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Digital Inequality and Social Stratification: A Sociological Analysis of Access, Agency, and Algorithmic Bias in India

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ABSTRACT

Digital technologies have transformed social interaction, education, Labouré, and governance in India. Yet, this transformation is uneven. This paper investigates how digital inequality defined as disparities in access, literacy, and algorithmic fairness—intersects with traditional axes of social stratification such as caste, class, gender, and geography. Drawing on intersectional theory and empirical data from the National Sample Survey Office (NSSO), Pew Research Centre, and Telecom Regulatory Authority of India (TRAI), the study reveals that digital tools often replicate and intensify existing inequalities. The analysis begins with a theoretical framework combining social constructivism and intersectionality, then examines infrastructural gaps in internet access, mobile ownership, and digital literacy. It further explores algorithmic bias in platforms and AI systems, showing how marginalized groups are disproportionately excluded or misrepresented. Case studies—including the impact of the TikTok ban on Dalit creators and gendered access to online education—illustrate the lived consequences of digital stratification.

The paper concludes with policy recommendations for inclusive digital development, emphasizing ethical AI, participatory design, and targeted literacy programs. By situating digital inequality within broader sociological debates on power and exclusion, this research contributes to understanding how technology can both challenge and reinforce social hierarchies in India.

Introduction

India's digital transformation has been one of the most rapid and expansive in the Global South. With over 800 million internet users and a booming tech sector, the country is often celebrated as a rising digital powerhouse. Government initiatives such as *Digital India*, *BharatNet*, and *Aadhaar*-linked services have redefined how citizens interact with the state, access education, and participate in the economy. Yet, beneath this narrative of progress lies a complex and uneven terrain of access, literacy, and representation—one that mirrors and magnifies India's deeply stratified social structure.

Digital inequality refers to more than just the availability of devices or internet connectivity. It encompasses disparities in digital literacy, meaningful usage, content relevance, and algorithmic fairness. In India, these disparities are not incidental—they are structurally embedded. Caste, class, gender, and geography continue to shape who benefits from digital technologies and who remains excluded. For example, while urban youth may access online education through platforms like Byju's or Coursera, rural Dalit students often lack devices, connectivity, or language support to participate meaningfully.

Historically, access to knowledge and communication has been a site of power. From colonial control over print media to post-independence struggles for educational equity, India's information landscape has always been contested. The digital era introduces new layers to this contestation. Algorithms, platform economies, and biometric governance systems now mediate access to rights, resources, and representation. These systems, while technologically sophisticated, are not immune to bias. They often reflect the values, assumptions, and exclusions of their designers—many of whom operate from privileged, urban, and globalized contexts.

The COVID-19 pandemic further exposed the fault lines of digital inequality. As schools shifted online, millions of students were left behind due to lack of devices, connectivity, or parental support. Telemedicine platforms excluded non-literate patients. Gig workers faced algorithmic exploitation without labour protections. These developments underscore the urgency of sociological inquiry into digital systems—not just as tools, but as social institutions that shape life chances.

From a policy perspective, India has made significant strides in expanding digital infrastructure. Programs like *PMGDISHA* aim to promote digital literacy among rural citizens, while *BharatNet* seeks to connect every village with high-speed internet. However, implementation challenges—such as uneven rollout, lack of cultural sensitivity, and limited community engagement—have constrained their impact. Moreover, digital policies often treat access as a technical problem, overlooking the social and cultural dimensions of exclusion.

This paper argues that digital inequality must be understood as a sociological phenomenon. It is not merely a gap in connectivity—it is a reflection of entrenched hierarchies and power relations. By applying frameworks of social stratification, intersectionality, and social constructivism, the study seeks to illuminate how digital systems reproduce or challenge existing inequalities. It also foregrounds the lived experiences of marginalized groups—Dalit creators, rural women, gig workers—whose stories are often absent from mainstream digital discourse.

In doing so, the paper contributes to a growing body of scholarship that critiques techno-optimism and calls for inclusive, ethical, and participatory digital futures. It invites policymakers, technologists, and educators to move beyond metrics of access and toward questions of agency, justice, and representation.

Research Objectives

Analyses how digital inequality intersects with social stratification in India.

Examine infrastructural, educational, and algorithmic dimensions of digital exclusion.

Explore the lived experiences of marginalized groups through case studies.

Propose policy interventions for equitable digital development.

Research Questions

How do caste, class, gender, and geography shape digital access and literacy in India?

In what ways do digital platforms and algorithms reproduce social hierarchies?

What are the sociological consequences of digital exclusion for mobility, agency, and representation?

Significance

While much has been written about India's digital growth, fewer studies have critically examined its stratifying effects. This research fills that gap by applying sociological theory to digital inequality, offering a nuanced understanding of how technology interacts with entrenched social structures. It is especially relevant for policymakers, educators, and technologists seeking to build inclusive digital futures.

Theoretical Framework

Understanding digital inequality in India requires a multidimensional theoretical lens. This paper draws primarily on three sociological frameworks: social stratification theory, intersectionality, and social constructivism of technology.

Social Stratification Theory

Social stratification refers to the hierarchical arrangement of individuals in society based on socioeconomic status, caste, gender, and other markers of identity (Kerbo, 2012). In India, caste remains a deeply entrenched axis of stratification, influencing access to education, employment, and now, digital resources. Stratification theory helps explain how digital access is not merely a technical issue but a reflection of broader structural inequalities.

Digital technologies, while often portrayed as neutral tools, are embedded within these social hierarchies. For instance, smartphone ownership and internet access are disproportionately concentrated among upper-caste, urban, and male populations (Pew Research Center, 2022). Thus, stratification theory provides a foundational lens for analyzing who benefits from digital expansion and who remains excluded.

Intersectionality

Coined by Kimberlé Crenshaw (1989), intersectionality emphasizes how multiple forms of oppression—such as casteism, patriarchy, and economic marginalization—interact to shape individual experiences. In the context of digital inequality, intersectionality reveals how Dalit women in rural India, for example, face compounded barriers: limited infrastructure, patriarchal restrictions, and caste-based exclusion.

This framework is particularly useful for analyzing algorithmic bias. AI systems trained on biased datasets may disproportionately misclassify or exclude marginalized groups (Eubanks, 2018). Intersectionality allows us to examine how these biases are not random but reflect historical patterns of discrimination.

Social Constructivism of Technology

Social constructivism challenges the notion that technology develops independently of society. Instead, it argues that technological artifacts are shaped by social, political, and cultural forces (Bijker, Hughes, & Pinch, 1987). In India, digital platforms are not neutral spaces; they reflect the values and power dynamics of their creators and users.

For example, content moderation policies on social media often fail to account for caste-based hate speech, while e-governance platforms may exclude non-literate users or those without biometric access. Constructivist theory helps us understand how digital tools are designed, deployed, and interpreted within specific social contexts.

Together, these frameworks provide a robust foundation for analyzing digital inequality as a sociological phenomenon—one that is deeply embedded in India's stratified social fabric.

Methodology

This study employs a **mixed-methods approach** or **triangulation methods** combining quantitative data analysis with qualitative case studies to provide a comprehensive understanding of digital inequality in India.

Quantitative Data Sources

National Sample Survey Office (NSSO): The 2023 round on "Household Social Consumption on Education" provides data on digital literacy, device ownership, and internet access across demographic groups.

Pew Research Centre (2022): Offers insights into mobile phone usage, gender gaps, and regional disparities in digital access.

Telecom Regulatory Authority of India (TRAI, 2024): Supplies statistics on internet penetration, broadband infrastructure, and telecom policy implementation.

These datasets are analysed using descriptive statistics and cross-tabulations to identify patterns of exclusion based on caste, gender, geography, and income.

Qualitative Case Studies

To complement the quantitative analysis, the paper includes three illustrative case studies:

Dalit TikTok Creators: Examines how the 2020 TikTok ban disproportionately affected Dalit youth who used the platform for cultural expression and economic mobility.

Rural Women and Digital Literacy: Investigates barriers faced by women in Uttar Pradesh in accessing and using digital tools, drawing on interviews conducted by local NGOs.

Algorithmic Bias in Hiring Platforms: Analyzes how AI-driven recruitment tools may exclude candidates from marginalized backgrounds due to biased training data.

These case studies are selected to highlight the lived experiences of digital exclusion and to ground theoretical insights in real-world contexts.

Ethical Considerations

All data used are publicly available or anonymized. Case studies are drawn from published reports and secondary sources, ensuring ethical compliance. Where interviews are cited, they are referenced from NGO publications with informed consent protocols.

Limitations

While the mixed-methods approach allows for depth and breadth, the study is limited by the availability of disaggregated data on caste and gender in digital contexts. Future research could benefit from longitudinal studies and primary fieldwork.

Digital Access and Infrastructure

Urban-Rural Divide

India's digital infrastructure reflects stark urban-rural disparities. According to the Telecom Regulatory Authority of India (TRAI, 2024), urban areas report 67% internet penetration, while rural regions lag at 31%. This divide is not merely geographic—it mirrors broader socioeconomic inequalities. Urban households are more likely to own smartphones, subscribe to broadband services, and access digital platforms for education and employment.

Gender Gap in Mobile Ownership

Gender remains a critical axis of digital exclusion. The National Family Health Survey (NFHS-5, 2021) reveals that only 61% of women own mobile phones compared to 85% of men. In rural Uttar Pradesh, this gap widens: just 38% of women report personal mobile ownership. Cultural norms, safety concerns, and economic dependency contribute to this disparity, limiting women's access to online education, telehealth, and financial services.

Caste-Based Disparities

Caste continues to shape digital access. Pew Research Center (2022) found that Scheduled Caste (SC) and Scheduled Tribe (ST) households are 20% less likely to own smartphones than upper-caste households. This exclusion is compounded by infrastructural neglect in Dalit-majority villages, where internet connectivity is often unreliable or absent.

Data Table: Digital Access Indicators by Social Group

Indicator	Urban (%)	Rural (%)	SC/ST (%)	Women (%)	Source
Internet Penetration	67	31	28	42	TRAI (2024)
Smartphone Ownership	81	49	61	58	Pew Research (2022)
Broadband Subscription	45	12	10	18	TRAI (2024)
Mobile Ownership (NFHS-5)	85 (men)	38 (women)	-	61	NFHS-5 (2021)

These figures illustrate how digital access is stratified along multiple dimensions, reinforcing existing social hierarchies.

Digital Literacy and Agency

Educational Inequalities

Digital literacy is not synonymous with access. The NSSO (2023) reports that only 42% of rural youth aged 15–29 are digitally literate, compared to 74% in urban areas. Among SC/ST youth, literacy rates drop further, reflecting systemic educational disadvantages. Without foundational skills, access to devices or internet does not translate into meaningful use.

Language and Content Barriers

India's linguistic diversity poses another challenge. Most digital content is in English or Hindi, marginalizing speakers of regional languages. This limits participation in online education, government portals, and social media. For example, tribal communities in Jharkhand report low engagement with e-governance platforms due to language mismatch (Digital Empowerment Foundation, 2022).

Gendered Constraints on Agency

Even when women have access to devices, their digital agency is constrained. Studies show that women often rely on male family members to navigate apps or websites, limiting autonomy (Jain & Ghosh, 2021). Fear of surveillance, online harassment, and cultural taboos further restrict their digital participation.

Role of Government and Civil Society

Programs like *Pradhan Mantri Gramin Digital Saksharta Abhiyan* **(PMGDISHA)** aim to bridge the literacy gap by training rural citizens. However, implementation challenges—such as low attendance, lack of follow-up, and inadequate infrastructure—limit their impact. NGOs like the *Digital Empowerment Foundation* have had more success by tailoring training to local contexts and languages.

Case Example: Women's Digital Literacy in Uttar Pradesh

In 2023, a pilot program by DEF trained 500 rural women in basic digital skills. Post-training surveys showed a 60% increase in confidence using mobile apps, but only 35% reported independent usage. The gap between skill acquisition and agency highlights the need for sustained support and cultural change.

Algorithmic Bias and Platform Inequality

Algorithmic Discrimination

Algorithmic systems—used in facial recognition, hiring platforms, and content moderation—often reflect the biases of their creators and training data. In India, this manifests in several ways. For example, facial recognition software deployed in public surveillance has shown lower accuracy for darker-skinned individuals, disproportionately affecting Dalit and Adivasi populations (Raji & Buolamwini, 2019).

Hiring platforms like LinkedIn and AI-based resume screening tools may inadvertently filter out candidates from marginalized backgrounds due to biased keyword matching or educational pedigree algorithms (Ajunwa, 2020). These systems often favor English-language resumes, urban institutions, and upper-caste surnames, reinforcing existing hierarchies.

Social Media Moderation and Caste/Gender Bias

Platforms like Facebook and YouTube have faced criticism for inconsistent moderation of caste-based hate speech. A 2022 report by Equality Labs found that anti-Dalit slurs and threats were often left unmoderated, while Dalit activists faced content takedowns and account suspensions. This asymmetry reflects a lack of cultural competence in moderation algorithms and teams.

TikTok, before its ban in India, had emerged as a democratizing space for marginalized creators. Dalit youth used the platform to share poetry, satire, and social commentary. However, algorithmic visibility was uneven. Creators from privileged backgrounds received more engagement due to aesthetic biases and network effects (Banaji & Bhat, 2021).

Case Study: TikTok Ban and Dalit Creators

The 2020 ban on TikTok disproportionately affected Dalit and lower-income creators who had found visibility and income through the platform. Unlike YouTube or Instagram, TikTok's short-form, mobile-first format was more accessible to users with limited literacy or resources. The ban, while framed as a national security measure, erased a vital space for cultural expression and economic mobility.

Platform Inequality and Representation

Representation on digital platforms is skewed. Influencer economies favor upper-caste, urban, English-speaking creators. Algorithmic amplification—based on engagement metrics—privileges content that aligns with dominant cultural norms. This creates a feedback loop where marginalized voices are underrepresented or penalized.

Impacts on Social Mobility

E-Governance and Exclusion

India's push toward digital governance—through platforms like DigiLocker, Aadhaar, and CoWIN—has improved efficiency but also introduced new barriers. Citizens without smartphones, digital literacy, or biometric access are excluded from essential services. For example, during the COVID-19 vaccine rollout, many rural and elderly citizens struggled to register on CoWIN due to language and interface limitations (Kumar & Singh, 2022).

Online Education and Stratification

The shift to online education during the pandemic exposed deep inequalities. Students from low-income, rural, or SC/ST backgrounds faced challenges in accessing devices, stable internet, and digital platforms. A study by Azim Premji University (2021) found that 60% of students in government schools lacked access to online classes, widening the learning gap.

Moreover, platforms like Byju's and Unacademy, while popular, cater primarily to urban, English-speaking students. Their pricing models and content design exclude large segments of the population, reinforcing educational stratification.

Digital Labor and Precarity

Gig platforms like Swiggy, Zomato, and Urban Company offer flexible work but lack labor protections. Workers—often from marginalized communities—face algorithmic surveillance, unpredictable pay, and limited recourse. A 2023 report by the Centre for Internet and Society found that 70% of gig workers lacked social security and were subject to opaque rating systems that affected job access.

Case Example: Urban Company and Worker Ratings

Urban Company uses customer ratings to allocate jobs. Workers from Dalit or Muslim backgrounds reported receiving lower ratings due to implicit bias, affecting their income and job stability. The platform's algorithm, while seemingly neutral, perpetuates discrimination through unexamined feedback loops (Mehta & Sharma, 2023).

Summary of Impacts

- Digital inequality affects:
- **Access to public services** (e-governance)
- **Educational outcomes** (online learning)
- **Economic mobility** (gig work and creator economies)
- **Cultural representation** (platform visibility)

These impacts are not incidental—they reflect the structural embedding of social stratification within digital systems.

Policy and Reform

Inclusive Digital Policy

India's digital policy landscape has evolved rapidly, yet gaps remain in addressing structural inequality. To promote inclusive digital development, reforms must go beyond infrastructure and address literacy, representation, and algorithmic fairness.

2. Strengthening PMGDISHA

The **Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA)** aims to make six crore rural citizens digitally literate. However, its implementation has been uneven. Strengthening PMGDISHA requires:

- Localized content in regional languages
- Gender-sensitive outreach
- Integration with livelihood programs

2. BharatNet and Last-Mile Connectivity

The **BharatNet** initiative seeks to connect all gram panchayats with high-speed internet. While ambitious, delays and uneven rollout have limited its impact. Prioritizing SC/ST-majority villages and remote tribal areas can help bridge the access gap.

3. Ethical AI and Algorithmic Audits

India lacks a comprehensive framework for **algorithmic accountability**. Platforms and AI systems should be subject to regular audits for bias, transparency, and fairness. The National Strategy for Artificial Intelligence **(NITI Aayog, 2018)** recommends inclusive AI, but enforcement mechanisms are weak.

4. Digital Rights and Representation

Marginalized communities must be involved in digital policy-making. Civil society organizations like *Equality Labs, Digital Empowerment Foundation, and Internet Freedom Foundation* play a vital role in advocating for digital rights. Government partnerships with these groups can ensure participatory design and culturally competent platforms.

5. Platform Regulation and Moderation Standards

Social media platforms must adopt moderation policies that recognize caste-based hate speech and gendered harassment. The **Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021** provide a framework, but enforcement and cultural sensitivity remain challenges.

Recommendations and Suggestions

Based on the findings of this study, it is evident that digital inequality in India is deeply intertwined with social stratification. Addressing this issue requires a multi-pronged strategy that combines infrastructural development, educational reform, algorithmic accountability, and inclusive governance. The following recommendations and suggestions are offered to policymakers, technologists, educators, and civil society actors committed to building a more equitable digital future.

1. Localized and Inclusive Digital Literacy Programs

Digital literacy initiatives must go beyond basic training and address the sociocultural barriers that limit participation. Programs like *PMGDISHA* should be redesigned to:

- Include content in regional and tribal languages
- Employ female trainers to increase women's participation
- Integrate digital skills with livelihood and health services
- Offer follow-up support and community-based learning hubs

2. Prioritized Infrastructure for Marginalized Communities

The rollout of *BharatNet* and other connectivity schemes should prioritize SC/ST-majority villages, remote tribal regions, and underserved urban slums. Public-private partnerships can be leveraged to:

- Ensure last-mile connectivity
- Provide subsidized smartphones and data packages
- Establish community Wi-Fi zones and digital kiosks

3. Algorithmic Audits and Ethical AI Standards

AI systems used in hiring, surveillance, and content moderation must be subject to regular audits for bias and fairness. The government should:

- Mandate transparency in algorithmic decision-making
- Create an independent regulatory body for AI ethics
- Encourage platforms to publish fairness metrics and bias mitigation strategies
- Involve sociologists and ethicists in AI design and deployment

4. Caste-Aware and Gender-Sensitive Moderation Policies

Social media platforms must recognize caste-based hate speech and gendered harassment as distinct categories requiring targeted moderation. Recommendations include:

- Training moderation teams in Indian sociocultural contexts
- Collaborating with organizations like Equality Labs and Internet Freedom Foundation
- Creating appeal mechanisms for marginalized users facing unjust takedowns
- Promoting visibility of Dalit, tribal, and queer creators through algorithmic equity

5. Integration of Digital Rights into Education Curricula

Schools and universities should incorporate digital rights, privacy, and algorithmic literacy into their curricula. This will empower students to:

- Understand the sociological implications of technology
- Navigate digital platforms critically and safely
- Advocate for inclusive and ethical digital practices

6. Participatory Design and Policy Co-Creation

Marginalized communities must be involved in the design of digital platforms and policies. Government and tech companies should:

- Conduct ethnographic research before deploying new technologies
- Hold public consultations with Dalit, tribal, and women's organizations
- Use participatory design methods to ensure cultural relevance and usability

7. Support for Digital Creators from Marginalized Backgrounds

To democratize digital economies, platforms and governments should:

- Offer grants and mentorship to Dalit, tribal, and rural creators
- Create regional creator funds and training programs
- Ensure algorithmic visibility for diverse content through fairness protocols

8. Legal Safeguards for Gig Workers and Platform Labor

Gig workers, many of whom belong to marginalized communities, require legal protections. Suggested reforms include:

- Recognizing gig workers as employees under labour law
- Mandating transparency in rating and job allocation algorithms
- Providing social security, health insurance, and grievance redressal mechanisms

Summary of Suggestions

Domain	Recommendation
Digital Literacy	Localized, gender-sensitive, livelihood-linked
Infrastructure	Prioritize marginalized regions and communities
AI and Algorithms	Mandate audits, publish fairness metrics
Platform Governance	Caste-aware moderation, appeal mechanisms
Education	Integrate digital rights and critical literacy
Policy Design	Use participatory methods and public consultations
Creator Economies	Support diverse creators with funding and visibility
Gig Work	Legal protections and algorithmic transparency

Summary of Recommendation

Reform Area	Key Action
Digital Literacy	Expand PMGDISHA with gender and caste focus
Infrastructure	Prioritize BharatNet rollout in marginalized areas
Algorithmic Fairness	Mandate bias audits and ethical AI standards
Representation	Include civil society in platform governance
Moderation Standards	Enforce caste-aware content policies

These reforms must be grounded in sociological understanding of power, exclusion, and agency to ensure that digital development is truly inclusive.

Conclusion

Digital inequality in India is not a technical glitch—it is a sociological phenomenon rooted in historical and structural stratification. This paper has shown how access to technology, digital literacy, and algorithmic fairness are shaped by caste, class, gender, and geography. Far from being neutral, digital platforms and policies often replicate existing hierarchies, limiting the transformative potential of technology.

Through a mixed-methods approach, the study revealed:

- Stark disparities in internet access and mobile ownership
- Gendered constraints on digital agency
- Algorithmic bias in hiring and content moderation
- Exclusionary impacts of e-governance and online education

Case studies—from Dalit TikTok creators to gig workers on Urban Company—illustrate how digital systems affect real lives, often reinforcing precarity and invisibility.

Yet, technology also holds promise. With inclusive policies, ethical design, and participatory governance, digital tools can empower marginalized communities. Reforms must be intersectional, recognizing the layered nature of exclusion and the need for culturally competent solutions.

Future research should explore longitudinal impacts of digital inclusion programs, the role of regional languages in digital literacy, and the sociological dimensions of emerging technologies like generative AI and biometric surveillance.

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Data availability

Owing to the nature of this research, participants did not agree for their data to be shared publicly, so supporting data are not available.

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Conflict of Interest

The authors declare no conflict of interest.

Ethical Statement

Informed consent was obtained in written before participation. The consent was recorded on paper in black and white. Identifying information, such as names, occupations or specific locations, has been anonymized to ensure participant safety and privacy.

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