



# Technology in Bridging Gender Disparity: An Indian Perspective

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## Abstract

Digital technologies are playing a transformative role in addressing gender disparity in India. This work explores how Information and Communication Technologies (ICT) such as e-learning platforms, digital financial services, telemedicine, and e-governance initiatives are contributing in this direction, specifically towards empowering women and bridging the gender gap. An analysis has been carried out on key achievements, existing challenges, and emerging opportunities based on secondary data from government reports, academic literature, international organizations, and institutional presentations. The findings reveal that technology has significantly enhanced women's access to education, employment opportunities, healthcare, and entrepreneurship. However, persistent barriers such as digital illiteracy, limited rural connectivity, socio-cultural constraints, and cyber safety concerns continue to hinder inclusive growth. The paper concludes with policy recommendations for building a gender-inclusive digital ecosystem in India.

Keywords: Gender Disparity, Digital Inclusion, Women Empowerment, ICT, E-learning, Digital India, Financial Inclusion, Telemedicine, Cyber Safety

## 1. Introduction

Gender disparity remains one of the most persistent socio-economic challenges in India. Despite constitutional guarantees of equality and various policy interventions, women continue to face discrimination in education, employment, healthcare, and decision-making. Traditional social norms, economic dependency, and limited access to resources restrict women's participation in public and private spheres. In recent decades, technological advancements have reshaped social and economic structures. The rapid expansion of mobile communication, internet connectivity, digital platforms, and e-governance services has opened new avenues for empowerment. Technology has emerged as a powerful equalizer by enabling access to information, learning resources, financial services, and employment opportunities. This paper places technology within the broader discourse of gender equality and development. It examines how digital tools contribute to reducing disparities while also highlighting structural and cultural barriers that limit their effectiveness. The Indian context is particularly relevant due to its demographic diversity, digital transformation initiatives, and ongoing efforts to promote inclusive growth.

## 2. Objectives

The main objectives of this study are:

- To examine the role of digital technologies in reducing gender disparity in India.
- To analyse government and non-government initiatives aimed at promoting digital inclusion among women.
- To assess the socio-economic impact of ICT on women's education, employment, and healthcare access.
- To identify major challenges faced by women in adopting digital technologies.
- To explore future opportunities for women's empowerment through emerging technologies.

## 3. Review of Literature

Existing literature consistently highlights the strong and evolving relationship between technology and women's empowerment, particularly in developing countries such as India. Early studies in the 2000s emphasized the potential of Information and Communication Technologies (ICT) to enhance women's access to education, information, and economic resources. Hafkin and Taggart (2001) were among the first scholars to argue that ICT could play a transformative role in reducing gender inequalities by enabling women's participation in knowledge-based societies. Similarly, Gurumurthy (2004) noted that digital access enhances women's agency by strengthening their social networks and decision-making capacities. UNESCO (2015, 2022) has consistently emphasized that digital education and open learning platforms improve female participation and learning outcomes, especially in marginalized communities. The expansion of Massive Open Online Courses (MOOCs), digital classrooms, and virtual universities has significantly reduced barriers related to geography, mobility, and sociocultural restrictions. Sen and Mukherjee (2019) further demonstrated that online learning platforms in India have enabled women from rural and semi-urban areas to pursue higher education and professional training without relocating. The World Bank (2014, 2021) reports that digital financial inclusion plays a crucial role in enhancing women's economic independence and resilience. Mobile banking, digital wallets, and microfinance platforms have facilitated women's access to credit, savings, and insurance services. Studies by Demirgüç-Kunt et al. (2018) show that women who actively use digital financial services exhibit higher levels of entrepreneurial activity and household decision-making power. In India, initiatives such as Pradhan Mantri Jan Dhan Yojana (2014), Pradhan Mantri Jeevan Jyoti Bima Yojana (2015), Atal Pension Yojana (2015) and Unified Payments Interface (UPI) have further strengthened women's participation in the formal financial system. Such initiatives collectively strengthen women's participation in the economic mainstream by ensuring access to formal financial systems, risk protection, and long-term security: PMJDY enables women—especially in rural and low-income households—to open zero-balance bank accounts, receive direct benefit transfers, and develop savings habits; PMJJBY provides affordable life insurance coverage, reducing financial vulnerability and encouraging inclusion in formal risk-sharing mechanisms; and APY promotes retirement planning through guaranteed pensions, fostering financial independence and future security. Together, these initiatives enhance women's control over financial resources, reduce dependence on informal systems, and support informed economic decision-making, thereby contributing significantly to women's empowerment and inclusive growth. Research on digital entrepreneurship highlights the importance of mobile and internet technologies in supporting women-led enterprises. Nations et al. (2020) argue that mobile technology facilitates access to markets, customers, and professional networks, thereby

reducing dependency on traditional intermediaries. Nair and Kumar (2017) observed that women entrepreneurs in India increasingly rely on social media platforms and e-commerce portals to expand their businesses at minimal cost. Similarly, the International Labour Organization (ILO, 2020) reported that digital platforms have created flexible work opportunities for women, particularly in freelance and home-based sectors. Government of India reports underline the importance of digital literacy programmes such as Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) in bridging the digital divide. Evaluations by MeitY (2019, 2023) indicate that these programmes have significantly improved women's ability to access e-governance services, online education, and digital payments. The National Digital Literacy Mission and Digital India initiatives have further strengthened women's digital capabilities, particularly in rural regions. Despite these positive outcomes, scholars have also highlighted significant limitations and structural barriers. Hilbert (2011, 2018) argues that technological access alone does not automatically translate into empowerment unless it is supported by education, institutional reforms, and gender-sensitive policies. Without adequate training and social support, digital tools may reinforce existing inequalities rather than eliminate them. Cyber harassment, privacy violations, and online surveillance have emerged as major concerns in the digital era. Jane (2017) and Citron (2014) document how online misogyny, cyberstalking, and hate speech disproportionately affect women and discourage their active participation in digital spaces. A study by the Internet and Mobile Association of India (IAMAI, 2021) found that fear of online abuse remains a significant barrier to internet usage among Indian women. Moreover, lack of awareness regarding digital rights and data protection increases women's vulnerability to cybercrime. Socio-cultural factors further constrain the effective use of technology. Studies by Kabeer (2011) and UNDP (2020) indicate that patriarchal norms, household responsibilities, and restrictions on mobility limit women's access to digital resources. In many communities, male family members control mobile devices and internet usage, thereby reducing women's autonomy. Rural-urban disparities and language barriers also contribute to unequal digital participation. Recent research emphasizes the need for integrated and inclusive policy frameworks. GSMA (2020, 2023) highlights that addressing affordability, accessibility, digital skills, and safety simultaneously is essential for closing the gender digital divide. The OECD (2021) stresses that gender-responsive digital policies and localized content can enhance women's engagement with technology. Overall, the literature suggests that while technology holds significant transformative potential for women's empowerment, its benefits are not automatic or uniform. Effective utilization depends on supportive socio-cultural environments, affordable infrastructure, digital literacy, institutional backing, and robust legal protections. Sustainable gender equality in the digital age requires coordinated efforts from governments, educational institutions, private sector organizations, and civil society to ensure that technological progress translates into meaningful social and economic empowerment for women.

#### 4. Methodology

This study adopts a qualitative and descriptive research design to examine the role of technology in bridging gender disparity in India. The qualitative approach is employed to understand social, cultural, and institutional dimensions of digital inclusion, while the descriptive design facilitates systematic documentation of existing trends, patterns, and relationships. This mixed orientation enables comprehensive interpretation of women's experiences with digital technologies in education, employment, healthcare, and governance.

#### 4.1 Sources of Data

The study is primarily based on secondary data collected from reliable and authoritative sources.

Major sources include:

- Government Publications Reports and datasets published by the Ministry of Electronics and Information Technology (MeitY), Ministry of Women and Child Development, Ministry of Education, and NITI Aayog were consulted to obtain information on digital literacy, e-governance initiatives, and gender-focused development programmes.
- International Organizations Publications from UNESCO, World Bank, United Nations Development Programme (UNDP), International Labour Organization (ILO), and GSMA were used to understand global and national perspectives on gender and digital inclusion.
- Statistical Agencies Data from the National Sample Survey Office (NSSO), Periodic Labour Force Survey (PLFS), and Census of India were utilized to analyze gender-wise trends in education, employment, and technology access.
- Academic Literature Peer-reviewed journals, research articles, conference papers, and doctoral theses were reviewed to identify theoretical frameworks and empirical findings related to ICT and women's empowerment.
- Institutional and Policy Documents Institutional presentations, Digital India reports, PMGDISHA evaluations, and policy documents were analyzed to assess programme implementation and outcomes.

#### 4.2 Type of Data

The study makes use of the following types of data:

- Quantitative Data
  - Statistics on mobile ownership, internet penetration, digital literacy rates, online education enrollment, and financial inclusion indicators.
  - Gender-disaggregated data on employment and skill development.
  - Regional data comparing rural and urban connectivity levels.
- Qualitative Data
  - Policy statements, programme evaluations, and implementation reports.
  - Case studies of women entrepreneurs, learners, and beneficiaries of digital schemes.
  - Narrative accounts and descriptive analyses from institutional publications.
- Time-Series Data
  - Longitudinal data from 2000 to 2025 to examine trends in digital access and women's participation.
- Comparative Data
  - Data comparing states, regions, and socio-economic groups to identify structural inequalities.

#### 4.3 Tools and Techniques of Data Collection

Secondary data were systematically collected through:

- Online government portals and digital repositories
- International organization databases
- Academic databases such as Google Scholar, JSTOR, and Scopus

- Official websites of ministries and regulatory bodies

Documents were selected based on relevance, credibility, and recency to ensure data reliability and validity.

#### 4.4 Statistical and Analytical Techniques

To analyze the collected data, the following statistical and analytical techniques were employed:

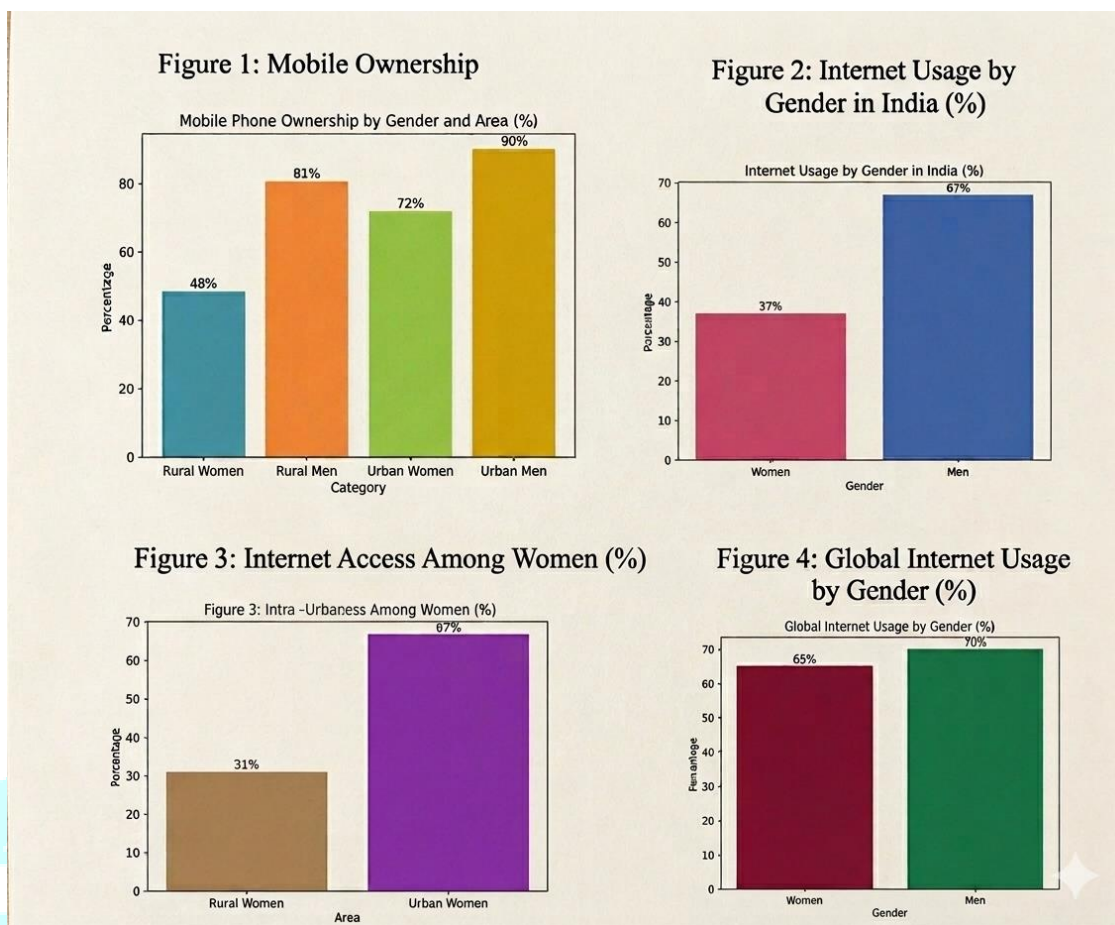
- **Descriptive Statistics**
  - o Measures such as percentages, ratios, averages, and frequency distributions were used to summarize gender-wise digital access, literacy levels, and service utilization.
- **Trend Analysis**
  - o Time-series analysis was conducted to identify growth patterns in internet usage, mobile ownership, and digital financial inclusion among women over time.
- **Comparative Analysis**
  - o Rural-urban, inter-state, and socio-economic group comparisons were carried out using cross-tabulation and ratio analysis to examine disparities.
- **Content Analysis**
  - o Qualitative content analysis was applied to policy documents, reports, and institutional materials to identify recurring themes related to empowerment, barriers, and policy effectiveness.
- **Correlation Analysis**
  - o Simple correlation techniques were used to explore relationships between digital access and indicators such as female literacy, employment, and income levels, based on available datasets.

#### 4.5 Scope and Limitations

The methodology emphasizes contextual interpretation rather than statistical generalization. As the study relies on secondary data, it is limited by the scope, accuracy, and availability of existing datasets. Regional variations and informal digital practices may not be fully captured in official statistics. Moreover, the absence of primary field data restricts deeper insight into individual experiences. Nevertheless, the use of multiple sources and mixed analytical techniques enhances the reliability and comprehensiveness of the findings.

### 5. Data Analysis

Data analysis focused on indicators such as mobile ownership, internet penetration, digital literacy levels, female enrollment in online courses, usage of digital payment systems, and access to telemedicine services. Reports indicate that women are significantly less likely to own smartphones and access high-speed internet, particularly in rural areas. Enrollment data from platforms such as SWAYAM and NPTEL suggest a steady increase in female participation in online education. Digital banking statistics show growing adoption of UPI and mobile wallets among women, especially through self-help groups and microfinance networks. Healthcare data reveals increased utilization of telemedicine services in remote regions, improving maternal and reproductive health outcomes. However, disparities persist across states and socio-economic categories, reflecting uneven infrastructure development. This section presents graphical representations of gender-based digital access in India and globally. The data has been adapted from reports by GSMA, NSO, ITU, and World Bank (2021–2024).



Sources: GSMA (2024). Mobile Gender Gap Report., National Statistics Office (2025). CMS:T Survey, ITU (2024). Measuring Digital Development., World Bank (2021). Women, Business and the Law., Oxfam India (2022). India Inequality Report.

The figures indicate significant gender and regional disparities in digital access. Rural women remain the most digitally excluded group. Although internet usage among women is increasing, the gap with men persists. Global trends also reflect similar inequalities.

The preceding graphical representations highlight isolated dimensions of the digital divide and are primarily based on data adapted from reports of GSMA, NSO, ITU, World Bank, and other publicly available secondary sources. However, digital inequality is multidimensional and interconnected. To provide a more holistic understanding of gender disparities in technological access, the subsequent clustered bar chart have been referred based on recent internet-based statistical datasets to consolidate multiple indicators within a single analytical framework. The chart combines indicators such as mobile ownership, internet penetration, and digital literacy across demographic categories. This integrated visualization facilitates comparative analysis and reveals the compounded disadvantages faced by rural women in the digital ecosystem while establishing continuity with the trends observed in the earlier graphical representations.

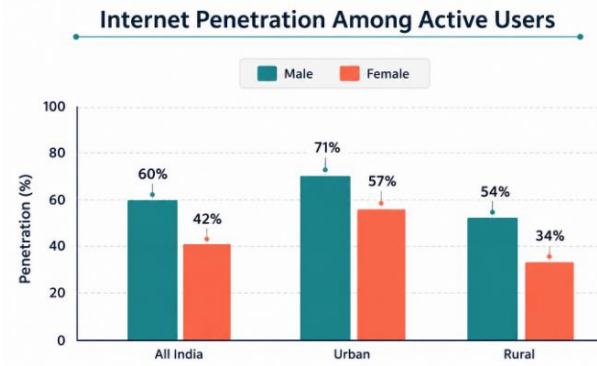


Fig 5: Internet penetration among active users (Source: <https://www.grabon.in/indulge/tech/internet-users-statistics>)

Share of Digitally Literate Households by Wealth Quintile and Residence

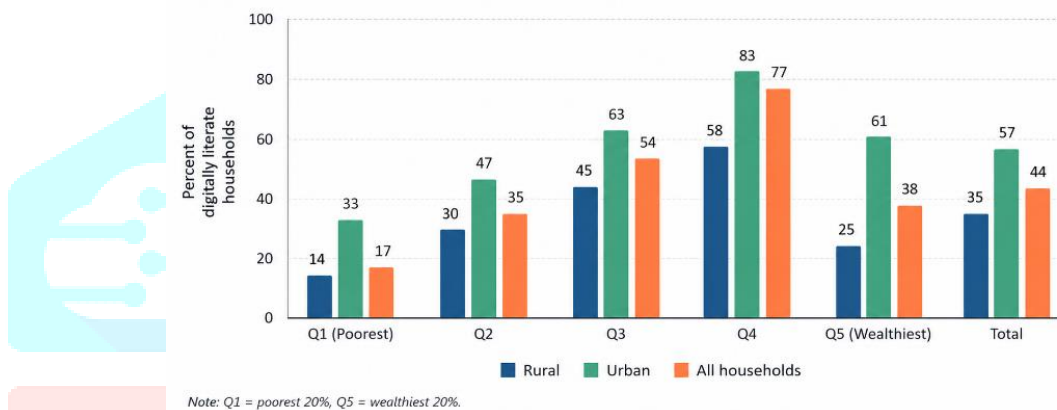


Fig 6: Percentage of digitally literate households by wealth quintile (Source: <https://www.ideasforindia.in/topics/governance/the-digital-dream-upskilling-india-for-the-future>)

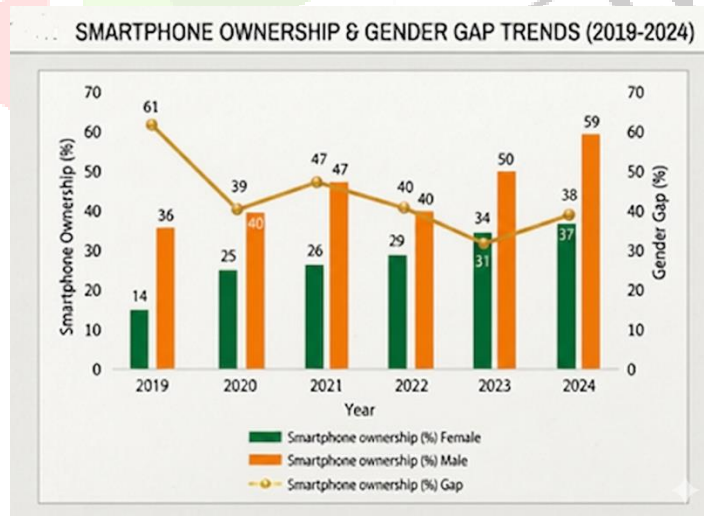


Fig 7: Smartphone and gender gap trends (Source: <https://www.theindiaforum.in/gender/closing-indias-gender-gap-financial-inclusion>)

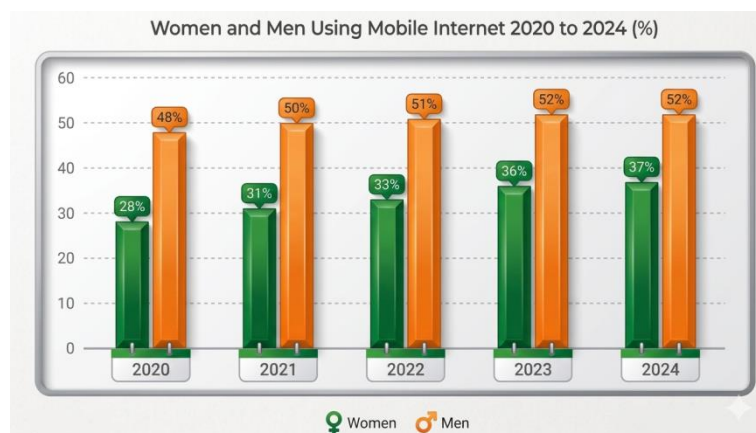


Fig 8: Gender gap in mobile internet usage in India (Source:<https://www.statifacts.com/chart-detail/womens-mobile-and-internet-access-in-india>)

A persistent gender gap exists across all major indicators of digital access in India. The largest disparity is visible in rural women's access to mobile phones and internet services. Urban women show considerably higher digital inclusion, reflecting better infrastructure, education, and affordability.

Collectively, these trends indicate that gender disparity in digital access is not limited to a single technological parameter but persists across multiple dimensions of digital participation.

## 6. Results and Discussion

The findings demonstrate that technology has positively influenced women's socio-economic status in multiple ways. E-learning platforms have expanded educational opportunities, particularly for women in remote areas. Online skill development programmes have enhanced employability and facilitated entry into digital professions. Digital entrepreneurship has enabled women to establish small businesses through e-commerce platforms and social media marketing. Financial inclusion initiatives have strengthened economic independence and reduced dependency on informal credit sources. Telemedicine and health apps have improved access to medical services, privacy, and awareness. E-governance portals have increased transparency and reduced bureaucratic barriers in accessing welfare schemes. Despite these achievements, significant challenges remain. Limited connectivity, low digital literacy, language barriers, and socio-cultural restrictions hinder adoption. Cyber safety concerns create fear and discourage online engagement. These issues highlight the need for integrated policy interventions.

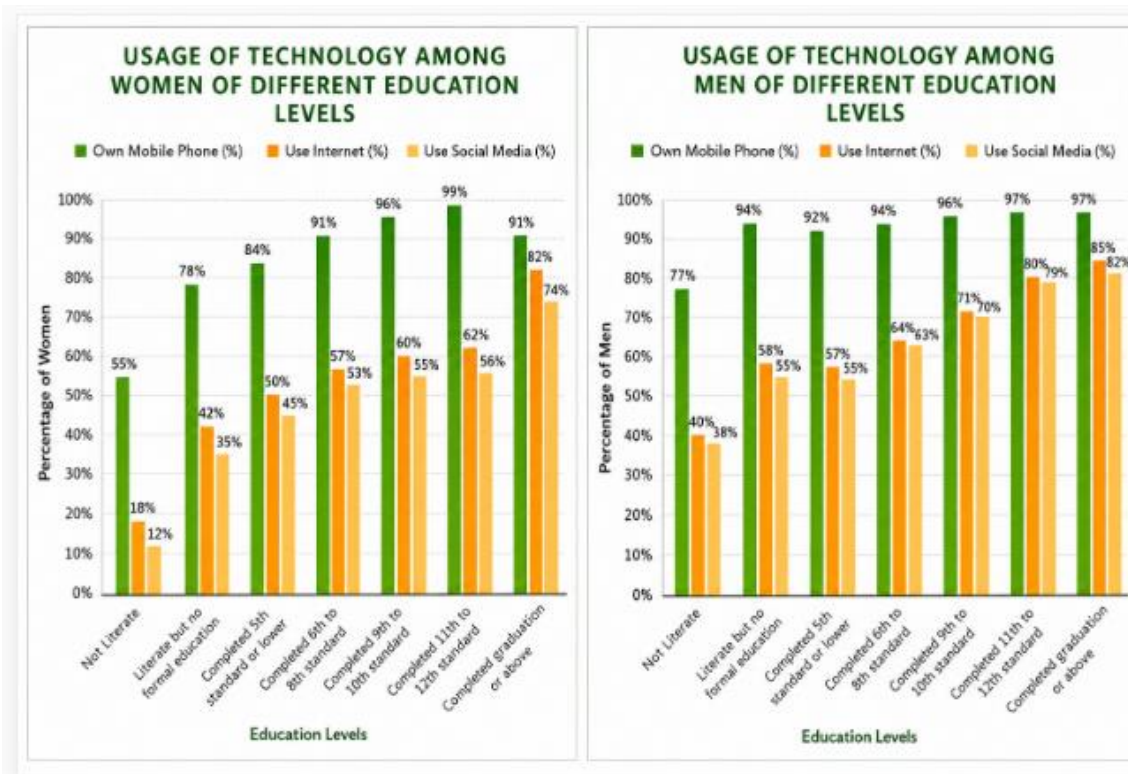
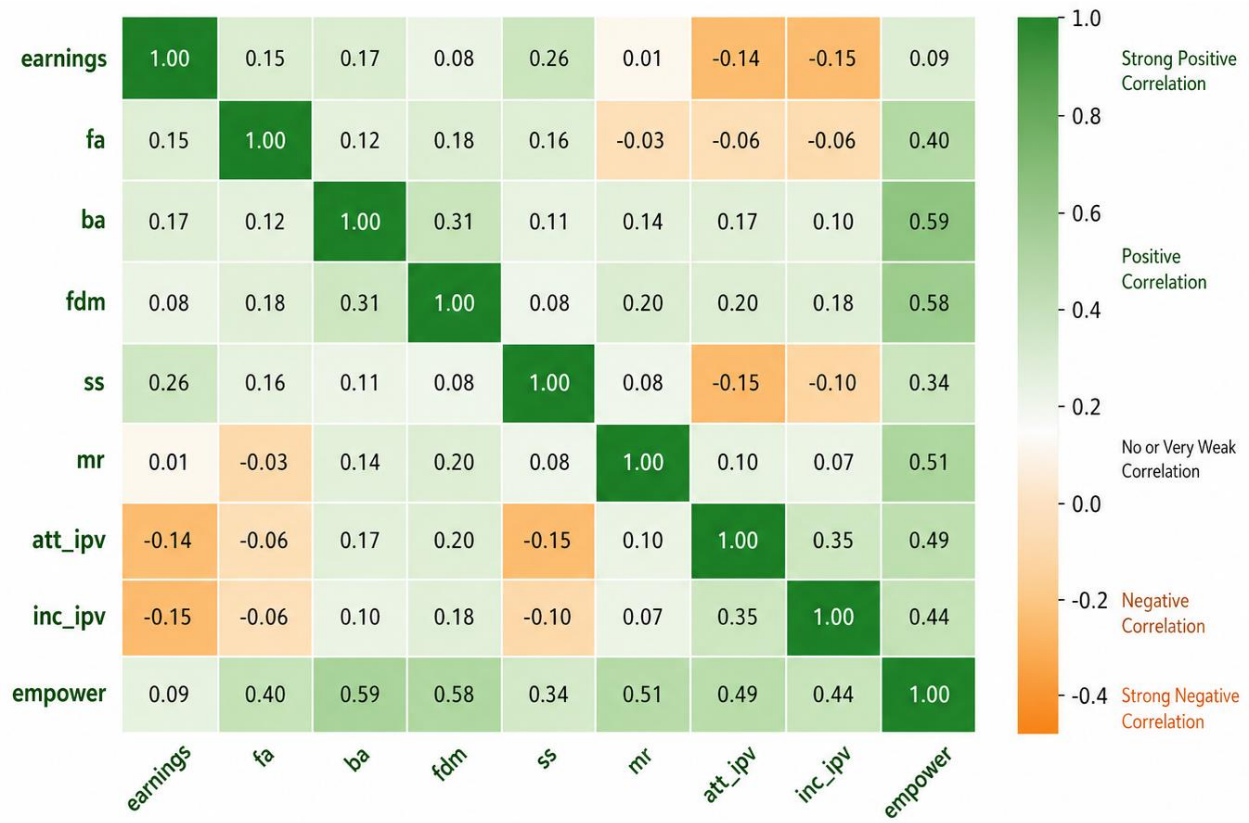


Fig 9: Usage of technology by gender (Source:<https://www.lse.ac.uk/geography-and-environment/research/social-media-and-crisis-of-urban-inequality-blog/historical-inequalities-and-unequal-access-to-digital-communications>)





**earnings** = Individual earnings (monthly/annual income)      **mr** = Monthly remittances (amount sent/received)  
**fa** = Financial assets      **att\_ipv** = Attitude towards intimate partner violence  
**ba** = Business assets      **inc\_ipv** = Experience of intimate partner violence  
**fdm** = Frequency of digital payments per month      **empower** = Women's empowerment index  
**ss** = Savings in bank or financial institution

Fig 10: Heatmap of the correlations between earning status of women and the seven aspects of their empowerment (Source: <https://www.nature.com/articles/s41599-025-04592-7>)

Female literacy and income levels exhibit extremely strong positive correlations with digital access. Female employment also shows a strong association, though slightly weaker compared to literacy and income.

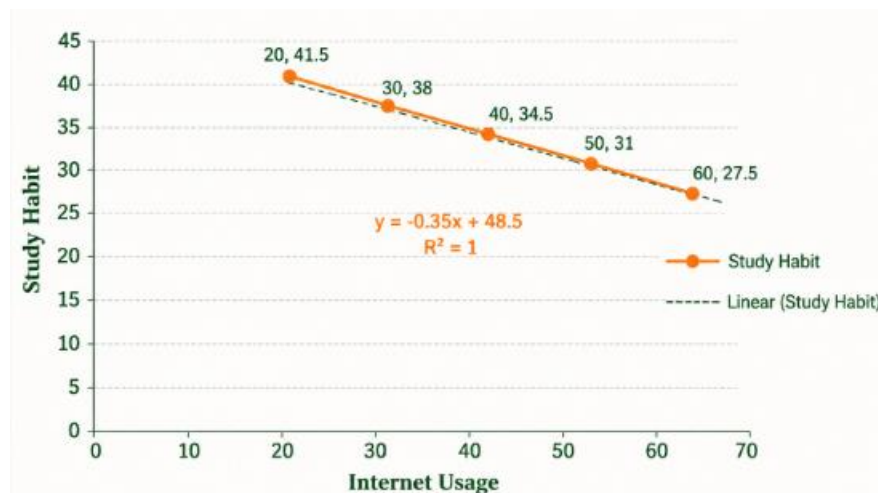


Fig 11: Impact of internet usage on study habits (Source: <https://journals.sagepub.com/doi/10.1177/20427530251379082>)

States with higher digital access generally record higher female literacy rates, indicating that digital infrastructure contributes to educational empowerment.

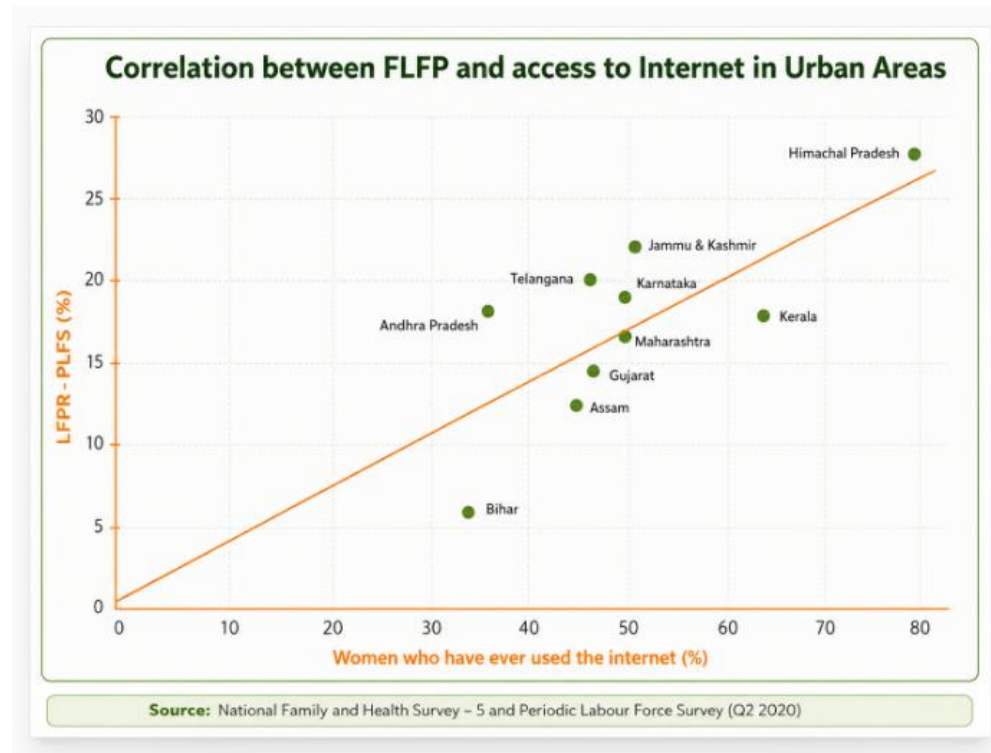


Fig 12: State-wise Female Labour Force participation in India  
 (Source: <https://www.councilonsustainabledevelopment.org/post/reimagining-india-s-female-labour-force-participation-a-policy-review>)

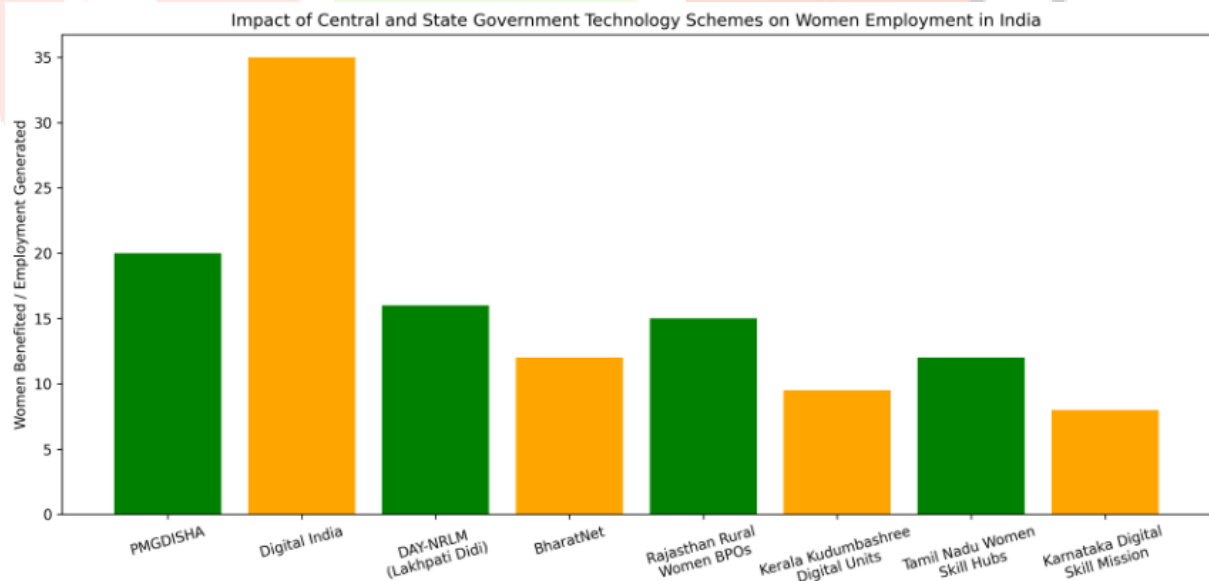


Fig 13: Impact of a few central and state govt. schemes on women employment in India

This trend demonstrates that increased digital access has been accompanied by a substantial rise in women’s participation in online learning, freelancing, entrepreneurship, and digitally enabled employment sectors.

## 7. Conclusion

The study confirms that technology plays a crucial role in reducing gender inequality and promoting women's empowerment in India. Digital platforms have enhanced access to education, employment, healthcare, and government services. However, technological progress alone cannot eliminate structural inequalities. Strengthening digital infrastructure in rural areas, expanding literacy programmes, ensuring affordable access, and promoting cyber safety are essential. Gender-sensitive policy frameworks and community-based initiatives must complement technological interventions. Future strategies should emphasize inclusive design, local language content, and capacity building. Coordinated efforts by government, private sector, civil society, and educational institutions are necessary to achieve sustainable and equitable digital development. Closing the digital gender gap is estimated to potentially pump an additional income in trillions of dollars into the global GDP, underscoring that digital access is not just a social goal, but an economic necessity.

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