's diverse telecom landscape. By consolidating multiple compliance dimensions—timeliness, default severity, bank guarantee enforcement, document submission, license tenure, and multi circle behaviour—into a unified metric, the model enables:

- **Risk Based Supervision**: The Office of the Principal Controller of Communication Accounts (PCCA) in each telecom zone can publish a Comprehensive Quarterly Compliance Score report, facilitating inter regional benchmarking and prioritization of audit resources toward high-risk licensees.
- **Enhanced Financial Accessibility**: Structured compliance scores, endorsed by the DoT, provide credit agencies, lending institutions, and investors with reliable, regulator-validated indicators to reduce information asymmetry and streamline credit appraisal for capital intensive telecom projects.

- **Performance Benchmarking**: Quarterly public disclosure of scores creates a competitive, incentive driven environment in which operators strive to maintain or improve their rating, thereby driving sector wide compliance excellence.
- **Policy and Planning Integration:** Policymakers can leverage aggregate score trends to identify systemic compliance gaps, evaluate the efficacy of regulatory interventions, and calibrate license renewal criteria or incentive schemes tied to compliance performance.
- **Stakeholder Confidence:** Transparent scoring increases trust among consumers, industry partners, and financial markets, reinforcing the credibility of India's telecom regulatory regime.

Furthermore, the framework's temporal decay mechanism ensures that past infractions lose their adverse weight over time, rewarding operators who resume consistent compliance. By also incorporating proportional default severity and recurrence penalties, the model captures both the magnitude and persistence of non-compliance events. These design elements collectively create a balanced, forward looking compliance metric suited for continuous monitoring.

Conclusion

This paper presents a novel Compliance Scoring Framework that addresses a critical need for standardized, data driven regulatory assessment in India's telecom sector. The model's key contributions include:

1. **Innovative Composite Metric**: Integration of multidimensional compliance indicators into a single, 0–100 scale with clear interpretive bands (Excellent to Poor).
2. **Temporal and Severity Adjustments:** Advanced decay and proportional penalty mechanisms that differentiate between one off defaults and chronic risk.
3. **Scalability and Practicality**: Excel based implementation enabling rapid deployment, customization, and potential integration with automated data feeds.
4. **Stakeholder Utility**: Relevance for regulators (risk based supervision), financial institutions (credit risk assessment), policymakers (evidence based planning), and licensees (performance benchmarking).

Future research may explore **machine learning** techniques to dynamically calibrate weights, incorporate real time network performance metrics, and integrate user generated quality of service data. Pilot implementation by in one of the PCCA zones, followed by stakeholder feedback loops, will be critical to refine the framework and inform national rollout. Ultimately, embedding the Compliance Score into licensing guidelines and financial evaluation practices can elevate compliance standards, foster financial inclusion and support the sustainable growth of India's telecommunications ecosystem.

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Author's Profile

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5.2 Enhancing Grievance Redressal Performance in CCA Units: A Proposal for Responsive Governance

Shri Harshvardhan Singh Khangarot

Abstract

To facilitate a responsive and citizen centric grievance mechanism and as part of the Government of India's vision to improve ease of living, it is essential to have a robust grievance redressal system as it is a direct reflection of the Government's commitment to transparency, responsiveness, and citizen welfare. Taking insights from the practical experiences from the North East (NE) Circle, this paper proposes two key interventions for further strengthening the grievance redressal mechanism: elevated disposal level for postal grievance portal appeals and implementation of speaking order format. This paper also includes a suggested sample template for a speaking order. In conclusion, the paper highlights areas where deeper exploration is required.

Keywords

Grievance Redressal, Postal Grievance, Speaking Order, Elevated Disposal Level, Responsive Governance.

Introduction

Grievance redressal is not just an administrative responsibility — it is a direct reflection of the government's commitment to transparency, responsiveness, and citizen welfare. Drawing upon personal experiences from my tenure in the NE-2 Circle, Dimapur, and inspired by the larger vision of the Department of Telecommunications, this article proposes two key interventions to further strengthen grievance redressal mechanisms across the CCA units.

Effective grievance redressal stands as a critical pillar of good governance, serving as a catalyst for overall improvement in the service quality. Considering the increasing number of pensioner grievances being handled by the 28 CCA units in the country, it is imperative to adopt measures that reinforce our commitment to prompt, fair, and transparent grievance handling.

In the year 2022-23, CCA Units handled **860** Centralised Public Grievance Redress and Monitoring System (CPGRAMS) (hereinafter referred to as "PG Portal")

grievance. As more and more pensioners have been migrated to the SAMPANN platform, and the *direct* disbursement of pension is effected to them, bypassing the traditional middle-agencies of banks/post offices, the number of grievances to be handled by CCA units, especially related to disbursement, are bound to increase. It is because the grievances, which were previously directed towards banks/post offices, shall now be raised with CCAs. No surprise that the figure (number of PG Portal Grievances) increased to 1700 in 2023-24 and has further risen to 3950 during the year 2024- 25.

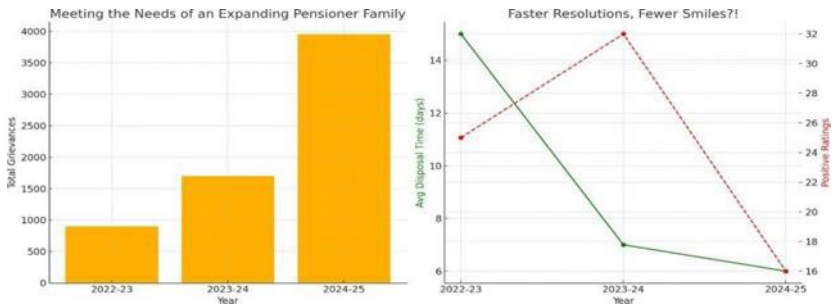


Fig-1 Trend since 2022-23

During the period, CCAs have successfully kept the average disposal time of grievances quite low. In fact, there has been a significant reduction in the average disposal time from 15 days to 6 days. While this is a matter of pride and holds a convincing testimony to our commitment towards the welfare of the pensioners, it is equally important to ensure that we maintain the quality of our grievance disposal, and also benefit from the feedback received from the aggrieved pensioners. It is said that feedback opens the door to a dialogue and is the foundation upon which trust and improvement are built. Data related to the number of disposals receiving positive ratings (good or above) from the aggrieved pensioners, suggest that 'quality of disposal' is where we may have some sincere work to do.

Proposed Administrative Interventions

With this objective, I propose two administrative interventions which align with the Government of India's priority on enhancing ease of living and also foster a more robust grievance redressal process across the CCA units.

1. Elevated Disposal Level for PG Portal Appeals

To strengthen the objectivity and effectiveness of grievance resolution, we may work towards ensuring that appeals submitted via the Public Grievance (PG) Portal are reviewed and disposed of by an authority at least one level above the initial

grievance- handling authority.

This additional level of oversight will enhance accountability and instill greater confidence in the grievance redressal mechanism. Disposal of appeals at higher level would inspire more sincerity in the initial disposals as well.

Fig-2 Appeal Disposal at Higher Level

2. Implementation of a Speaking Order Format

We may prescribe a "Speaking Order" format for the initial grievance disposal as well as for appeal disposals. A comprehensive detailed response format will ensure that each grievance is addressed comprehensively, providing the complainant with a clear and resolution that outlines the basis for the decision. This approach will contribute significantly to transparency and the perception of fairness in grievance handling.

Fig-3 Ingredients of a Speaking Order

I have attempted to draft a sample Speaking Order[1]-

Sir/Madam,

This letter is in reference to your grievance registered on [Date] via the PG Portal with reference number [Grievance Reference Number], regarding [Brief Summary of the Grievance]. We value your concerns and have reviewed your greivance promptly and thoroughly, and we have conducted a detailed review of your case.

1. **Grievance Summary-** [Provide a concise but complete description of the

grievance as raised by the aggrieved party.]

2. **Applicable Rules and Regulations-** [Introduce specific rules, policies, or circulars that are relevant to the grievance and will guide the decision-making process.]

3. **Reasoning and Analysis-** [Explain the thought process and rationale for addressing this grievance. Outline the steps taken to review the grievance and how the applicable rules have been interpreted in this case.]

4. **Root Cause Identification-** [Identify any underlying causes that contributed to the issue, if identifiable. This may include process gaps, documentation issues, etc.]

5. **Final Decision-** [Clearly state the decision or action taken. If any corrective actions are being implemented, specify them here.]

6. **Information on Appellate Rights-** If you are dissatisfied with this decision, you have the right to appeal through the PG Portal. Please submit your appeal along with the necessary details, referencing this decision. This appeal will be reviewed by an authority at a higher level to ensure fair reassessment.

7. **Feedback Invitation-** We value your feedback on this grievance disposal process. You are invited to provide your feedback through the feedback utility available on the PG Portal. Your input is essential for improving our services. and grievance handling mechanisms.

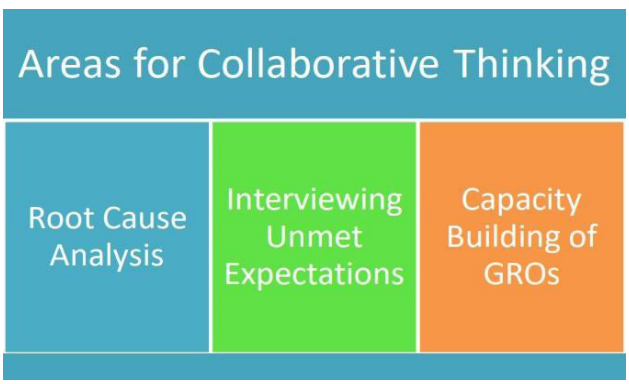
Thank you for your patience and for giving us the opportunity to address your concerns.

Sincerely,
[Name of Grievance Officer]
[Designation]
[Office Contact Information]

[1]The headings and the content in the Sample are for suggestion purpose. The idea is to highlight the critical ingredients of a Speaking Order and to propose what exactly a particular ingredient would expect from the Redressal Officer

Conclusion

Both interventions resonate with the core objective of facilitating a responsive and citizen- centric grievance mechanism, directly contributing to the Government's vision for ease of living. They may bring measurable improvements in our grievance redressal performance. In conclusion, I invite thoughts and feedback on three areas that merit deeper exploration: first, the gap between quick grievance disposal and modest feedback ratings—what does this signal about actual satisfaction levels? Second, the need for systematic root cause analysis to address recurring grievance types proactively. And third, the readiness of our grievance officers to take on enhanced responsibilities—what capacity building or support structures would best enable them? Insights on these aspects would enhance efforts to build a responsive, citizen focused grievance system.



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Author's Profile

Shri Harshvardhan Singh Khangarot is a Director in the Department of Telecommunications, Government of India, currently serving in the SEA & Training Finance division. An officer of the Indian Post & Telecommunications Accounts and Finance Service (2012 batch), he holds a Master's degree in Development Studies and a Bachelor's degree in Economics and Political Science. He has over 12 years of experience in public finance and administration, including telecom field assignments in North East-II Circle (Nagaland) and Madhya Pradesh Circle (Bhopal). He actively pursues continuous learning through the iGOT platform.

5.3 Social Welfare Potential of India Post

Ms. Taruni Pandey

Abstract

Many of us tend to look at posts as "messengers of mail" but we often forget that posts are a "deliverer of multitude of services", especially social services. With about 656,000 post offices and 5.23 million staff, it is the world's largest physical distribution network that runs across the length and breadth of nations. It's the most omnipresent yet the most underutilized institution, especially when it comes to bridging logistics gap between providers and people. Time and again, Posts have proved to be an invaluable asset in carrying messages, themes, awareness, and products to the last mile and to the last person- an asset that no new technology can boast of even in the 5G and satellite communication generation.

India Posts has been a historical institution that employs more than 4 lakh people and boasts of more than 1.5 lakh post offices. It has witnessed the colonial era, the struggle of independence, the wounds of partition and the development of India as the fifth largest economy in the world. With countless savings schemes and agency services, India Posts has serviced the poorest of the poor, the most vulnerable, and those sections of society that were considered unreachable by modern means of communication. Today, India Posts incurs a loss of around 20,000 crore (rupees) every year, with questions being raised on the future of this magnanimous institution. In this paper, the author presents various ideas that can be implemented by Department of Posts in the domain of social services along with various self- sustaining financial models that can be built to alleviate the burden of the ongoing deficit. The author advocates for analysing social services not from the standards of economics, but from the economic benefits that are derived from a social development arc. The author has used global case studies of successful postal best practices that can be emulated by India Posts and which have the potential to become flag bearers for the postal department in the coming future.

Keywords

Posts, Social Service, Models, Development, Logistics.

Introduction

Universal Postal Union (UPU) defines postal social services as 'services that are explicitly designed to convey direct benefits to society, and that are implemented regularly and reliably and are broadly accessible' (Universal Postal Union, 2021). The objectives of these services include reducing inequality, poverty; catering to the vulnerable and the ageing population; offering educational, health and employment benefits and making government services accessible to the farthest and the furthest. According to S. Eckert, "Postal offices figure among the oldest institutions on a nation state's territory, they are historically among the biggest domestic employers, and they have often provided critical social services" (Eckert, 2017). Article 3 of the UPU Convention states that all users/customers should have access to "quality basic postal services at all points in their territory, at affordable prices" (Universal Postal Convention, n.d.).

Post's core business is letter and parcel and some social services are a by-product of this core business for example, connecting the remotest communities that are un-serviced by telecommunications hence bridging human relations and contact. Then there are other social services that are intentionally created by Posts to create a better ecosystem for social development. For example, in India, various savings schemes like Kisan Vikas Patra, Sukanya Samriddhi Yojna, Senior Citizens Savings Scheme and others directly influence millions of people across the country. These social services possess intrinsic value that not only has the ability to advance social progress but also the capacity to generate revenue for Posts- an area that has a huge potential for expansion.

The Need for Postal Social Services

Social services are an obligation of the government and a virtue to be adopted by the private sector. These services improve the overall health of a community and the nation by adding onto the economic and sustainable development models, ushering in a comprehensive advancement of the society as a whole. Social services are aimed at minimizing deprivation and providing equal opportunities to all sections of the society, thus fostering better education, health, employment, growth and fraternity amongst citizens, which in-turn add onto the GDP and per capita income of the country. The need and potential for postal social services hence, are justified and are enumerated below:

1. **Recognition of Target Population:** Postal social services have the capacity to provide multitude of benefits not only to the society but to the

institution of posts. Social service schemes can be strategized and adopted for target populations to deliver specific products and services in a self-sustaining model. Every Posts and the particular demography it serves is distinctive and no fixed template of a universal social development model can be provided for all nations and all communities. But this uniqueness aids in creating specialized designs that can service key user groups and can sustain and prosper in specific niches.

2. **Recognition of Benefits:** Postal social services dispense various advantages by creating value for development actors, generating revenue for Posts and by enhancing social capital and social progress. Posts offer extensive physical, digital and social infrastructure that function as entry points for the citizenry to access social services. In a technologically driven era where disruptive innovations are wiping out classic institutions, these benefits hold ultimate significance for the future of a historical institution like Posts.

3. **Assessing Existing Capacity:** Posts have an existing historical capacity in the form of its services, products, partnerships, competency and physical assets that can be reviewed and recalibrated to offer new social services. This recalibration must not be treated as mere fixation or improvement but as a fundamental necessity to close the existing gaps to create profit generating and efficient services with a social compass.

4. **Retaining and Building Trust in Posts:** Historically, Posts has been used to dispense sensitive information, acting as a trusted agency for the public. In South Asian countries like India and Nepal, postmen have been reading out letters for the uneducated sections and an unsaid agreement for the privacy of the said information has been maintained. Even during modern times, majority of the rural sections in developing nations trust posts with their finances and savings more than banks. This historical legacy can be leveraged to provide social services that require trust, privacy and confidence like distributing social payments and working with the vulnerable sections.

5. **Last Mile Connectivity:** A greater part of the world is still untouched by modern communication and in such areas, Posts provides connectivity and reaches not only to the public but also to the service delivering agencies. Posts, all across the globe and especially in India, have established themselves as trusted government agents at the grass root level and their

postmen have become the flag bearers of 'barefoot service delivery'. The wide network of the post offices and the sheer number of staff provide an incomparable edge to the Department of Post in executing any scheme at the grass root level like 'har ghar tiranga campaign' or the *'postcard campaign to commemorate 75 years of independence.'* Be it the world's highest post office at Hikkim, Himachal Pradesh or the one of its kind 'floating post office' in Dal Lake, Srinagar; India Posts has its reach in places that other agencies be it private or government can only aspire to have. In isolated communities, mail carriers provide the only link for social connection to the residents and this legacy of posts can be utilized to cement the core schemes and themes of the government in such areas that have been left unattended due to lack of other forms of logistics and connectivity.

6. **Recognition of Potential of Secured Information Delivery:** In the era of cybercrimes and network hacking that can render any information at risk, letters provide a conventional mode of transmission of sensitive information to areas of conflict, to and fro from the intelligence agencies and the people working at ground level. This secured transmission of sensitive data can aid in peace building mechanisms in sensitive zones like Naxalite hit areas of Jharkhand, border areas of Kashmir and Arunachal Pradesh and other areas with issues of internal security like Nagaland and Manipur. Such secured channel of information provides a route to dispense information and link the furthest and farthest citizenry without compromising on national security. Even the presence of a government agency like posts in a far-flung area can give its residents a sense of security, thus enabling productivity.

7. **Partnership with Technology:** In an era of e-commerce and m-commerce and an ever-increasing volume of parcels, the focus of posts needs to shift to regain its historical significance and to become an important component of the global digital economy. This new digital age has brought changes in consumption patterns of end users and by repositioning itself posts can rebrand its image and value. This association with the digital economy can then be leveraged to instill partnerships with key development players like government, NGOs, multilateral institutions and so on to generate socially responsible services and services under the umbrella of CSR.

UPU and Postal Social Services

1. **Istanbul World Postal Strategy:** UPU supports diversification of postal operations as a strategic response to the pace of technological and social change, and to generate additional revenue, increase competitiveness and remain relevant (Universal Postal Union n.d.).

Fig 1- Istanbul World Postal Strategy 2017-2020 (Page- 15)

2. **Abidjan Postal Strategy:** One of the four key areas of action outlined in the Abidjan Postal Strategy 2021–2025 is that the "governments should decrease gaps in postal development through increased investments and focused policies, and promote various ways to utilize the postal network for socio economic development" (Universal Postal Union n.d.).

3. Postal social services questionnaire completed by UPU member countries between December 2019 and February 2020.

   A questionnaire was prepared by UPU with qualitative questions about the provision of social services with a broad pre-incorporated definition of 'postal social services' without an exclusive list of said services. 113 UPU

members took part in the survey and a data base was created regarding the present status of social services provided by posts in all these countries.

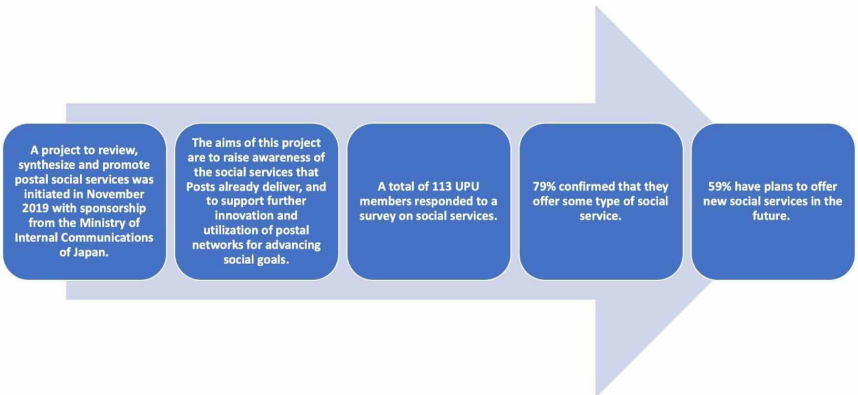

Fig 2- Results of the Postal social services questionnaire completed by UPU member countries between December 2019 and February 2020.

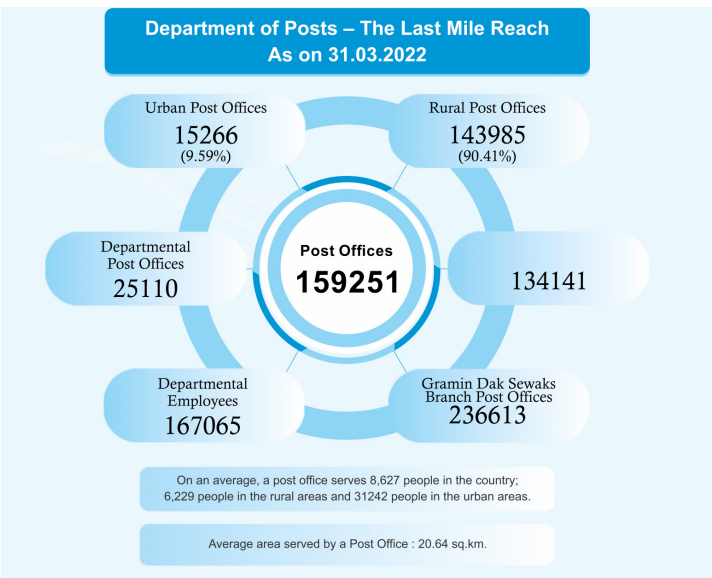

Fig 3- Overview of Indian Posts (India Post, 2023)

India Post: An Overview

With more than 159251 post offices, Department of Posts in India is the world's largest postal network. Its historical legacy can be traced back to 1727 when the first post office was established in what was then Calcutta, following which GPOs were established in the three presidency towns of Calcutta, Bombay and Madras

and the India Post Office Act of 1837,1854 and 1898 were enacted to bring about uniformity in postal operations. Communications is listed at Entry number 31 in List 1 of the Seventh Schedule of the Constitution of India, making it a Union subject and giving the Parliament exclusive powers to make laws on it. Recently, the Government has passed the new "Post Office Act of 2023" which came into effect from June 18, 2024 superseding the erstwhile "India Post Office Act of 1898".

The core activity of the postal department is the procession, transmission and delivery of mail and money remittance throughout the country. This core activity is supported by a diverse range of other services like insurance and banking.

The vision of the department is to make the products and services of India Posts the first choice for customers by sustaining the world's largest postal network, by providing services on value for money basis and with speed and reliability. The following mission of India Posts includes two very important aspects that sheds light on the social inclination and duties enshrined for the department (India Post, 2023):

- To continue to deliver social security services and to enable last mile connectivity as a Government of India platform
- To ensure that the employees are proud to be its main strength and serve its customers with a human touch.

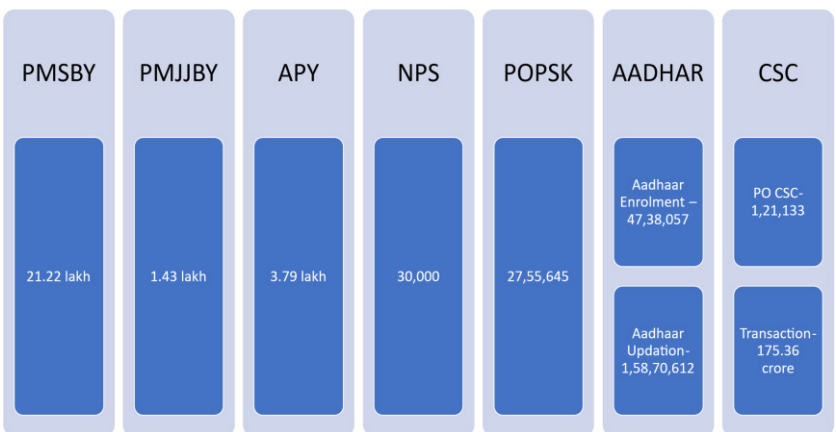

Fig 4- Success of various schemes of India Posts (India Post, 2023)

The new Act of 2023 intends to streamline the delivery of citizen-centric services and extend government benefits to the country's most distant areas, therefore improving the quality of life of its citizens (India Post, 2023). This mandate

narrates a clear message of the significance of the social service delivery domain of India Posts, thus highlighting the increasing reliability of the government on this department for its last mile service connectivity.

Till date, India Posts has successfully completed and is still undertaking a multitude of social service schemes panning across banking, insurance, pension disbursal, direct benefit transfer, railway reservation and more.

Global Best Practices of Posts in Social Service Delivery

1. **Logistics and Reverse Logistics:** This includes delivery and collection of medical materials to and from the public.

   During the COVID-19 pandemic the world saw innovation and revamping in various sectors that were better suited to deal with the emergency at hand. Countries across globe found newer ways of service delivery that would reduce the potential of exposure to the coronavirus, buying time for developing herd immunity in populations.

   Medical Supply Chain

   Australia implemented a next-day pharmacy home delivery service via its postal network for vulnerable citizens thus helping them stay at home.

   Posts in Costa Rica secured supply of handwash directly from the manufacturer and sold it to the public via a dedicated website. It also restricted the number of bottles per customer to two per month to control speculation, resale or hoarding. Thus, by regulating the sourcing, sale and delivery of the product, Posts was able to keep the prices low at a time when alcoholic handwashes were sold at rates much higher than their original price. They have also established a revenue generating door-step medicine delivery system that became so popular that private cars had to be rented out to increase the fleet of delivery vehicles.

   United States has established a process for clinics to offer a medicine mail- back service for their patients using their postal network which leads to safe disposal of expired, over-the-counter and unwanted drugs

   Reverse Logistics in Waste Recycling, Energy and Utilities

   Australian Posts collects larger items like cardboard, glass, plastic and others and delivers them to recycling centers that it has partnered with.

Benin Posts directly sells solar-powered products like solar energy LED lamps with restricted bulk purchase to prevent hoarding and resale. This facilitates easy public access to renewable and clean energy.

In Ireland, An Post has created a portal called Green Hub to aid the public in improving energy efficiency of their homes by providing information on clean energy, associated grants, low-cost finance options *via* Post and a one-stop service solution that assigns a local contractor to manage the entire home upgradation project. This has multiple social benefits like easing a complex process, improving sustainability and economics of a household by reducing electricity bills.

The Macao Post and Telecommunications Bureau has partnered with Environmental Protection Bureau, a local department and is providing boxes at designated post offices to collect batteries for recycling, which if disposed improperly can expose people to corrosive and toxic substances.

2. **Partnership with private players and NGOs:** In Norway, the Post partnered with a private grocery chain to enable same or next day doorstep deliveries. The customers place their orders *via* the webpage of the grocery chain which is then transmitted to the nearest supermarket, where employees prepare the orders and the Post collects and delivers the items to the public.

   China Post has partnered with various charitable organizations like China Foundation for Poverty Alleviation and China Women's Development Foundation, for 'Love Parcel' and 'Mother Parcel' initiatives. Citizens can donate funds through the postal outlets and then charitable institutions use these funds to curate specialized kits that will aid young and vulnerable mothers and school going kids. These parcels are then collected by China Post that has established dedicated warehouse units for the same and these kits are delivered across the country at universal service price. According to China Post, the Love Parcel project has collected 780 million yuan in donations and has supported more than 7.12 million students, covering 892 counties in 31 provinces (Universal Postal Union, 2021).

   In Netherlands, Post has partnered with a foundation to collect donated birthday presents and deliver them to children of low-income families.

   In Myanmar and Colombia, the Post collects books donated by public and then delivers them to public libraries free of charge to facilitate access to reading material and to promote literacy.

3. **Utilization of Postal Infrastructure:** Sensors have been mounted on postal infrastructure to collect data on various parameters like monitoring of physical condition of roads in France, air pollution levels in Belgium and collecting information on weather in Finland. Such data can be used by government and private safety actors to combat diseases and to ensure preventive steps. This data also possesses economic value as has been illustrated by La Poste's survey subsidiary group 'Geoptis'.

   In countries like Mauritius and UAE, health camps and blood donation drives are conducted in postal offices.

   Posts in Switzerland, Tanzania and Bhutan operate regional or national bus routes building on their ability and competence in managing a vehicle fleet.

4. **Community cohesion and inclusion:** In Japan, Watch Over service (Mimamori) was started in 2019 across 20,000 post offices wherein after charging a monthly fee of 2500 JPY, postal staff visit elderly people once a month to check on the well-being of its elderly population. Japan has a super-ageing society and this has presented its own unique set of problems like isolation, depression, loneliness and lack of support for the elderly. To overcome these issues, the post provides for these regular visits that can be booked by both the elderly and their families. A questionnaire is prepared and the answers are recorded and sent to the families electronically or via mail. Post has also added value to this service by issuing a monthly magazine on extra subscription basis that contains puzzles, exercises and other activities for the elderly.

   In France, cluster of services are being marketed especially customized for the elderly population that includes home visits by mail carriers (up to six times a week), home and garden maintenance and meal and medicine delivery.

Proposals for Augmentation of Social Service Delivery by India Posts

1. According to Statista Market Insights, the revenue in Over the Counter (OTC) pharmaceutical industry in India is estimated to reach USD27.47 bn by 2024 (Statista, 2024). These OTC products can be purchased without a prescription. This leads to hoarding of medicines and many of these drugs remain unused, get expired and are disposed off without proper precautions. India Posts can build upon its expertise in nationwide connectivity to offer mail back services of such unused medicines and products like saline bottles, syringes, insulin strips and others. By partnering with government and private hospitals,

pharmacies and NGOs, India Posts can establish a logistics chain that can deliver usable medicines to the needy and also help in proper disposal of the expired products. This can be built in a self-sustaining model that allows incentivization of customers and revenue generation for posts along with recycling and reuse of medicines. This will in turn cut down medical waste, healthcare costs and thus reduce the environmental burden of the healthcare sector of India.

2. India Posts can partner with pharmaceutical companies like Netmeds, PharmEasy and others for door-step delivery of medicines and other healthcare and sanitation related products. For this, Posts needs to strengthen its delivery data systems to improve upon its efficiency and information updation system. Such upgradation can lead to an increase in its brand value and can aid in augmenting customer satisfaction.

3. The serological testing market in India has been projected to grow at a CAGR of 16.1% reaching USD 813.6 million in 2030 (Fortune India Insights, 2020). This potential pool of market can be exploited by posts by establishing cold chain logistics that will allow collection of samples from patients and their delivery to test centres.

4. Multiple services if offered in the domain of public health will lead to collection of anonymized data that holds immense value for commercial health and insurance companies. Sale of such data will lead to revenue generation for the department and augment its resources.

5. Cold chains once established can be recalibrated and used in other sectors that rely on temperature sensitive logistics like industries dealing with fruits, dairy, beverages, frozen food and others. Such diversification in the product delivery can provide shelter against collapse of a particular sector thus, securing financial cushioning.

6. India Posts can mimic successful models of posts of Ireland, Macau, Australia and Benin and establish dedicated chains for recovery of recyclable materials. Building on its ubiquitous presence, postal department can establish special collection counters of recycled materials in its post offices. This can be started as a pilot project in select cities and if successful, this model can be expanded accordingly. With global warming and pollution reaching newer heights, sectors of renewable energy and recycling and reuse industries are bound to grow exponentially and India Posts must create a self-sustaining model that will support environmental sustainability for the country and financial sustainability for posts.

7. India Posts can create a one stop solution website or an app that will provide information on renewable energy in both English and vernacular languages. This app should have an easily navigable and user-friendly interface so that its use can be popularized even in the rural sections. This app will have a list of registered local contractors (on the lines of the GeM Portal) that specialize in services in the renewable energy domain. Also, the full list of government subsidies and schemes will be displayed, along with an overall cost benefit analysis of renewable services, to create awareness amongst the public of the incentives received when switching to clean energy. This can be created by teaming up with multiple partners like Ministry of Environment Forest and Climate Change, Universal Postal Union, UNFCCC and many other multilateral institutions that provide aid and incentives in the domain of green energy. The technological operations can be built in-house with the expertise of CEPT, Mysuru thus saving costs on outsourcing.

8. India Posts can partner with Non-governmental Organizations (NGOs) to create delivery networks that connect resource-rich fragments of society to resource- deficient sections thus enabling easy access to aid and reducing the loss of resources. A project can be developed where firstly high priority vulnerable sections of the society should be identified. The funds then can be collected *via* donation by public either at postal branches or electronically via the postal website. NGOs can then be brought in to create specially curated parcels for the targeted vulnerable sections of the society like "Amma Baba ki Potli" for elderly, "Paalna" for newborns, "Bacchon ke Baste" for school going kids and so on. These parcels can then be collected and re-distributed by posts using dedicated warehouse distribution centres for nationwide coverage.

9. According to Indian Textile Journal, in India more than 1 million tonnes of textiles are discarded every year, majority of which comes from household waste thus making it the third largest source of municipal solid waste (Falavia, 2021). To reduce these kinds of disparities (between tons of textile waste generation on one hand and lack of clean clothing on the other) posts can establish direct collection models where citizens can donate used clothes, books, bags and so on directly to postal branches. Post offices can establish small sections to collect such donations and local school going teens can be incentivised to volunteer every weekend for segregation and maintenance of the stock. Temporary counters can be opened fortnightly where students can help with the distribution. To incentivise students, schools should be encouraged to provide grace marks to inculcate in them the spirit of community service. Such kind of a multi-stakeholder model will work on a myriad of social issues

and help in the establishment of community cohesion and inclusion.

10. Postal infrastructure can be leased for mounting of different kinds of sensors aiding in collection of data on pollution (urban cities), cloud bursts (Himalayan and North Eastern States) thus helping agencies in prevention and control of pollutant related health issues and disasters, along with revenue generation for posts. These sensors can also be self-owned and as the data generated from these sensors have economic value, they can then be sold to respective agencies for monetary benefits.

11. Postal infrastructure can also be repurposed for public utilities on pay per use basis, like storing of luggage in unused warehouses, public use of postal broadband to support digital inclusion, leasing of parking spots and more. This will augment the government's efforts of asset repurpose and asset monetization.

12. As postal department has existed historically in the remotest of areas, they become the entry point for a citizen inside the domain of government services. Thus, postal infrastructure can be utilised to hold various events like medical health camps, blood donation camps and others, specifically in Left Wing Extremist and tribal areas as they have well-established trust and familiarity with the local population. In the rural areas, postal buildings can be provided to Gram Panchayats and Self-help groups on availability basis in exchange of minimal fees. For comparison, out of 2.48 lakhs Gram panchayats in India, more than 52000 do not have a building and in four of the states, this figure stands at 40% (Dubbudu , 2018). Postal offices in remote areas can also be used as community focal points for organization of cultural events like filmscreening, puppet shows, katha kahani and others to induce harmony, patriotism and social awareness.

13. A new GPS enabled village map app can be developed by India Posts that will collect data for infrastructure mapping of villages like ponds, sewers, canals and others and which can further be linked with MGNREGA. The app must be enabled to take inputs from public (in terms of grievances supported by picture proofs) that can help in real-time monitoring of rural assets. In order to eliminate costs of outsourcing, postal department should take adequate steps to strengthen in-house technological units like CEPT, Mysuru.

14. According to secondary data based on a study conducted by Longitudinal Ageing Study in India (LASI) in 2017-18, 20.5% of adults aged 45 years and above reported moderate loneliness and 13.4% reported frequent loneliness

(Srivastava & Srivastava 2023). According to National Statistical Office (NSO)'s Elderly in India 2021 Report, India's elderly population is set to rise 41% over the next decade and hence these issues of lonesomeness and solitude are going to increase manifolds (Mishra, 2023). Most of the youth from rural and urban areas are migrating to other states and countries for job opportunities, leaving their parents and grandparents in their native towns and villages. To counter this problem, India Posts can provide a Watch Over Service for the elderly on a monthly subscription model that can be subscribed by both the elderly and their families. Using the postal staff capacity of more than 4 lakh employees, India Posts can provide services like – subscription-based visits, delivery of food and medicine, home and garden maintenance along with access to government services like Aadhaar enabled Payment Services (AEPS), Aadhaar updation and so on. The status of the visits can then be updated with picture proofs to the families bringing them peace of mind and the commission thus generated can be apportioned to the specialized staff as incentive.

15. Mail carriers work at the ground level and are well-versed with the local population. Hence, they can be trained to act as specialized information conduits for delivery of information like school drop outs, child labour, child marriage and domestic violence to the block, sub-divisional and district administration. Department of Women and Child Development in cooperation with India Post has launched a one of its kind project called 'Rakshadoot' that aims to facilitate the filing of complaints of domestic violence by women and children. Both the victims of domestic abuse and their representatives can visit their nearest post-office and say the code "Thapal" to the postal staff. The postmaster/mistress will then help them write their full address on a white paper and put it in the letter box without any stamp and without further questions. This can also be done without informing the postmaster by posting the letter anonymously with the code 'Thapal', only with the address of the victim. These letters are then scanned and sent to the Department of Women and Child Development, for further action. Projects like 'Rakshadoot' that ease the filing of complaints of social crimes faced by the supressed and vulnerable sections of the society can be replicated across ministries and crimes like sexual abuse, dowry, untouchability, child labour and more can be brought under its umbrella. The component of anonymity against the societal prejudice of shame and the fear of the abuser are tackled effectively in such a set up thus empowering victims and guaranteeing their safety. Various departments can be brought under a single project that will give impetus to the broader vision of easy, accessible and faceless registry of complaints. In Left wing extremist and border areas,

specialized training can be provided to mail carriers by onboarding Ministry of Home Affairs for sensitive information collection which will strengthen the intelligence of our forces, advancing India's strategic interests.

16. Philately, the collection and study of postage stamps, is of considerable importance in India, offering a unique lens through which the country's rich cultural and historical tapestry can be explored and through which awareness for various social issues can be generated. Government is trying to re-introduce philately as a hobby for the younger generation with various initiatives like letter writing competitions on mygov.in or by organizing National Philatelic Exhibition- AmritPex 2023 in New Delhi. This exhibition saw a footfall of 25,000 students, stamp lovers and tourists from across India thus indicating the potential of revival of this lost hobby as a 'digital detox'. In this technologically driven era of social media and influencers, where young kids are becoming increasingly susceptible to 'scrolling reels' and having shorter concentration span, philately can be used to bring back interests in hobbies that involve the sensory and motor systems using the tangible rather than being lost in a digital loop. Such small changes in daily habits can improve mental balance, intelligence, concentration and emotional quotient of the younger populace. India Posts had also organized "75 Lakh Postcard Campaign to PM" as a part of the Azadi ka Amrit Mahotsav celebrations. It was estimated that around 75 Lakh postcards would be sent but eventually 1.37 crore postcards were received from across India. These postcards can now be re-sent back to the students with a signed note from the Prime minister and a stamp as a gift, further encouraging these young kids to pursue philately as a hobby.

Conclusion

The need for India Posts to enhance its role as a social service provider is critical as this not only provides the opportunity to the department to advance social development but also garners benefits for posts in terms of revenue generation, engagement with multiple stakeholders, revival of brand and augmentation of customer base. An important question to address is whether India Posts has the capacity to implement new services using existing resources and if not, then can the existent gaps be met *via* innovation and training. For any project to be undertaken size, competition and value of the market should be researched along with setup and operational costs followed by the launch of pilot projects. These pilot projects must have policy inputs and policy evaluation systems in-built for better monitoring. Any new social scheme should be incorporated only after taking inputs from postal staff since they are the points of contact and delivery and without their consent and co-operation, such projects become ineffectual. India Post has

had a unique standing in the Indian society as a historic social service deliverer and just like the Armed Forces and Police, India Post too should be viewed and analysed from the perspective of social cost benefit while incorporating provisions of financial value. The "Human Wide Area Network" capacity of India Post should thus be leveraged to provide socio-economic benefits to the Indian Citizenry and guide the country to Mahatma Gandhi's ideals of S*arvodaya*.

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Author's Profile

Ms. Taruni Pandey is an officer of the Indian Post & Telecommunication Accounts and Finance Service (IP&TAFS), 2022 batch, presently serving as Assistant Chief Accounts Officer (ACAO) at the National Communications Academy – Finance (NCA-F), Ghitorni, New Delhi. In her current role, she is actively engaged in capacity building, policy documentation, and training initiatives related to telecom finance, ICT regulation, public procurement, and digital governance.

She is the co-author of the book titled "A Practical Guide to Writing ITU Contributions," which was unveiled by Member (Finance), Department of Telecommunications and published by NCA-F. The guide was launched during the Workshop on "AI Standards for Increasing the Efficiency of Telecommunications and ICTs", held in collaboration with the ITU Local Area Office for South Asia. The workshop witnessed participation from senior officials of ITU Headquarters, Geneva, and delegates from BIMSTEC countries, among others. The book aims to introduce officers and stakeholders to the structure and processes of the International Telecommunication Union (ITU) and to encourage effective contribution writing in global standardization efforts.

Her work reflects a strong interest in the intersections of governance, international ICT standards, financial reform, and institutional innovation in the telecom and digital sectors.

5.4 Gender and Technology: Is This Creating a New Glass Ceiling?

Ms. Sayari Sil

Abstract

The concept of the "glass ceiling" traditionally highlights the invisible yet formidable barriers that prevent women from reaching leadership roles despite equal qualifications. In the digital era, this ceiling is further reinforced by a new structural barrier—the gender digital divide. This article explores how unequal access to digital technology, digital literacy, and socio-cultural constraints are deepening gender disparities in India. Despite the progress made by women in various fields, where their representation is growing in relation to the national average, the broader picture remains concerning. Only 33% of Indian women use the internet, with rural women facing even starker exclusion. This divide limits women's ability to access education, healthcare, financial services, government welfare, and employment—thereby exacerbating social and economic inequalities. Drawing from real-world case studies, national surveys, and global reports, the paper underscores how digital exclusion perpetuates economic dependency and limits women's participation in the knowledge economy. It advocates for inclusive, vernacular, and affordable technological solutions, combined with digital skilling and gender-sensitive policy frameworks, to dismantle this evolving digital glass ceiling and ensure equitable digital empowerment for women across India.

Keywords

Gender Digital Divide, Glass Ceiling, Women Empowerment, Digital Literacy, Socio-cultural Barriers, STEM Education, Digital Economy, Financial Inclusion, Women Entrepreneurship, Language Accessibility, Digital India Mission, Digital Exclusion, Internet Penetration, Tech Gender Gap, Smartphone Ownership, E-Governance Access, Digital Skilling, Social Norms, Online Education, Digital Financial Services, Artificial Intelligence Bias, Digital Infrastructure, Vernacular Content, Rural Connectivity, Digital Inequality, Digital Inclusion Policy

Glass Ceiling

Imagine a ceiling over you made of glass, transparent yet formidable. Such a ceiling has often been faced by women in formidable positions. It is the way in which

unfair attitudes and practices can prevent women, or other groups, from getting the best jobs in a particular area of work, an organization, etc., although there are no official laws or rules to prevent them getting these jobs. However, the picture has been a little different for the civil services when compared to corporate or business world. In this article, we will explore how the digital age is perpetuating the barriers for growth.

Digital Divide

It is the gap between people who have access to digital technology and those who don't. The scenario in India:

Internet Usage Gap: Only 33% of women in India have ever used the internet compared to 57% of men, according to the National Family Health Survey (NFHS- 2019-20).

Rural Disparity: The gap is even more pronounced in rural areas where men are twice as likely to use the internet than women.

Regional Comparison: India has one of the largest gender gaps in internet usage within the Asia-Pacific region.

Impact on Access: Factors like lower literacy rates, limited access to devices, and societal norms contribute to women's lower internet usage.

How the Digital Divide Thickens the Glass Ceiling

With the advent of Industrial Revolution 4.0, digital economy is witnessing growth at an unprecedented level. From online classes to remittances, digitization has engulfed the whole world. While this has innumerable benefits, the population on the other side of the coin is facing even more discrimination.

This paper examines how digital divide can be bridged by educating women, providing them access to (Information & communication technology) ICT & empowering them financially to pay their own bills, take their decisions & skill them in areas of their interest or choice. Digital divide is the new form of inequality in women's access to & participation in all communication systems, especially their insufficient contribution in nation building. This is exactly why Swami Vivekananda had exclaimed "There is no chance for the welfare of the world unless the condition of woman is improved. It is not possible for a bird to fly on only one wing. There is no hope for that family or country where there is no

estimation of women, where they live in sadness. For this reason, they have to be raised first."

Reasons for this Divide

1. **Access to Technology:** In 2023, 35% of adult women in India owned a smartphone, compared to 51% of adult men (NSSO, 2023). There is a gender gap of 16 percentage points. High costs of devices and internet services disproportionately impact women, who often have lower incomes than men (Telecom Regulatory Authority of India, 2023).

2. **Digital Skills and Literacy:** Studies like the National Family Health Survey, 2019 found that only around 33% of Indian women use the internet compared to 57% of men (NFHS, 2020). Stereotypes and biases discourage women from pursuing careers or education in STEM (Science, Technology, Engineering, and Mathematics) fields (National Family Health Survey, 2023).

3. **Socio-Cultural Barriers:** In some cultures, restrictions on women's mobility or societal norms limit their ability to access and use technology. Concerns about online harassment and safety deter women from fully engaging in digital spaces.

4. **Employment and Economic Opportunities:** The digital economy offers many opportunities, but the lack of digital access prevents women from benefiting equally. Women-owned businesses often struggle with online visibility and access to digital financial services.

5. **Representation in Tech Development:** In India, women make up about 30–36% of the tech workforce, which is still lower than the number of men in the industry. AI algorithms and digital platforms sometimes reflect gender biases, reinforcing existing inequalities (NASSCOM, 2023).

Impacts of the Gender Digital Divide in India

1. **Educational Barriers Leading to 'Feminisation of Unskilled Workforce'**

   Digital literacy is crucial for education, but many girls and women lack access to the internet and digital devices.

   > *Case Study:* During the COVID-19 pandemic, online learning became the norm. However, a UNICEF report highlighted that only 33% of women in India had access to the internet, leading to a high dropout rate among girls, especially in rural areas.

2. Perpetuating Economic Inequalities

The digital divide limits women's access to job opportunities, financial services, and entrepreneurship.

Case Study: In Uttar Pradesh, women working in self-help groups (SHGs) faced difficulties in accessing digital financial transactions due to a lack of mobile phones and digital literacy. This resulted in lower earnings and economic dependence (UN Women, 2022).

3. Reduced Accessibility to Digital Healthcare

Telemedicine and online health services have grown in India, but many women remain excluded due to lack of digital access.

Case Study: In Bihar, many pregnant women in rural areas could not access online consultations during the pandemic, leading to increased maternal health risks (World Health Organization, 2022).

4. Inclusion-Exclusion Error in Government Welfare Programs

Digital platforms are used for welfare schemes like PM Jan Dhan Yojana, PM-KISAN, and Direct Benefit Transfers (DBT). Women without digital access struggle to avail of these benefits.

Case Study: Many women in rural Rajasthan lacked smartphones, preventing them from directly receiving government subsidies or welfare benefits into their accounts.

5. Cyber Harassment and Cyberbullying

A lack of digital literacy makes women more vulnerable to cyberbullying, online fraud, and harassment.

Case Study: Recent case of deepfake videos of the actress Rashmika Mandana shook the nation. As a progressive nation, the actress has been made the brand ambassador of the Indian Cybercrime Coordination Centre.

It is indeed contradictory that while being a leader in knowledge economy with impressive presence in Software Development in Silicon Valley, Google Microsoft & other Multinational Companies, India is home to half the world's poor & illiterate people, most of whom are women.

The first Prime Minister Pandit Nehru said, "To awaken people, it is women who must awaken, once she is on the move, the family moves, the village moves and the nation moves".

Digital divide keeps a closed door for women limited to her home & health. ICT opens a window to the world outside where information flows to them freely without distortion or censoring and they become a part of access to information like their male counterparts. ICT creates a potent force for transforming social, economic & political life globally.

Digital divide leads to economic & social marginalization of the future generations, restricting opportunities for growth & diversification of the digital economy. Women in developing countries form the deepest part of the divide and being further removed from the information age, they will fall into an abyss. Therefore, the digital gap is of increasing concern. Without participation in information technology, women are left locked without the key to the charging globalized world of the 21st century.

A digitally equipped woman can use a smart phone, connect a laptop to a network, send an SMS, email.

- Use WhatsApp, Facebook, YouTube for showcasing her skills
- Banking through UPI Internet for financial independence.
- Access OTT platforms on TV for knowledge and entertainment.
- Upload her products on her page or website and promote entrepreneurship.

One of the main reasons of digital divide is the lack of knowledge of English and since it is the dominant language used in digital communication, the ones without much knowledge in the language are pushed further behind in the race for information.

Thus, encouraging widespread adoption of local language platforms can democratize access to digital tools making them more accessible to non-English speakers. India has developed the Bhashini App for this purpose to translate digital information in local Indian languages.

Bridging the affordability gap, *i.e.,* economically empowering those who fall in the financially weaker bracket is another way ahead. It is to be ensured that smart phones, internet connection and other devices become affordable & accessible to

the needy. Basically, those who can access the internet *versus* those who cannot, is not the only problem. Access is related to the availability & affordability of technology and its gadgets, there is an issue of relevance of technology to local communities. Unless they understand the power of connectivity for growth in socioeconomic areas, the digital divide will remain exacerbated. No content with poor understanding & skills will seem relevant and this will perpetuate the gap between the haves and the have nots. For the availability of quality digital literacy, percolation of information, skills and gadgets are the need of the hour. Thus, along with digital gender divide there is a rural urban divide also among lower income illiterate users in less developed countries.

Following Case Studies Illustrate Gender Digital Divide in the Indian Economy

"Gender and the Digital Divide Across Urban Slums of New Delhi, India: Cross-Sectional Study" (2020)

This study examines gender disparities in mobile phone ownership, internet access, and knowledge of SMS text messaging among residents of urban slums in New Delhi. The findings reveal that women are significantly less likely than men to own mobile phones or have internet access. Factors such as age, individual education, housing type, and the number of earning members in a household were identified as predictors of technology access.

"Gendered Space: The Digital Divide between Male and Female Users in Internet Public Access Sites" (2014)

This research explores the gender dynamics of digital access in public spaces over a decade in Austin, Texas. Through participant observations and interviews, the study found that male users outnumber female users in public internet access points. It also highlights differing perceptions of public access venues, with women associating libraries with books and family, while men associate them with technology.

"Towards Understanding the Gender Digital Divide: A Systematic Literature Review" (2021)

This comprehensive review analyses existing literature on the gender digital divide, focusing on differences in ICT access and use, as well as factors contributing to these disparities. The study reports that women often have lower access to, and

usage of ICTs compared to men, with variations across different regions and contexts.

Digital divide is an alarming global issue as it raises barriers to growth of economics & individuals. ICT is a crucial & critical aspect of modern life. Everyone uses technology for different reasons whether for growth of nations as a whole or individuals, businesses governments, civil societies or NGOs. Technology is the driver of business efficiency & global economy. It helps governments to deliver welfare services, protect borders, empower citizens and boost their quality of life.

It enhances 4 C's–

- Communication
- Collaboration
- Cooperative movements
- Collective emancipation

Currently, around 48.7% of rural men & 24.6% of rural women only are privileged to access the internet. Around 38% of households are considered digitally literate, highlighting a gap between urban & rural internet access.

According to ITU Report 2019– 48% of female population was using internet globally compared to 55% of population.

In developing countries, internet use was –

- 40% - Women
- 49% - Men

The inequalities in actual use can hinder women's social & economic development opportunities (Hafkin & Huyer, 2007).

Studies in India have eported significant access differences (Bala & Singhal, 2018). Gender divide in India – a case of interregional analysis of Uttar Pradesh (Bala & Singhal, 2018).

There is gender digital divide in accessing & using ICT. There are gender disparities in ICT access time & use purpose too. Men use these for entertainment purposes, women use these for education.

In India, the most important factor in social norms is the family member's approval of the women to undertake access & usage (Bala & Singhal, 2018). Because of heavy burden of household and family responsibilities, women who are married and have children have very little free time to experiment with new technologies (Antonio & Tuffley, 2014).

Gender expectations make it difficult for women to develop the skills with device use of technology. Education & income play an important role in the adoption of technology by individual. Having a low income & education prevents women from having & using ICT. 2/3rd of world's illiterate population is women & access to education is still a great barrier to women than men (Antonio & Tuffley, 2014). (Alozie & Akpan Obong, 2017), women are disadvantaged only to the extent they have less education low income & higher level of domesticity.

In a study done by Surik & Sharma (2023) in understanding Digital Gender Divide in J&K UT, they have found following challenges –

- Cultural norms & gender stereotypes
- Overprotective nature of family members
- Poor financial conditions
- Technophobia
- Poor connectivity
- Hostile online environment
- Sociocultural factors.

According to NSSO data, only 24% rural Indian households have access to the internet compared to 66% penetration in cities.

Further 14% of rural citizens actively use the internet in contrast to 59% of urban adoption. The disparity is because of inadequate network, payment capacity & ability to understand English. There is a need for creating localized vernacular internet content.

Rural disconnect has severe implications to access for entitlements & opportunities. Only 27% of beneficiaries under Pradhan Mantri Kissan Niddhi Scheme receiving Direct Benefit transfer payments highlights gaps in financial inclusion out of which number of women are insignificant.

Many recruitments in companies are becoming online. With applications & assessments going digital, internet literacy has become a crucial determinant for gaining employment where women are largely left out.

Vernacular knowledge platforms like Vokal, Khabri, Niki.AI are spearheading access to voice based research & content across various domains, catering to language diversity of rural India.

Movements like the #meToo on social media, that highlighted sexual harassment faced by women at workplace, led to immense emancipation of women. India has conceptualized the The Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal) Act, 2013 to deal with this concern. In digital skilling, startups like Avantis & Skillveri impact job linked vocational training for rural women overcoming geographical barriers.

Only ICT combined with innovative ideas for skilling can unlock new lively opportunities and bridge the gender divide. Harnessing power of collaboration, communication & cooperation can bridge the gender divide. Innovation & inclusive technology combining affordable infrastructure assistance mechanism and rural hubs can harbinger change & herald a digital economy where women are empowered regardless of their geographical location. According to Internet & Mobile Association of India (IAMAI) & Kantar, an analytic firm, an estimated 665 million people in India *i.e.*, 45% of population do not access the internet as on February, 2024.

Even those who have limited access feel inadequate. “One would like to take small steps towards self-upgradation & upliftment” said one househelp who was interviewed. “I will always teach my daughter English & Computer so that she does not feel like an outlier but can join other children in their study on computer or use of phone”, said another. Lower income maids, older and belonging to lower castes, are on the wrong side of digital divide. This structural reality hits hardest perpetuating the social, economic & political disparities. There is a growing digital disparity faced by elderly, economically disadvantaged and people living in far flung rural areas. They are being left out and new barriers prevent them from crossing the growing gap – new glass ceiling for those who are willing to join the mainstream. Their struggle for equal access to technology further hinders their ability to use it effectively leaving them lagging behind in an ever evolving technology driven world. Thus, the internet gender gap accentuates the social divide thus exacerbating universal access divide. Those who have access to internet create relationships & social circles with people with shared interests,

thus improving their knowledge, skills & employment potential. Those without computer knowledge & internet facilities among women, are seen to be driven into huge growing barriers of accessibility, affordability & capabilities. Poor technological skills among girls are evident, with about 12% of women having infavourable social perceptions regarding internet use while 8% do not use as their families do not accept them.

The gender divide with regard to digital skills is also stand at only 30% of women knowing how to use the internet, to browse and find required information for their work (Google search), operate mobile for online financial transactions (UPI) and e-services like health (Aarogya Segu), education corner (e-NCERT) & many e-governance portals like UMANG.

Dissecting the digital divide further based on age group, educational qualification & employment status affect accessibility, affordability and use of internet. Many families have indicated that such comparison is fair as both are doing their best. It depends on family situation & priorities. Women love to multitask and thus, their digital skills can have a multiplier effect on the economic & social value to their work. If women know to navigate & assert themselves, highlighting emerging forms of collaboration life SEWA, Lijjat Papad, Embroidery sector etc. WhatsApp group to cooperatives to trade unions, it can lead to inclusive, equitable & sustainable development in India & the world at large. The other side of this engagement is to care for children. Older users need to be supported by civil society, government & other organizations at large.

Impact of digital innovations like Artificial Intelligence and Machine Learning on labor replacement make women more vulnerable due to gender equalities in labor market, underrepresentation in STEM & less wages for women.

As per UNWOMEN 2022, narrowing the digital divide would increase women's labor force participation which would improve their socio-economic wellbeing. A study by IMF revealed that equal participation of women in the workforce in Indian economy could boost GDP by over 27%.

Women entrepreneurship leads to women empowerment, though there are significant barriers to utilizing economic opportunites due to caste, religion, class and other new factors like digital divide. Access to social media opens new avenues and aids in expanding their client base, source orders & make payments. They can further collaborate to build solidarity with other small & micro enterprises. This may be better possible in urban rather than rural far-flung areas.

In case of women vendors & gendered technology in informal markets in Assam by (Borborah & Das, 2022), it was found that lack of access to digital technology was due to family responsibilities & societal norms where women are considered secondary within the household.

The Government of India led by Digital Communication Commission launched the Digital India Mission in 2015 to transform the country into a digitally empowered society and a knowledge-based economy. The National Digital Communication Policy aims to have new digital technologies to unlock productivity as well as reach the unserved & underserved markets catalyzing growth in new age jobs and universal coverage with widespread instruments of access & empowerment.

Three Missions are digitally connecting India –

- National Broadband
- BharatNet
- GramNet

Propel India –

- Training
- Reskill Manpower

Data protection, net neutrality, security to create Robust Digital Communication Network.

The USOF aims to reach the last mile & cover far flung hill & rural areas through Bharat Net, Gram Net initiatives. Sanchar Shakti Scheme aimed to help women learn to repair mobiles.

Recommendations

A more digitalized economy would refine public services such as education, health, childcare and safety, protection through insurance & social assistance digital infrastructure outreach research & development backed by appropriate women centric public policy. There is a need for customized, contextualized participatory & accountable process of policy formulation that local, social, economic situations are kept in mind along with structural sociocultural norms to shape labor & economic participation truly reflecting the voice of those who have historically been marginalized and were kept away from technological advancement including digitalization (Uma Rani et al. 2022).

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5.5 Policy and Regulatory Frameworks for Emerging Technologies in Spectrum

Shri P.S. Shekhawat

Abstract

Society's increasing use of radio-based technologies, and the tremendous opportunities for social development that these technologies provide, highlight the importance of radio-frequency spectrum and national spectrum management processes.

Technological progress has continually opened doors to a variety of new spectrum applications that have spurred greater interest in, and demand for, the limited spectrum resource. Increased demand requires that spectrum be used efficiently and that effective spectrum management processes be implemented.

This paper outlines the shift in the spectrum management framework to cater the needs of emerging technologies demands and the challenges associated with. The paper also highlights the Telecommunications Act, 2023 as a case example and highlights various innovative steps taken by the Government of India.

Keywords

Radio Frequency Spectrum, Spectrum Management (SM) Process, International Telecommunication union (ITU), Radiocommunication Bureau (BR), Radio Frequency interference (RFI), Internet of Things (IoT)

Introduction

Overview of Spectrum Management

The Radio Frequency (RF) spectrum is a finite and indispensable natural resource that caters to the vast array of wireless communication technologies. Ranging from 3 Hz - 300 GHz, this portion of Electromagnetic Spectrum is responsible and facilitates transmission of wireless traffic over platforms, like Mobile Phones, Satellite Communication, Wi-Fi, Broadcasting services etc. The ability of any country to take full advantage of the spectrum resource depends heavily on efficient spectrum management that facilitate the coexistence of radio systems and ensure minimum interference.

The Finite but non-tangible nature of Radio Frequency Spectrum

Unlike tangible resources like water or minerals, the Radio Frequency Spectrum does not get depleted through use. But its capacity is limited due to the chances for RF interference leading to degradation or disruption of services. At any given time and location, only a limited number of signal transmission is possible without causing any unwanted and disruptive overlap called as signal interference. This exclusivity requires careful and meticulous RF Spectrum Management to make sure that many Radio Communication Services (RCS) can exist without service degradation.

RF Spectrum's Pivotal Role in Wireless Communications

The Radio Frequency spectrum is considered as the foundation of all wireless services, which allows a plethora of services that drive economic growth, social development and innovation. It is essential for crucial application such as Wireless Broadband, FM/AM Broadcasting, Non-Terrestrial Communication, and Emergency Services etc .

With the demand for services which uses wireless Connectivity increases , with the proliferation of Internet of Things (IoT), 5G etc. the utilization of RF spectrum becomes more crucial than ever.

Evolution of Spectrum Management

The evolution of spectrum management has been a very dynamic journey, moving from a very centralized and rigid approach to a flexible and market driven approach. This transformation has been supported by the advancement in technologies and the growing demands for wireless services.

Historical Perspective: From Command/Control to Market-Driven approach

Historically, spectrum management was majorly a command & control approach, where governments/ administrations were the custodian of RF Spectrum and assigned frequencies for a particular service or user. These approaches, although ensured order wise allocation, but led to several inefficiencies, because it lacked flexibility and adaptability with changing technological developments.

Recognizing these limitations, countries started moving towards a more market driven approach by 1990s. These market driven approaches introduced new mechanisms like spectrum auctions, allowing market forces to determine the policies and pricing of radio spectrum resources. This approach led to increase in

efficiency, encourage market competition and innovation.

Technological Drivers: Influencing Spectrum Policies

The rapid technological development and advancements in wireless technologies led to significant factor in defining policies for spectrum management:

- *Mobile Broadband:* The proliferation in use of mobile broadband services exponentially increased the demand for RF Spectrum. The deployment of 5G networks, requires access to a wider range of bandwidth to deliver the enhanced data speeds and connectivity.

- *Satellite Communications:* The emergence of the satellite technologies, especially in LEO constellations has demanded a new dimension to Spectrum Management. These systems require regulatory frameworks which can accommodate the unique requirements of satellite communications, considering international coordination and interference management.

- *Internet of Things (IoT):* The emergence of IoT ecosystem, having lakhs of devices interconnected, demands spectrum policies which support diverse applications which require different bandwidths and different latency requirements. This has mandated to the explorations of delicensed and shared spectrum approaches to facilitate the IoT deployments.

Current Trends: Adaptive Spectrum Access approach

To address the ever-growing demands of modern wireless communications, spectrum management approaches have to be dynamic, adaptive and based on flexible access models

- *Adaptive Spectrum Access:* ASA allows for real-time adjustment of spectrum use, enabling a very efficient utilization by allowing secondary users to access underutilized frequencies /bands without causing harmful interference to primary users. These approaches are particularly beneficial in scenarios where spectrum demand is not static but fluctuates over time.

- *Spectrum Sharing:* The radio spectrum is under increasing pressure for both the introduction of new, and expansion of existing services. At the same time, current users should be provided an appropriate level of protection from interference in an environment where increased spectrum sharing is inevitable. Innovative sharing models, which user tiered access

frameworks balances the needs of incumbent users with those of new entrants. These models are very efficient in promoting a more efficient spectrum use.

- *Technology-independent Licensing:* Spectrum Regulators are moving towards technology-neutral policies that can allow licensees to use any technology within their assigned RF spectrum. This encourages innovation and allows operators to adapt to the advancement in technologies without regulatory challenges.
- *AI/Blockchain based Spectrum Management:* Emerging technological frameworks like AI / Blockchain based Spectrum Management propose utilizing blockchain technology to create a very decentralized, secure and transparent spectrum management systems. These systems aim for a very dynamic spectrum trading and real-time allocation, enhancing the overall spectrum efficiency.

Emergence of New Technologies

Emerging technologies such as 5G, IoT, and AI are revolutionizing the telecommunications landscape, necessitating evolved regulatory approaches to ensure efficient, equitable and secure spectrum management.

IMT 2020: Transforming Connectivity and reshaping Spectrum Demands

IMT 2020 or 5G represents the fifth generation of mobile cellular network technology, offering higher data speeds, with ultra-low latency, and offering capacity to connect millions of devices simultaneously. These advancements have led to applications like telemedicine, remote surgeries, driverless vehicles, Augmented Reality/Mixed Reality/Extended Reality experiences. However, 5G's reliance on higher frequency bands, like millimetre waves brings in challenges in Spectrum management and interference management. Regulators are hence compelled to use flexible licensing approaches like adaptive spectrum sharing, to accommodate the diverse requirements of 5G services.

IoT: Managing Massive Device Connectivity

The Internet of Things (IoT) encompasses a huge network of millions of interconnected devices, from appliances being used in smart homes to sensor used for industrial purpose, all interacting over wireless medium. Some estimates suggest around 30 billion connected devices by the year 2025. As a result, the

demand for spectrum resources is exploding. IoT devices generally require low-power, wide- area network capabilities, necessitating regulatory frameworks which can support use of unlicensed spectrum and private network deployments. Additionally, the proliferation of IoT has also raised concerns about data security and privacy, compelling regulators to develop guidelines to address these issues while fostering innovation.

AI: Enhancing Spectrum Management and Regulatory Oversight

Artificial Intelligence (AI) is increasingly becoming integral for optimizing spectrum utilization and enhancing the regulatory processes. AI algorithms can analyse vast data to predict spectrum usage patterns, detect underutilisation, and can automate decision-making in real-time, improving spectrum utilization efficiency and reducing interference probabilities. Also, AI helps regulators in monitoring compliance and enforcing spectrum policies more effectively. However, the deployment of AI also poses ethical considerations, algorithmic transparency, and accountability, which regulators must have to address to ensure fair and responsible use.

Regulatory Challenges in Spectrum Management for Emerging Technologies

The rapid advancement of emerging technologies such as the Internet of Things (IoT), and Artificial Intelligence (AI) has introduced complex regulatory challenges in spectrum management. These technologies demand innovative approaches to ensure equitable, efficient, and interference-free utilization of the radio frequency spectrum. The Regulatory Challenges in RF Spectrum Management for Emerging Technologies can be summarised as below:

Interference Management

As the number of inter-connected devices increases, especially with IoT proliferation, the risk of interference among these devices generally operating in overlapping frequency bands escalates many folds. Traditional spectrum management approaches, which often are static allocations, do not accommodate the dynamic nature of modern wireless communications.

Regulators must develop adaptive strategies to mitigate interference, such as implementing adaptive spectrum access (ASA) and enforcing strict certification processes for devices operating in unlicensed bands.

Spectrum Scarcity and Allocation

The finite nature of the radio frequency spectrum, coupled with the expanding demand from 5G, satellite systems, and IoT, has intensified competition for spectrum resources. Allocating spectrum efficiently requires the balancing in the needs of various stakeholders, including Telecom network operators, satellite services providers, and private enterprises.

Regulatory Fragmentation

Divergent regulatory frameworks across various regions may lead to inefficiencies and obstruct the seamless deployment of emerging technologies like 5G. For instance, varying electromagnetic field (EMF) exposure limits and different certification standards across regions and administrations can complicate international operations. Harmonizing the regulations, for example as seen with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines, is essential to facilitate global interoperability.

Economic Sustainability and Investment

The high costs associated with spectrum acquisition, including auction fees and spectrum charges, can hamper the investment in infrastructure development. Operators may face challenges in achieving a positive return on the investment, especially when revenue from traditional services declines. Regulatory bodies must consider the economic implications of spectrum pricing and explore models that promote sustainable growth while ensuring fair competition.

Technological Neutrality and Flexibility

Emerging technologies often require flexible spectrum management approaches that are not tied to specific technologies. Implementing technology-neutral policies allows the accommodation of various innovations without necessitating frequent regulatory changes. Additionally, promoting spectrum sharing and trading can enhance spectrum utilization efficiency.

Public and Private Sector Coordination

The deployment of private 5G networks for industrial applications requires coordination between public regulators and private entities. While private networks can offer specific customized solutions for sectors like manufacturing and healthcare, they may also impact the performance of public networks. Regulators must balance the interests of various stakeholders to ensure equitable access and

prevent monopolistic practices.

Strategies for Addressing Regulatory Challenges

Addressing the regulatory challenges in spectrum management for emerging technologies necessitates a multifaceted approach that balances innovation, competition, and public interest. By adopting flexible, harmonized, and forward-thinking policies, regulators can create an environment conducive to the growth and development of next-generation wireless technologies.

- *Implementing Adaptive Spectrum Access (ASA):* Allowing real-time spectrum allocation can enhance efficiency and reduce interference.
- *Harmonizing Global Standards:* Collaborating with international bodies to establish consistent and stable regulations can facilitate cross-border operations.
- *Adopting Technology-Neutral Policies:* Allowing flexibility in spectrum usage supports innovation and accommodates diverse technologies.
- *Encouraging Spectrum Sharing:* Developing regulatory frameworks for spectrum sharing can optimize utilization and reduce congestion.
- *Enhancing Stakeholder Engagement:* Regulators must Involve industry players in the regulatory process to ensure that the policies are well-informed and balanced with the needs of stakeholders.

Case Study: The Telecommunications Act, 2023

The Telecommunications Act, 2023 marks a transformative shift in India's telecom landscape, introducing new provisions that addresses challenges posed by emerging technologies and the finite nature of RF spectrum resource. Below is a detailed evaluation of The Telecommunications Act's provisions concerning spectrum management and their alignment with the needs of emerging technologies.

1. Spectrum Management Provisions

Technologically Neutral Spectrum Utilization

The Act empowers the government to allow spectrum utilization in a more flexible, technologically neutral manner. This approach allows for the deployment of diverse technologies—such as 5G, Internet of Things (IoT), Artificial Intelligence (AI), and satellite communications— without being

constrained by legacy allocations. This flexibility is critical for accommodating the rapid evolution in communication technologies.

Secondary Assignment, Sharing, Leasing and Trading

To optimize the use of scarce spectrum resources, the Act provides a legal framework for:

- Secondary Assignment: Allowing the reassignment of spectrum among operators.
- Trading and Sharing facilitates spectrum users to share or trade spectrum, promoting efficient utilization.
- Leasing and Surrender: allowing leasing of spectrum and its surrender when not in use.

These provisions of the Act allow to enhance spectrum efficiency and adaptability in response to changing technological demands.

Administrative Allocation for Satellite Communications

In a significant policy shift from recent practices of market driven auction models , the Act permits the administrative allocation of spectrum for the use of satellite broadband services. This approach synchronises with the ongoing global practice and is expected to expedite the deployment of satellite-based internet services, particularly in under-served and remote/rural areas.

2. Provisions for Emerging Technologies

Regulatory Sandboxes and Test Beds

The Act introduces provisions for establishing regulatory sandboxes and test beds. These measures allow for the experimentation and testing of new technologies and business models under a controlled real time regulatory environment. Such initiatives are crucial for promoting and encouraging innovation and facilitating introduction of emerging technologies into the market.

Provisions to Support for Research and Development

The Act broadens the scope of the Universal Service Obligation Fund (USOF), now termed the "Digital Bharat Nidhi," (DBN) to include funding for research

and development (R&D) in the field of telecommunications. This specific provision aims to encourage innovation and the development of homegrown indigenous technologies, supporting the growth in the sectors like 6G, cloud computing, and AI- driven communication systems.

3. Regulatory Enhancements

Unified Authorisation Framework

The Act consolidates various licenses and registrations into a single "authorisation" regime. This streamlined approach simplifies compliance for entities ranging from core telecom service providers to those operating radio equipment, thereby reducing regulatory complexity and promoting a more conducive environment for technological developments.

Empowerment of the Department of Telecommunications (DoT)

While the Act grants the DoT enhanced powers, including the ability to re-farm or harmonize RF spectrum, the Act has also led to discussions on the potential reduction in the independent regulatory authority of the Telecom Regulatory Authority of India (TRAI). The Balancing in the roles of the DoT and TRAI might be crucial in ensuring transparent and effective governance in the telecom sector.

In a nutshell, The Telecommunications Act, 2023 represents a forward-thinking approach to spectrum management and the integration of modern emerging technologies into India's telecom landscape. By introducing flexible spectrum policies, promoting innovation through R&D support, and aligning it with global standards, the Act provides for a robust foundation for the evaluation and growth of India's digital infrastructure.

Conclusion

In conclusion, as we navigate the complexities of emerging technologies, effective spectrum management becomes of paramount importance. By promoting adaptive and dynamic policies, investing in regulatory personnel capacity building, and engaging with diverse stakeholders, regulators can ensure that spectrum resources can be utilized efficiently and equitably. Continuous policy evaluation and international collaboration is very much essential in addressing the future challenges, fostering innovation, and safeguarding public interests in the evolving digital landscape.

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Shri P. S. Shekhawat, Deputy Wireless Advisor, is an IRRS Officer of 2010 batch. He joined Wireless Planning and Coordination Wing in 2011 after clearing Indian Engineering Services (IES) Examination. Since then, Shri Shekhawat has been posted as various establishment of monitoring establishments of WPC and WMO before moving to NCA -W as Deputy Director.

Shri Shekhawat has good experience of working and heading Monitoring Station units of WMS Punjab, WMS Rajasthan, WMS Gujarat and IMS Delhi.

Shri Shekhawat has participated in various ITU and APT meeting representing Indian delegation and is presently serving as chair of NATIONAL WORKING PARTY (NWP 1C).

5.6 Cyber Security in Network Infrastructure: Analysis of Vulnerabilities and Methods to Prevent Cyber Attacks

Shri Bhavesh Sharma

Abstract

Network infrastructure forms the backbone of modern communication and data processing. Consequently, its security is paramount. This paper analyses common vulnerabilities within network infrastructure that can be exploited by cyber-attacks ranging from hardware flaws to software configuration errors and human weaknesses. We then explore preventative methods spanning technical solutions, procedural guidelines and educational initiatives. Finally, we discuss the future scope of network infrastructure security, highlighting emerging threats and the importance of adaptive and proactive security measures.

Keywords

Cyber-attacks, Network Infrastructure, Vulnerabilities, Network Infrastructure Security

Introduction

In the 21st century, network infrastructure underpins virtually all aspects of modern life from personal communication and entertainment to critical infrastructure like power grids and healthcare systems. As networks become more complex and interwoven, the attack surface available to malicious actors expands. Cyber-attacks targeting network infrastructure can result in significant financial losses, data breaches, disruptions in essential services and even threats to national security. Therefore, a comprehensive understanding of network vulnerabilities and effective prevention strategies is crucial for maintaining a secure and resilient digital environment.

Common Vulnerabilities in Network Infrastructure

Network infrastructure encompasses a wide range of components including,

Hardware Devices

Routers, switches, firewalls, servers and endpoint devices.

Software Systems

Operating systems, network management systems and security applications.

Communication Protocols

TCP/IP, DNS, HTTP and others.

Physical Infrastructure

Cabling, data centres and physical security measures.

Each of these areas presents potential vulnerabilities that can be exploited by attackers.

Some common vulnerabilities include,

Hardware Vulnerabilities

Firmware vulnerabilities in routers and switches are frequently targeted. Compromising these devices can allow attackers to intercept traffic, inject malicious code and gain control over the network.

For Example, Mirai Botnet attack that occurred in 2016.[1] In this attack, a large number of Internet of Things (IoT) devices including routers, cameras and other network equipment were compromised due to vulnerabilities in their firmware.

Software Vulnerabilities

Unpatched operating systems and applications are a persistent threat. Exploiting known vulnerabilities allows attackers to gain unauthorized access and execute arbitrary code.

For Example, WannaCry ransomware attack that occurred in May 2017.[2] This attack targeted vulnerabilities in Microsoft Windows operating systems specifically a flaw in the Server Message Block (SMB) protocol which had a known vulnerability in older versions of Windows.

Weak Passwords and Authentication

Default credentials, weak passwords, and lack of multi-factor authentication make it easier for attackers to breach systems.

[1]https://blog.cloudflare.com/inside-mirai-the-infamous-iot-botnet-a-retrospective-analysis
[2]https://www.fortinet.com/resources/cyberglossary/wannacry-ransomware-attack

For Example, Twitter hack which occurred in 2020[3]. This incident demonstrated how attackers exploited these weaknesses to gain unauthorized access to high-profile Twitter accounts including those of Elon Musk, Barack Obama and Joe Biden.

Misconfigured Firewalls and Access Control Lists (ACLs)

Improperly configured firewalls and ACLs can leave ports open and allow unauthorized access to sensitive resources.

For Example, Improperly configured firewalls and these vulnerabilities can lead to unauthorized access and compromise sensitive resources like Capital One data breach in 2019[4]. This breach exposed over 100 million customer records and was largely caused by misconfigured firewall rules that allowed an attacker to exploit vulnerabilities.

DNS Spoofing and Cache Poisoning

Attackers can manipulate DNS records to redirect traffic to malicious websites or intercept sensitive information.

For Example, Dyn DDoS attack which happened in 2016[5]. This was primarily a Distributed Denial of Service (DDoS) attack. It also involved DNS (Domain Name System) hijacking and manipulation which is a key technique for redirecting traffic to malicious websites or intercepting information.

Man-in-the-Middle (MITM) Attacks

Attackers can intercept communication between two parties to steal credentials or inject malicious content.

For Example, in 2014, Lenovo pre-installed a piece of software called Superfish on many of its laptops.[6] This software was intended to display personalized ads to users but it had a severe security flaw that allowed attackers to intercept encrypted communications (such as HTTPS traffic) steal sensitive information like login credentials and inject malicious content into webpages.

[3]https://www.theguardian.com/technology/2020/jul/15/twitter-elon-musk-joe-biden-hacked-bitcoin
[4]https://www.capitalone.com/digital/facts2019/
[5]https://www.theguardian.com/technology/2016/oct/26/ddos-attack-dyn-mirai-botnet
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Denial-of-Service (DoS) and Distributed Denial-of-Service (DDoS) Attacks

Overwhelming network resources with malicious traffic can disrupt services and prevent legitimate users from accessing them.

For Example, in October 2016, a massive Distributed Denial of Service (DDoS) attack targeted Dyn a major DNS service provider. The attack caused widespread disruptions to many popular websites including Twitter, Reddit, Spotify and Netflix. The attackers used an army of compromised Internet of Things (IoT) devices to generate malicious traffic and overwhelm Dyn's network resources making them unable to respond to legitimate requests.[7]

SQL Injection and Cross-Site Scripting (XSS)

These vulnerabilities in web applications can allow attackers to steal data, deface websites or compromise user accounts.

For Example, in 2017, Equifax one of the largest credit reporting agencies in the United States suffered a massive data breach that exposed the personal data of approximately 147 million people. The breach was a result of a vulnerability in Equifax's web application framework specifically a flaw in the Apache Struts software which was part of their web application infrastructure.[8]

Insider Threats

Malicious or negligent employees can compromise network security by stealing data, installing malware or misconfiguring systems.

For Example, in 2013, Target one of the largest retailers in the U.S. experienced a massive data breach that affected over 40 million credit and debit card accounts and 70 million customers' personal information. While the breach was largely external (carried out by cybercriminals). A malicious or negligent employee indirectly contributed to the breach by mishandling access credentials.[9]

Physical Security Weaknesses

Lack of physical security measures such as unsecured data centres or exposed cabling can allow attackers to gain access to physical network components.

[7]https://www.theguardian.com/technology/2016/oct/26/ddos-attack-dyn-mirai-botnet
[8]https://archive.epic.org/privacy/data-breach/equifax/
[9]https://medium.com/thedeephub/complete-case-study-target-data-breach-2-ba4bb365a82e

For Example, in 2014, one of the main ways that CryptoLocker ransomware spread was through physical access to servers in unsecured data centers leading to the deployment of ransomware on systems without proper authorization.[10]

Methods to Prevent Cyber Attacks

A multi-layered approach to security is essential for protecting network infrastructure. This approach includes technical controls, procedural guidelines and educational initiatives.

Technical Controls

Firewalls and Intrusion Detection/Prevention Systems (IDS/IPS)

Monitor network traffic for malicious activity and block or alert on suspicious events. Next-generation firewalls (NGFWs) incorporate application awareness and advanced threat intelligence to provide more comprehensive protection.

For Example, Cisco Firepower combines a Next-Generation Firewall with an Intrusion Prevention System (IPS) to monitor and block malicious traffic in real time. For instance, hospitals use Cisco's Snort IPS to detect and block attack patterns or generate alerts, protecting critical systems like electronic health records (EHR). This continuous monitoring helps prevent unauthorized access to sensitive patient data, ensuring security and privacy.

Virtual Private Networks (VPNs)

Encrypt network traffic to protect data in transit and provide secure remote access.

For Example, NordVPN secures remote access by encrypting internet traffic with AES-256 encryption keeping online communications private. It's commonly used by small businesses and freelancers to protect data while working remotely or on public Wi-Fi. A freelancer might use NordVPN to safeguard sensitive client information when working from a coffee shop or traveling.[11]

Access Control Lists (ACLs)

Restrict network access based on source IP address, destination IP address, port number and protocol.

[10]https://www.proofpoint.com/us/threat-reference/cryptolocker
[11]https://nordvpn.com/

For Example, In AWS (Amazon Web Services) Security Groups manage traffic to EC2 (Amazon Elastic Compute Cloud) instances by setting rules based on IP ranges, ports and protocols. Customers use them to control access to critical resources, like databases. A financial company might restrict database access to authorized IPs such as those from its corporate office to protect sensitive data.

Authentication and Authorization Mechanisms

Implement strong authentication methods such as multi-factor authentication (MFA) to verify user identities. Use role-based access control (RBAC) to restrict access to resources based on user roles.

For Example, Microsoft Azure AD (now Microsoft Entra ID) offers multi-factor authentication (MFA) to enhance user verification through multiple forms of authentication like passwords and fingerprint scans or SMS codes. Companies use MFA to secure access to critical systems and cloud applications reducing the risk of unauthorized access. A tech company might require MFA to protect sensitive data stored on cloud platforms and reduce credential theft risk.

Vulnerability Scanning and Penetration Testing

Regularly scan networks and systems for vulnerabilities and conduct penetration tests to identify and exploit weaknesses.

For Example, Nessus is a popular vulnerability scanner that identifies security flaws, misconfigurations and unpatched software. Companies use it to scan for vulnerabilities like missing patches or misconfigurations that could be exploited by attackers. A tech startup might use Nessus to proactively patch vulnerabilities and prevent cybercriminals from exploiting them.[12]

Patch Management

Deploy security patches promptly to address known vulnerabilities in operating systems, applications and firmware. Automated patch management systems can help streamline this process.

For Example, Windows Server Update Services (WSUS) helps IT administrators manage Microsoft product updates across an enterprise network. Large organizations use WSUS to ensure systems receive critical security patches promptly minimizing vulnerabilities. A government agency

[12]https://www.techtarget.com/searchnetworking/definition/Nessus

may use WSUS to deploy updates to thousands of desktops and servers reducing the risk of security breaches.[13]

Security Information and Event Management (SIEM) Systems

Collect and analyze security logs from various sources to detect and respond to security incidents.

For Example, Splunk is a popular SIEM tool that analyzes security logs to detect and respond to incidents. Organizations use it to monitor real-time data and generate alerts for unusual behaviour like brute-force login attempts or data exfiltration. A financial institution might use Splunk to monitor login and transaction logs quickly identifying potential fraud and mitigating risks.[14]

Network Segmentation

Divide the network into smaller isolated segments to limit the impact of a security breach. This can be achieved using VLANs, firewalls or micro segmentation technologies.

For Example, Cisco's VLAN technology allows businesses to segment networks into isolated subnetworks controlling traffic and limiting access to critical resources. Enterprises use VLANs to separate sensitive data and infrastructure containing potential security breaches. A hospital might use VLANs to isolate medical devices from corporate IT reducing the risk of cyber-attacks and protecting sensitive medical data.

Data Loss Prevention (DLP) Solutions

Monitor network traffic and endpoint devices to prevent sensitive data from leaving the organization.

For Example, Symantec Data Loss Prevention (DLP) monitors network traffic, emails and endpoint devices to prevent unauthorized transmission of sensitive data. Companies use DLP to block the transfer of confidential information such as credit card numbers or intellectual property.[15]A law firm may use DLP to prevent sensitive legal documents from being sent to unauthorized recipients or uploaded to unapproved cloud services ensuring client privacy and regulatory compliance.

[13]https://learn.microsoft.com/en-us/windows-server/administration/windows-server-update-services/deploy/deploy-windows-server-update-services
[14]https://www.designgurus.io/answers/detail/what-is-the-splunk-siem-tool
[15]https://docs.broadcom.com/doc/data-loss-prevention-family-en

Endpoint Detection and Response (EDR)

Monitor endpoint devices for malicious activity, provide threat intelligence and enable incident response.

For Example, CrowdStrike Falcon is an Endpoint Detection and Response (EDR) solution that monitors endpoint devices for suspicious activity providing real-time threat intelligence and enabling quick incident response. Security teams use Falcon to detect and address threats like malware or unauthorized access. A corporate enterprise might deploy Falcon to protect its remote workforce from advanced cyber threats ensuring rapid detection and containment of potential attacks.[16]

Procedural Guidelines

Security Policies

Develop and enforce comprehensive security policies that address acceptable use password management, data protection and incident response.

For Example, Google has comprehensive security policies covering areas like acceptable use, password management, data protection and incident response. These policies include guidelines to prevent unauthorized access, malicious content downloads and unauthorized data sharing. Google requires two-factor authentication (2FA) and strong passwords for all employees ensures sensitive data is encrypted and restricts access to authorized personnel. The company also has clear procedures for detecting and responding to security incidents outlining roles and mitigation steps to reduce risks.

Incident Response Plan

Create a detailed incident response plan that outlines the steps to be taken in the event of a security breach. This plan should include roles and responsibilities, communication protocols and recovery procedures.

For Example, in response to the 2013 data breach affecting 38 million users Adobe improved its incident response plan by establishing a clearer chain of command enhancing communication with affected parties and collaborating with law enforcement. These updates aimed to ensure faster investigation, remediation and public disclosures strengthening Adobe's ability to manage security incidents and minimize their impact.[17]

[16]https://www.crowdstrike.co.uk/falcon-platform/
[17]https://medium.com/@maazptl24/the-adobe-attack-of-2013-a-cautionary-tale-of-cybersecurity-failure-1ef4ec74eb64

Change Management Process

Implement a formal change management process to ensure that all changes to network infrastructure are properly tested, documented and approved.

For Example, Microsoft follows a formal change management process within its ITIL (Information Technology Infrastructure Library) framework to control and document infrastructure changes. Before implementation risk assessments and impact analyses are conducted. Proposed changes are reviewed by management and security teams for compliance. Logged once approved and accompanied by a roll- back plan to ensure system stability and security.

Business Continuity and Disaster Recovery Planning

Develop plans to ensure business continuity and disaster recovery in the event of a major disruption to network infrastructure.

For Example, Amazon Web Services (AWS) ensures cloud infrastructure availability with robust business continuity and disaster recovery plans. It uses multi-region replication to back up data across data centers enabling seamless failover if one center fails. AWS also regularly tests its recovery plans to ensure services can be restored quickly minimizing disruption impact.[18]

Regular Security Audits

Conduct regular security audits to assess the effectiveness of security controls and identify areas for improvement.

For Example, Facebook conducts regular internal and third-party security audits to ensure compliance with data protection regulations like GDPR (General Data Protection Regulation).[19]The audits review data processing, user consent and security controls while risk assessments and reports help maintain high data privacy standards and regulatory compliance.

Educational Initiatives

Security Awareness Training

Provide regular security awareness training to all employees to educate them about common threats, phishing scams and best practices for protecting sensitive information.

[18]https://www.cloudtech.com/resources/aws-disaster-recovery-business-continuity-plan
[19]https://en-gb.facebook.com/business/news/facebooks-commitment-to-data-protection- and-privacy-in-compliance-with-the-gdpr

For Example, Google provides regular security awareness training through in- person sessions, online courses and real-time alerts focusing on threats like phishing and ransomware. Their annual "Safer Internet Day" includes expert presentations on handling sensitive data recognizing suspicious activity and securing accounts. The program also covers best practices like using two-factor authentication (2FA) and securely managing customer data to help employees prevent security incidents.

Role-Based Training

Provide specialized security training to employees in specific roles such as system administrators, developers and security analysts.

For Example, Facebook offers specialized security training for system administrators, developers and security analysts to address specific security risks. Administrators focus on server and network security. Developers learn secure coding practices and analysts are trained in threat intelligence and incident response. This targeted training ensures each role is equipped to manage security risks effectively.

Simulated Phishing Attacks

Conduct simulated phishing attacks to test employees' ability to identify and avoid phishing scams.

Cofense (formerly PhishMe) helps companies test employees' ability to recognize phishing emails through simulated attacks. If an employee clicks a malicious link they are redirected to a training module. A Cofense study found that organizations using regular simulations saw a 50% reduction in employee susceptibility to phishing scams enhancing security awareness and reducing attack risks.

Future Scope of Network Infrastructure Security

The landscape of network infrastructure security is constantly evolving in response to new threats and technologies. The future scope of this field will likely be shaped by the following trends:

Increased Automation and Artificial Intelligence (AI)

AI will be used to automate security tasks, detect anomalies and respond to security incidents more quickly and effectively. AI-powered threat intelligence platforms will provide real-time insights into emerging threats.

Zero Trust Architecture

This security model assumes that no user or device should be trusted by default even if they are located within the organization's network perimeter. Zero trust requires strict identity verification, continuous monitoring and granular access control.

Software-Defined Networking (SDN) and Network Function Virtualization (NFV)

These technologies allow for more flexible and programmable network infrastructure enabling dynamic security policies and automated threat response.

5G and IoT Security

The widespread adoption of 5G and the increasing number of Internet of Things (IoT) devices will create new security challenges. These devices often have limited security features and can be easily compromised. Secure configuration, authentication and robust encryption will be crucial.

Cloud Security

As more organizations migrate to the cloud, securing cloud infrastructure and data becomes increasingly important. This requires a shared responsibility model where both the cloud provider and the customer are responsible for security. Cloud-native security solutions will play a key role in protecting cloud environments.

Quantum-Resistant Cryptography

The development of quantum computers poses a threat to current encryption algorithms. Organizations need to begin transitioning to quantum-resistant cryptography to protect their data from future attacks.

Proactive Threat Hunting

Instead of passively waiting for security incidents to occur, organizations will increasingly adopt proactive threat hunting techniques to identify and eliminate threats before they can cause damage.

Conclusion

Cyber security in network infrastructure is a critical concern for organizations of all sizes. By understanding common vulnerabilities, implementing effective prevention methods and adapting to emerging threats. Organizations can

significantly reduce their risk of cyber-attacks. A proactive and multi-layered approach to security, encompassing technical controls, procedural guidelines and educational initiatives are essential for maintaining a secure and resilient network infrastructure. The future of network security will be shaped by automation, AI, zero trust architectures and quantum-resistant cryptography. By embracing these advancements and continually adapting security strategies organizations can stay ahead of the evolving threat landscape and protect their valuable assets.

Case Study: Massive Aadhar Data Breach

An American cybersecurity firm reported that the Personally Identifiable Information (PII) of 815 million Indian citizens including, Aadhaar numbers and passport details was being sold on the Dark Web.[20]

The threat actors offering the data alleged that it was obtained from the Indian Council of Medical Research (ICMR) which has faced multiple cyberattack attempts with 6,000 incidents reported in 2022.

Dark Web

a) The dark web consists of websites that are not indexed by search engines and can only be accessed through specialized web browsers. Much smaller than the surface web it is considered a part of the broader deep web.

b) Using the analogy of an ocean and iceberg the dark web would represent the submerged tip of the iceberg.

Figure 6.1 : Dark Web

c) The dark web is deliberately concealed and can only be accessed through

[20]https://www.thehindu.com/sci-tech/technology/how-the-personal-data-of-815-million-indians-got-breached-explained/article67505760.ece

specialized software, configurations or authorization making it a part of the internet that is not easily accessible to typical users.

Personally Identifiable Information

About PII

a) Personally Identifiable Information (PII) refers to data that either on its own or combined with other relevant information can be used to identify an individual.

b) PII can include direct identifiers such as passport details or quasi-identifiers which, when combined with other data can be used to accurately identify an individual.

Access to Sensitive Data

a) Threat actors selling stolen data on the dark web refused to disclose how they acquired the data making any attempts to trace the source of the leak purely speculative.

b) Lucius, the second threat actor found selling data online claimed to have access to a 1.8 terabyte data leak involving an unnamed "India internal law enforcement agency". However, this claim has not yet been verified.

c) Data samples analyzed by researchers include several mentions of UIDAI (Unique Identification Authority of India) Aadhaar cards and voter ID cards. It is also likely that the threat actors managed to breach a third-party entity collecting this information.

Threats Arising from Leaked Information

a) India as one of the fastest-growing economies globally ranked 4th worldwide in malware detections during the first half of 2023 according to a survey by Resecurity.

b) The turmoil in West Asia and the rise in attacks by threat actors exploiting the chaos led to a significant exposure of personally identifiable data which in turn heightened the risk of digital identity theft.

c) Threat actors use stolen identity information to carry out online banking theft, tax fraud and other forms of cyber-enabled financial crimes.

Previous Instances of Data Breach

a) Aadhaar data leaks were also reported in 2018, 2019 and 2022, with three significant breaches including one where farmers' data stored on the PM Kisan website was exposed on the dark web.

b) Earlier in 2023, reports surfaced about a bot on the messaging platform Telegram that was retrieving personal data of Indian citizens who had registered on the Covid-19 vaccine intelligence network (CoWIN) portal.[21]

Provisions Related to Data Governance in India

IT Amendment Act, 2008

a) India has implemented certain privacy provisions through the IT (Amendment) Act, 2008.

b) However, these provisions primarily apply to specific situations such as limiting the publication of names of juveniles and rape victims in the media.

Justice K. S. Puttaswamy (Retd) vs Union of India, 2017

a) In August 2017, a nine-judge bench of the Supreme Court delivered a landmark verdict in the case of Justice K. S. Puttaswamy (Retd) vs Union of India. The Court unanimously ruled that Indians have a constitutionally protected fundamental right to privacy which is considered an essential aspect of life and liberty under Article 21 of the India Constitution.[22]

B.N. Srikrishna Committee, 2017

a) In August 2017, the government set up a committee of experts on data protection led by Justice B.N. Srikrishna. The committee submitted its report in July 2018 along with a draft Data Protection Bill.

b) The report includes a comprehensive set of recommendations to enhance privacy laws in India such as restrictions on data collection and processing the establishment of a Data Protection Authority the right to be forgotten, data localization and more.

[21]https://vajiramandravi.com/current-affairs/cowin-data-breach-what-does-the-alleged-data-leak-reveal/
[22]https://privacylibrary.ccgnlud.org/case/justice-ks-puttaswamy-ors-vs-union-of-india-ors

Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021

a. The IT Rules (2021) require social media platforms to exercise increased responsibility and vigilance regarding the content shared on their platforms.

Proposal of 'Digital India Act', 2023 to replace IT Act, 2000

a) The IT Act was initially created to protect e-commerce transactions and define cybercrime offenses but it did not adequately address the complexities of the modern cybersecurity landscape or cover data privacy rights.

b) The proposed Digital India Act aims to drive India's economic growth by fostering greater innovation and supporting startups while simultaneously ensuring the safety, trust and accountability of its citizens.

Way Forward

The UIDAI has recommended to use a "masked Aadhaar" that displays only last four digits of Aadhaar number which enhances the privacy and security. Further, to ensure the accountability, Aadhaar Act should be amended to reintroduce the independent oversight through a high-powered "Identity Review Committee." The government should limit the mandatory Aadhaar usage to permissible purposes and provide various alternative authentication methods when Aadhaar authentication fails. Aadhaar users can also protect their Aadhaar data by locking it through the UIDAI website or mobile app, rendering the biometric information useless even if it is compromised.

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Book Reviews

6.1 The Economics of Attention: A Critical Review of Cal Newport's Digital Minimalism

Ms. Tanvika Singh

In the modern digital economy, attention has become the most sought after commodity. Platforms like Facebook, Google, and Apple have designed their business models to monetize user engagement, shaping an economic landscape where digital dependency fuels revenue. *Digital Minimalism* by Cal Newport critically examines this phenomenon, offering an alternative framework to reclaim personal autonomy from the influence of Big Tech.

Newport, a computer scientist and thought leader in digital culture, exposes the psychological underpinnings of the attention economy, where algorithmic design ensures prolonged user engagement. The book argues that digital platforms are not merely tools but sophisticated mechanisms engineered to optimize advertising revenue through continuous behavioral reinforcement. This framing is particularly relevant to finance, where advertising-based revenue models thrive on maximizing user screen time.

Newport's *Digital Minimalism* is not simply a critique but a proposed solution: a philosophical shift that prioritizes intentional digital consumption over passive engagement. His approach consists of two major steps:

Digital Decluttering– A systematic elimination of unnecessary digital distractions, allowing individuals to reassess their technology use in alignment with core values.

Sustained Minimalism Practices– Adoption of deep work, solitude, high-quality leisure, and face-to-face interactions to counteract digital fatigue.

The book emphasizes rational decision-making when engaging with technology. Instead of mindlessly consuming social media and entertainment apps, Newport advocates for an optimization approach-evaluating the highest benefit of technology use based on how well it enhances an individual's most cherished values. This means that instead of indiscriminately scrolling through posts and notifications, users should actively curate their digital engagement to support meaningful activities, whether that is professional growth, creativity, or personal relationships.

Newport's philosophy also challenges a fundamental assumption in traditional economics: that more is better. In consumer economics, higher consumption is often equated with greater satisfaction and well-being. However, in the context of digital technologies, more usage does not lead to more value-instead, it leads to less time for deeply fulfilling pursuits such as producing a great piece of music, engaging in intimate family moments, or immersing in deep intellectual work.

This is a new way of thinking about economic value-one that measures productivity and well-being not by the volume of digital interactions, but by the quality of time reclaimed for pursuits that matter. In this way, *Digital Minimalism* is as much a philosophical re-evaluation of personal choice as it is an economic critique of attention-based business models.

While Newport's analysis effectively dissects the problem at an individual level, it leaves a crucial question unanswered: Can digital addiction be addressed without systemic intervention? The role of Big Tech conglomerates like Facebook and Google in shaping user behavior extends beyond personal choice, as these platforms leverage sophisticated data analytics and AI-driven engagement strategies to sustain dependency.

From a finance perspective, this raises broader regulatory and economic concerns. Should governments and financial regulators impose stricter policies on data commodification and attention-extractive business models?

The European Union (EU) has taken proactive regulatory steps, such as the Digital Services Act (DSA) and General Data Protection Regulation (GDPR), which impose strict rules on data collection, algorithmic transparency, and user consent. These measures seek to curb exploitative digital business models by ensuring greater accountability for tech companies.

In contrast, India's approach is still evolving. The recently enacted Digital Personal Data Protection Act (DPDPA), 2023 introduces data privacy safeguards, but it lacks the depth of the EU's regulatory mechanisms in tackling algorithm- driven addiction and surveillance capitalism. Given India's large and growing digital user base, stronger policy interventions, including ethical AI regulations and consumer protection laws, will be critical in balancing innovation with digital well-being.

Additionally, Newport's minimalism presumes a certain degree of economic and social privilege. Not everyone can afford to disengage from the digital sphere especially those whose livelihoods depend on online platforms. For gig workers,

content creators, and small business owners, screen time isn't a distraction but a necessity. *Digital minimalism*, in this sense, may reproduce digital divides, favouring those with the resources and flexibility to opt out.

Moreover, the emphasis on individual discipline tends to downplay the systemic nature of digital addiction. While personal agency is essential, structural factors such as algorithmic manipulation, lack of digital literacy, and economic dependency on Big Tech ecosystems limit individual choice. Framing the solution solely as a matter of self-control risks oversimplifying a deeply entrenched socio-technological problem.

Despite these limitations, *Digital Minimalism* is a compelling and highly relevant read for those concerned with the intersection of technology, finance, and human well-being. This book is not merely about reducing screen time. It is about reclaiming agency in an economy designed to commodify attention. It challenges the reader to reconsider whether they are living life or merely watching it unfold through a screen.

In an era where passive scrolling substitutes for meaningful interaction, Newport's philosophy serves as a call to action. It is a book that compels its readers to switch off their phones mid-scroll not to disengage, but to reconnect. To trade digital validation for real conversations, algorithmic engagement for self-directed focus, and fleeting virtual interactions for lasting human connections.

Instead of liking a friend's picture on social media, *Digital Minimalism* will inspire you to meet them for a coffee, savor a croissant, and share a real conversation. This book is a powerful antidote for those who want to live life, not just watch it pass by on a reel.

Yet, to truly realize the potential of *Digital Minimalism*, its principles must be democratized and systematized**.** Policymakers, technologists, economists, and educators must collaborate to design infrastructures and institutions that:

- Prioritize digital well-being alongside innovation.
- Penalize manipulative design and reward ethical engagement.
- Embed digital wellness as a core competency in curricula and workplace norms.

Thus, *Digital Minimalism* compels us to confront an uncomfortable truth: that much of our digital behavior is not chosen, but conditioned. While Newport offers a valuable framework for reclaiming agency, meaningful change also demands systemic reform. Attention is too valuable a resource to be left to the invisible hand of the market.

To move beyond individual solutions, we need a collective response one that reimagines not just how we use technology, but how technology is built, governed, and made accountable. In doing so, we can begin to recover the most fundamental human asset in a digital world: the right to choose how we spend our time.

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    - Font Size: 12
    - Line Spacing: Double
    - Alignment: Justified
- Length:
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    - Book Reviews: Up to 1000 words
    - Case Studies: Up to 2500 words
    - Referencing: APA referencing style should be used.
- Covering Letter: A covering letter should identify the corresponding author with address, telephone numbers, and email address.

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