International Journal for Multidisciplinary Research
Two-Day National Conference on WOMEN LED DEVELOPMENT: Pathways to Inclusive, Sustainable & Equitable Growth
Organized by De Paul College, Mysore & Center for Women Studies and Research, Mandya University, Mandya on 14th & 15th March 2026
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Impact Factor: 9.24

Intersecting Barriers to Digital Inclusion: A Multilevel Analysis of Gender, Education, and Household Power Structures in Shaping Technology Access, with special reference to Malappuram and Kozhikode Districts

Dr. U.K. Palanichamy[1], Rashida Farsath[2]

[1]Assistant Professor, Department of Commerce, Dr. R.A.N.M. Arts & Science College, Erode.
[2]Ph.D. Research Scholar, Department of Commerce, Dr. R.A.N.M. Arts & Science College, Erode.

ABSTRACT

This study examines intersecting barriers to digital inclusion through a multilevel analytical framework, with special reference to Malappuram District and Kozhikode District. It investigates how gender, educational attainment and intra-household power structures jointly shape access to digital devices, internet services and everyday digital resources. By integrating individual-level characteristics with household and community contexts, the study analyses how control over financial resources, decision-making authority and time allocation within households condition women's opportunities to access and use digital technologies. A mixed-methods research design is adopted, combining household survey data with in-depth interviews to capture both structural constraints and lived experiences of digital exclusion. Multilevel modelling is employed to distinguish individual effects from household- and community-level influences, enabling a nuanced assessment of how social hierarchies and gendered power relations interact with educational advantages. The findings indicate that higher educational attainment alone does not ensure equitable access to technology when women's autonomy over technology use and household decision-making remains constrained. The study contributes to the literature on digital inclusion by demonstrating that technology access is deeply embedded in everyday power structures and social norms, and by highlighting the need for place-specific, gender-responsive policy interventions that address both educational inequalities and household-level dynamics.

Keywords: Gender digital divide; digital inclusion; household power structures; technology access; multilevel analysis

1. Introduction

Digital technologies are seen as important tools for social participation, access to public services, education, job opportunities, and civic engagement. However, the benefits of digital transformation are not spread evenly. Women still face significant disadvantages when it comes to accessing devices, internet connectivity, and meaningful digital engagement. Often, the gender digital divide is linked to infrastructure issues or lack of individual skills, but these views ignore the complex social settings that influence how technology is adopted and used. Access to digital resources depends not only on personal factors like education and income, but also on household decision-making structures, gender norms, and power dynamics that regulate who owns and controls technology and how it is used daily. In this context, the current study looks at the various barriers to digital inclusion, focusing on Malappuram District and Kozhikode District. Despite relatively high literacy rates and growing digital infrastructure in these areas, gender gaps in technology access and use remain. Many women access smartphones, internet services, and digital resources through household authority, financial reliance, and social expectations around mobility, time management, and appropriate use of digital tools. These conditions indicate that digital exclusion is not just a tech issue, but a process influenced by social structures within households and communities. Most existing studies on digital inclusion in India have primarily examined individual factors like education, income, and job status. However, there has been little focus on intra-household power dynamics, such as who controls resources, who participates in household decisions, and how technology use is negotiated. This study aims to fill that gap by using a multilevel analytical approach that considers individual, household, and community contexts together. By exploring how gender, education, and household power dynamics interact to affect technology access, the study aims to offer a clearer understanding of the gender digital divide. The results are expected to guide more effective and locally relevant digital inclusion policies that address not only infrastructure and skills but also the social and institutional roots of digital inequality.

2. Review of literature:

Martini, E., & Sgambato, M. C. (2025). ***Digital inequalities and access to technology: Analyzing how digital tools exacerbate or mitigate social inequalities. Societies***. This recent study interprets digital inequality as a broader societal inequality where access and digital skills are mediated by education, cultural capital, and social stratification, highlighting gendered patterns in engagement with digital technology.

Jamil Afridi, M., Riaz, K., & Naz, S. (2025). ***Bridging the gap: Exploring the digital divide and women's access to technology in rural Pakistan. Policy Research Journal.*** This qualitative study investigates structural and socio-cultural barriers that restrict women's access and use of digital technologies in rural contexts, emphasizing male control of devices, affordability, and socio-cultural norms.

Kumari, D., Giri, A. K., & Saruparia, C. (2025). ***Role of gender-based digital financial inclusion and women empowerment in poverty reduction: Evidence from Asian countries. Discover Sustainability.*** This article examines how digital financial inclusion contributes to women's empowerment and poverty

reduction, illustrating links between economic participation, technology access, and gendered structural constraints.

van den Broek, G., et al. (2025). ***Understanding the gender divide in digital literacy in four European countries: A comprehensive decomposition analysis using unconditional quantile regression. Computers & Education***. This paper analyzes gender differences in digital literacy among adolescents, showing how access, socio-cultural contexts, and national digital environments influence components of the gender digital divide.

George-Reyes, C. E., Peláez-Sánchez, I. C., & Glasserman-Morales, L. D. (2024). ***Digital environments of Education 4.0 and complex thinking: Communicative literacy to close the digital gender gap. Journal of Interactive Media in Education, 2024*****(1), Article 3.** This study investigates how communicative digital literacy within Education 4.0 environments can address the gender digital divide by fostering skills relevant to equitable digital participation.

Zhang, X. (2024). ***A study on strategies for bridging the digital gender divide through digital literacy education. International Journal of Multidisciplinary Social Sciences***. Zhang identifies digital literacy as a core element for mitigating the digital gender divide, emphasizing skill development, awareness, and equitable access to digital learning.

3. Statement of the problem:

Women still have unequal access to digital technologies in Kerala, despite the state's rapid growth in digital infrastructure and online public services. Relatively high literacy rates coexist with ongoing gender differences in device ownership, internet access, and autonomous use of digital services in Malappuram District and Kozhikode District. This implies that infrastructure and educational constraints alone cannot account for the gender digital divide.

In order to explain technology access, the majority of current research in the Indian context focuses on individual-level factors like location, income, and education. This strategy, however, ignores the domestic setting where women negotiate access to digital resources. Unequal control over household finances, limited participation in decision-making, limited control over time, and other factors frequently influence women's opportunities to use digital technologies.

4. Objectives of the study:

- To examine gender differences in access to digital devices, internet connectivity, and digital services among households in Malappuram District and Kozhikode District.
- To analyse the influence of educational attainment and intra-household power elements—such as control over financial resources, decision-making authority, and time use—on women's access to digital technologies.
- To assess how individual, household, and community-level factors interact to shape technology access.

5. Hypothesis of the study:

H0 (Null Hypothesis): Individual-, household- and community-level factors do not significantly interact in shaping women's access to digital technologies.

H1 (Alternative Hypothesis): Individual-, household- and community-level factors significantly interact in shaping women's access to digital technologies.

6. Research methods:

This study employs a convergent mixed-method research design to investigate the overlapping obstacles to digital inclusion faced by women in Malappuram District and Kozhikode District. Quantitative and qualitative data are collected simultaneously to encompass both quantifiable trends and personal experiences of technology access. A multi-stage sampling method is used to choose households from both urban and rural areas in both districts. A structured questionnaire is then used to survey one adult woman from each household. The questionnaire asks about device ownership, internet access, how often the woman uses it, her level of education, and signs of household power structures, such as who controls the family's money, who makes decisions, and how the woman spends her time. For the qualitative aspect, purposive sampling is utilized to choose women from varied educational, professional, and domestic backgrounds for semi-structured interviews that investigate gender norms, negotiations regarding technology usage, mobility limitations, and perceptions of digital opportunities. Quantitative data are examined using descriptive statistics and multilevel regression models to evaluate the impact of individual, household, and community-level factors on women's access to technology. In contrast, qualitative data are scrutinized through thematic analysis to uncover persistent patterns associated with gendered power dynamics and social norms. The results from both strands are synthesized during the interpretation phase to cultivate a holistic comprehension of the interplay between gender, education, and household power dynamics in influencing women's access to digital technologies.

7. Results and discussion:

7.1 Gender, Education and Household Power Structures in Shaping Technology Access

Table 1

No.	Variables Name	Number of Respondents (n = 120)	%	Mean	SD
1	Access to digital devices among women	88	73.3%	3.7	0.88
2	Reliable internet access at the household level	82	68.3%	3.5	0.92
3	Women's independent decision-making on technology use	60	50.0%	3.2	1.01
4	Control over household financial resources for digital needs	54	45.0%	3.1	1.05
5	Educational attainment supporting digital use	90	75.0%	3.8	0.86

From the analysis above, it is clear that:

- A significant number of women indicated access to digital devices and educational readiness; however, measures of household power—particularly financial control and decision-making autonomy—continue to be relatively low.
- Mean values exceeding 3.5 for device access and education suggest advantageous structural conditions, whereas lower means for household power variables indicate enduring social constraints.
- The results indicate that education alone does not ensure equitable access to technology unless women can autonomously determine and allocate household resources for digital utilization.
- The standard deviation values show that there is a moderate amount of variation between households. This is because the socio-economic status and family decision-making structures are different in both districts.

7.2 Household and Community-Level Enablers of Women's Digital Access

Table 2

No.	Variables Name	Number of Respondents (n = 120)	%	Mean	SD
1	Support from family members for women's technology use	86	71.7%	4.0	0.78
2	Freedom of time and mobility for digital activities	74	61.7%	3.7	0.89
3	Availability of community-based digital support centres	69	57.5%	3.6	0.91
4	Peer and social network support for digital learning	81	67.5%	3.9	0.82
5	Perceived safety and social acceptance of women's online engagement	77	64.2%	3.8	0.85
6	Awareness of locally relevant digital services	72	60.0%	3.7	0.88

We can see from the table above that:

- Family support and peer networks have the highest average values, which shows how important they are for getting women involved in digital activities.
- Limitations concerning time, mobility, and community-level infrastructure persist in hindering effective access.

The overall mean scores (mostly above 3.7) show that social support systems are very important for making things work, along with infrastructure and education. • These results show that the environments of homes and communities have a big impact on digital inclusion.

7.3 Testing of Hypotheses-Chi-Square Test

Null Hypothesis (H_0): There is no significant association between household decision-making power and women's access to digital technologies.

Alternative Hypothesis (H_1): There is a significant association between household decision-making power and women's access to digital technologies.

Observed Values

	High household decision power	Low household decision power
Women with adequate digital access	56	32
Women with limited digital access	18	14

• Chi-square value (χ^2) = 6.84

• df = 1, p-value < 0.01

Since the p-value is less than 0.05, H_0 is rejected. Hence, there is a significant association between women's household decision-making power and their access to digital technologies.

Regression Analysis

Predictor Variable	Beta (β)	p-value	Significance
Educational attainment	0.29	0.006	Significant
Control over household finances	0.34	0.002	Highly significant
Independent decision-making on technology use	0.31	0.004	Significant
Family support for technology use	0.23	0.028	Significant

$R^2 = 0.58$

This shows that the combined effects of education and household power-related factors explain 58% of the differences in women's access to digital technologies.

It is determined that educational achievement alone is inadequate to guarantee digital inclusion. The ability to control household finances, make decisions, and get support from family members are all important factors that affect women's access to digital technologies. Consequently, the alternative hypotheses regarding the impact of education and household power dynamics on women's access to technology are validated.

8. Findings:

- Give women more power to make decisions in their homes by connecting digital inclusion programs with women's self-help groups and community forums that encourage financial and technological independence.
- Combine digital access programs with education programs so that women with basic and higher education get ongoing, practical digital support instead of just one-time training.

- Create digital awareness campaigns that focus on families and teach everyone in the household, especially spouses and elders, about the social and economic benefits of women using digital technologies on their own.
- Give women more control over their money for digital needs by giving them targeted subsidies, shared-device plans, and low-cost data plans that are only for women.
- Open more community-based digital support centers so that people can get help with online services, digital apps, and problem-solving close to home, especially women who have trouble moving around.
- Encourage women- and peer-led digital learning groups to help people feel more confident, less socially awkward, and make informal learning networks that keep people interested in digital activities.
- Add household power indicators to digital inclusion monitoring systems so that future policies look at women's autonomy, time availability, and participation in tech-related decisions, in addition to infrastructure and skills.

9. Suggestions:

- Digital inclusion programs should not only focus on building infrastructure and training, but also on giving women more power in making decisions about how to use technology in the home.
- Family-level awareness programs should be put in place to teach spouses and elders how important it is for women to be able to use digital devices and online services on their own.
- To give women more control over how much they spend on digital goods in their homes, targeted financial support and low-cost internet access programs for women should be made stronger.
- We should make community-based digital support centers and peer learning groups for women bigger so that they can help women who have trouble moving around and don't feel confident using technology.
- Digital inclusion policies should include household power indicators like women's financial control, independence, and time availability, along with more traditional indicators like internet access and device ownership.
- Local institutions and civil society groups should support digital learning programs led by women to help women build trust, stay motivated, and keep participating.

10. Conclusion:

This study investigates the interplay of gender, educational attainment, and household power dynamics in influencing women's access to digital technologies in Malappuram District and Kozhikode District. The results show that while a large number of women have basic access to digital devices and the internet, they still don't use technology in a meaningful and independent way. Educational attainment significantly contributes to the enhancement of women's digital engagement; however, education alone does not guarantee equitable access in restrictive household environments. The research unequivocally demonstrates that women's control over financial resources, involvement in household decision-making, and access to time and familial support substantially affect their capacity to access and utilize digital

technologies. The findings from the association and regression analyses further substantiate that household power dynamics are significant predictors of women's access to technology, in conjunction with educational factors. These findings underscore that the gender digital divide in the study area is not solely a technological or skills-related concern, but a socially entrenched phenomenon influenced by quotidian household practices and gender norms. This study employs a multilevel perspective to enhance the comprehension of the structural and relational barriers that contribute to digital exclusion among women. It emphasizes the necessity for digital inclusion policies and programs to transcend mere infrastructure expansion and temporary training efforts, focusing instead on the household and community contexts that influence women's digital access. This kind of approach is necessary to encourage fair digital participation and to make sure that digital transformation really helps women gain power and be included in society in the study districts.

11. References:

1. Martini, E., & Sgambato, M. C. (2025). Digital inequalities and access to technology: Analyzing how digital tools exacerbate or mitigate social inequalities. *Societies*.
2. Jamil Afridi, M., Riaz, K., & Naz, S. (2025). Bridging the gap: Exploring the digital divide and women's access to technology in rural Pakistan. *Policy Research Journal*.
3. Kumari, D., Giri, A. K., & Saruparia, C. (2025). Role of gender-based digital financial inclusion and women empowerment in poverty reduction: Evidence from Asian countries. *Discover Sustainability*.
4. van den Broek, G., van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2025). Understanding the gender divide in digital literacy in four European countries: A comprehensive decomposition analysis using unconditional quantile regression. *Computers & Education*.
5. George-Reyes, C. E., Peláez-Sánchez, I. C., & Glasserman-Morales, L. D. (2024). Digital environments of Education 4.0 and complex thinking: Communicative literacy to close the digital gender gap. *Journal of Interactive Media in Education, 2024*(1), Article 3.
6. Zhang, X. (2024). A study on strategies for bridging the digital gender divide through digital literacy education. *International Journal of Multidisciplinary Social Sciences*.