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The Digital Divide, Gender And Education – Challenges For E-Governance among the Tribes of Odisha

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Abstract

When we analyze the e-governance in the daily process of human life, it is so important to form a people's governance. In the current scenario, Technology Advancement plays a major role in every field of human life. From womb to tomb the human being is not only limited to being a social, political, economic, or cultural animal it also takes the role of a mechanical or technological animal. Technological advancement symbolizes the growth and development of human society towards a touchless society. If we make a close relationship from the past to the present where the men took the role of jungle men by staying in the jungle and depending on nature to now's present world i.e. a touchless world where there is the presence of Artificial Intelligence or Robotic Technology. Due to the presence of information and communication technology in the governance process the last time that was gone when people had to visit the office physically and wait for the service, now people can access all the needy services of the government from anywhere at any time without any delay and red-tapism. Society is run with technological advancement and trying to together all but the technological advancement creates a gap between haves and haves not. The digital divide is defined as the gap between individual to individual, place to place, and community to community at different socio-economic levels concerning both access to information and use of information and technologies and their use. There are demands for gender equality and equality of both men and women in every sphere of day-to-day life. With the rise of technology, the role of both men and women become crucial in every field. However, we need to know how the digital divide separates the marginalized class from the mainstream of society and it also gives scope for the gap between men and women, educated and uneducated in access to technology and the internet. The research paper discovers how gender and education are behind the presence of a digital divide among the tribal youth of Odisha that restricted them to e-governance.

Keywords: Digital Divide, Gender inequality, Educational Inequality, e-Governance

Introduction

The integration of information and communication technology with the governance process has significantly increased the service availability and offering of e-services to the people (Latupeirissa, et al., 2024). This transformation i.e. governance to e-governance with the advancement of information and communication technology, made the development and implementation of online services more effective and more cost effective. The proliferation of the internet, mobile phones, and digital gadgets enlarges the scope of e-governance that covers more and more individuals in the process of service delivery. E-Governance has emerged as a significant approach with the utilization of information and communication technology and available digital tools and platforms to deliver government services to the people with the end of improving transparency, efficiency, and accessibility (Geleta & Mishra, 2019). E-Governance or electronic Governance emphasizes on the use of information and communication in the process of day-to-day function of the government. The Government always tries to facilitate a well based proper service to the whole community of human being.

Digital Divide or Digital Gap is simply mean to a gap between the Haves and the Haves Not. It is a gap between the individuals, business and geographical location at different socioeconomic levels with regards to their opportunities to access information and communication technology and their use of internet for variety of activities (OCED, 2001). The Adivasi, or the socially deprived people are the earlier residents of the earth. The indigenous individual who lives in the marginalized areas have a unique culture, tradition, language, social system, and custom. They always maintain their distinct feature that always mainstreams society. Due to geographical barriers, they are not much more conscious of the ongoing process, policies, and programs of the government. Because of the absence of proper communication facilities, they are disconnected from the day-to-day social, economic, political, and cultural processes of mainstream society. The government always try to connect the marginalized class with the process of governance. However, absence of proper communication, and network connectivity the government did not achieve its desired cent percentage. Most of the tribal regions are not connected with the government process and those regions remain, the people have to walk more than 5 KM to get access to the services that the government avails in the way of e-governance. However, for the tribal areas where the network connectivity and affordability are very low, it sets a barrier in the process of accessing and delivering services to the needy. The absence of proper network connectivity and affordability in socially

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deprived areas is known as the digital divide where there is a discrepancy between the haves and the have-nots of the digital infrastructure and digital setup to access the services of the governance. Some of the media reports also highlighted that only 6 percent of households have internet connection facilities in rural Odisha. (Correspondence, 2020). Beyond the lack of proper network connectivity, the tribes are unable to afford the digital gadget and its use.

Besides the affordability and the issues of network connectivity issues, there is a presence of a digital divide due to different social and cultural aspects that vary across different geographical regions (Christopher G. Reddick, 2020). More particularly there is a gender digital divide that creates a gap between the male and female tribal individuals in access to digital gadgets and the internet as well as e-governance services. Chowdhury and Binder state that a gender gap in meaningful digital use accompanies the gender gap in digital access (Tyers-Chowdhury, 2022). They said that India accounts for half of the gender digital divide. Merely one-third of the internet users are women. Indian women are more likely less than 15 percent have own their mobile phone (Associate, 2021). More about that the tribal women are much less interested regarding education and access of information and communication technology. Due to traditional and cultural privileges, women's education and skills always become less important in tribal families. The family is mainly patriarchal, with less scope for education and the role of women is limited within the four wall of the home to serve the family. The government launched initiatives like Beti Bachao Beti Padhao, Sudakhya, Mission Shakti, PMGDISH, Digital India etc. for literacy, digital literacy, empowerment among women and inclusion of women in the day-to-day governance process. However, due to geographical location, absence of proper communication facilities, interest in women's education, and economic barriers it creates a gender divide. Women in tribal areas are more segregated from access to technology. They are in a disadvantageous position regarding using of ICT. In an unstarred question of Parliament, the Minister of Electronic and Information Technology replied to the question of Dr. Amar Patnaik regarding the steps taken by the ministry to address digital divide in the tribal areas, the measures taken by the government to make online education viable and feasible for tribal children in Odisha and schemes that launched by the government to address aforementioned issues. The respective Minister of concern Ministry replied that during the period 2014-2016, the Govt. of India had implemented the National Digital Literacy Mission (NDLM) and the Digital Saksharta Abhiyan (DISHA)

Literature Review and theoretical framework

The poor digital infrastructure, affordability issues, and cultural biases significantly hindered online education, especially for tribal girls (Nayak, 2022). The findings emphasize the need for rethinking the digital learning ecosystem and provide policy recommendations to address these educational inequalities. (Nayak, 2022). Bridging the digital divide is crucial for effective digital transformation, especially in education and business continuity during the Covid-19 crisis (Aissaoui, 2021). Equitable access to digital technologies is crucial for successful digitization, and policy interventions must address this issue to ensure that all segments of society can benefit from digital advancements (Harb, 2022). At the family and individual level, socio-economic and demographic disparities have led to a digital divide, resulting in unequal access to high-quality digital infrastructure, with some members being left behind due to affordability constraints. (Kanagawa & Toshihiko, 2008). Access to technology is only one aspect of the digital divide. Meaningful use of technology requires social inclusion, which may be achieved through literacy, education, and institutional support. The digital divide is portrayed as a multifaceted problem with social, cultural, and economic facets rather than being just a question of gadget ownership or internet connectivity (Warschauer, 2004).The gender-based digital gap, emphasizing the necessity to interpret statistics and inconsistencies in the data that is already accessible. The adoption of ICT by women in underdeveloped nations is impacted by systemic disparities pertaining to gender roles and socioeconomic position. To eliminate the gender-based digital divide, gender-aware digital policies are required (Hilbert, 2011).

Research Questions:

- How does digital literacy influence the ability of tribal women to access e-governance services in Odisha?
- What role do gender and educational disparities play in shaping digital exclusion among tribal communities?
- How do infrastructural and socio-cultural barriers affect the adoption of digital technologies among tribal women?
- What targeted strategies can bridge the digital divide and promote inclusive digital governance for marginalized tribal populations?

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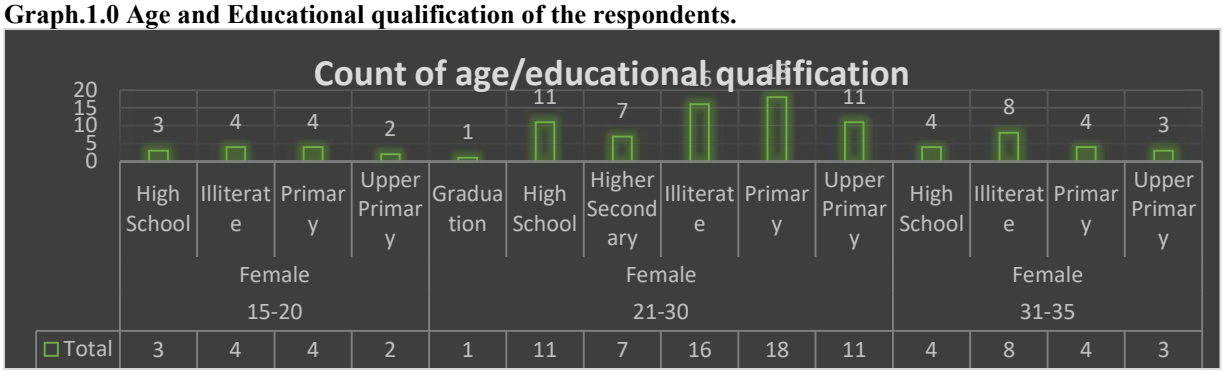
Graph.1.0 Age and Educational qualification of the respondents.



Objectives:
To examine how education and gender impact tribal women's access to digital technologies.
To analyze barriers to e-governance participation among tribal women.

Research Design and Methodology
Research Design
The present study adopts a descriptive research design with a quantitative methodology to explore the digital divide, gender, and education among tribal women in the Nabarangpur district of Odisha.

Study Area
The study was conducted in the Tentulikhunti and Nabarangpur Blocks of Nabarangpur District, Odisha. As per the 2011 Census, tribal communities constitute approximately 56 percent of the district's total population, with a tribal population of 681,173 (INDIA, 2011).

Literacy Profile
According to the 2011 Census, Nabarangpur district recorded an overall literacy rate of 77.87 percent, with male literacy at 84.93 percent and female literacy at 70.75 percent (INDIA, 2011). In urban areas, the literate population comprises 59,844 individuals, including 32,763 males and 27,081 females (INDIA, 2011).

Data Collection
Primary Data
Primary data was collected directly from respondents through individual interviews. A structured questionnaire was designed with close-ended questions, incorporating binary, Likert scale, and multiple-choice formats. The sample consisted of 96 tribal women between the ages of 18 and 35 years.
To ensure clarity and respondent understanding, the questionnaires were initially prepared in the Odia language and subsequently translated into Desia language. Before beginning each interview, the researcher provided a clear explanation of the study's purpose, objectives, and significance. Data collection started by recording the educational qualifications of the respondents and concluded by exploring geographical barriers in relation to the digital divide. After completion of the fieldwork, responses were translated into English using Microsoft Excel for further analysis.
Secondary Data
Secondary data was gathered from various government reports and the official websites of both the Central Government of India and the State Government of Odisha to complement and support the primary findings.

Tribes in Odisha
Among India's states and union territories, Odisha occupies a unique place in terms of tribes. Odisha is the homeland for the majority of Scheduled Tribes. As per the latest data of Census 2011, Odisha has the third highest percentage of tribal population in India after Madhya Pradesh and Maharashtra. Odisha. The census data showed that the state the tribes constitute 22.85 percent of the total population of the state and contribute 9.17 percent to the total tribal population of the country. About 64 different tribal communities speak as many as 21 languages and 74 dialects (SCSTRTI, 2018). Their ethnographic culture, dialects, traditions, and diverse socio-economic features create a unique place for the tribes. Among the hundreds of tribal communities, some communities are more isolated, archaic, vulnerable, deprived, and backward compared to other tribal communities. They are known as the Particularly Vulnerable Tribal Group (PVTG).

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The Government of India has identified fourteen numbers of PVTGs in Odisha through the Tribal Sub Plan under the 5th Five-Year Plan i.e. Birhor, Bondo, Chuktia Bhunjia, Didayi, Juang, Hill-Kharia, Dongria Kondh, Kutia Kondh, Lanjia Saora, Lodha, Mankirdia, Paudi Bhuyan, Saora (ODISHA, The PVTGs of Odisha, 2025). The Bhottoada, Gond, Paroja, Kandha, Omanatya, and Holva are the major tribes in Nabarangpur District (ODISHA, Nawrangpur, 2025). As per the government record, for the development of the tribes and tribal dominated districts, the government established nine numbers of Special Development Councils in nine tribal dominated districts, i.e. Mayurbhanj, Kendujhar, Sundergarh, Kandhamal, Gajapati, Koraput, Rayagada, Nowrangapur, and Malkangiri (SCSTRTI, 2018). The SDC covers 117 blocks, 2022 GPs, 18687 villages, and 14.05 lakh ST households of the above nine districts (SCSTRTI, 2018).

Image. 1.0: Districts with Special Development Council

Empirical Findings from the Study

There may be a digital gap on the basis of gender, education. Education and Gender are important determinants regarding the digital divide. As per the study, it analyzes the present of digital divide based on education and gender among the tribes by taking factors like availability of mobile phone, ability to operate mobile android phone, computer skills, digital gap among male and female, knowledge on ICT, accessibility of different government services through e-governance, financial transaction through UPI, accessibility of services through Common Service Center (CSC), e-Literacy etc. The study more specifically examined the educational qualification and gender with other factors to determine the existence of digital divide among the tribal women.

Table 1.0 Count of Educational Qualifications

Educational Qualification	Count
Graduation	1
High School	18
Higher Secondary	7
Illiterate	28
Primary	26
Upper Primary	16

The above table shows the numeric data regarding the educational qualification of tribal women. As per the data, 44 percent of tribal women have completed their formal education up to upper primary level, 26 percent have completed their education up to higher secondary, and only 1 percent have completed their graduation. Furthermore the 29 percent of tribal women are illiterate; they can't write or read.

Table1.2 Count of Respondents who have their mobile phone based on education

Educational Qualification	Own Mobile (Yes)	Do Not Own Mobile (No)	Total
Illiterate	17	11	28
Primary	16	10	26
Upper Primary	10	6	16
High School	15	3	18
Higher Secondary	7	0	7
Graduation	1	0	1

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Illiterate individuals (11) and those with primary education (10) represent the largest groups without mobile phones, while fewer respondents from high school (3) and upper primary (6) lack mobile access. On the other hand, mobile ownership is highest among illiterate individuals (17) and those with a high school education (15). The graduation category (1) appears to be underrepresented, likely due to a small sample size. Significant ownership is also observed among higher secondary (7) and primary (10) respondents. When comparing illiteracy and mobile ownership, more illiterate individuals own mobile phones (17) than those who do not (11), indicating growing mobile penetration regardless of educational background. Mobile access appears relatively balanced across different education levels, except for graduates, who are the least represented. The primary and upper primary groups exhibit a mixed pattern, with notable proportions both owning and not owning mobile phones.

Table1.3 Mobile phone ownership types by educational qualification

Educational Qualification	Android (Smartphone)	Keypad
Graduation	1	0
High School	9	6
Higher Secondary	7	0
Illiterate	7	10
Primary	9	7
Upper Primary	8	2

Smartphone (Android) Users: The majority of Android smartphone users have higher education levels, including Graduation (1), High School (9), and Higher Secondary (7). Interestingly, even illiterate individuals (ownership count not visible in full) and those with primary (not fully visible) or upper primary education own smartphones.

Keypad Phone Users: Keypad phone ownership is more common among individuals with lower educational qualifications. High school, illiterate, primary, and upper primary respondents own keypad phones, suggesting that those with lower education levels prefer simpler phones. People with higher education levels (Graduation, Higher Secondary, High School) tend to own Android smartphones, while those with lower education levels (Illiterate, Primary, Upper Primary) are more likely to own keypad phones. Some illiterate individuals own smartphones, indicating increasing digital accessibility even among those with limited formal education. Keypad phones remain in use among individuals with lower education, possibly due to affordability and ease of use.

Table 1.4 Respondents have Smartphone Operating Knowledge

Educational Qualification	Don't Know (%)	Know (%)	Total Respondents
High School	38.90 %	61.10%	18
Illiterate	89.30 %	10.70%	28
Primary	53.80 %	46.20%	26
Upper Primary	56.20 %	43.80%	16
Graduation	0.00%	100.00 %	1
Higher Secondary	0.00%	100.00 %	7

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Illiterate individuals struggle the most, with 89.3 percent unable to operate a smartphone. Graduates and Higher Secondary individuals have 100 percent smartphone literacy. Primary & Upper Primary levels show a mixed trend, with about 50 percent smartphone literacy. High school respondents have 61.1 percent proficiency, showing significant digital awareness.

Table1.5 Respondents have computer knowledge based on Education

Educational Qualification	No Training (%)	Yes Training (%)	Total Respondents
Graduation	100.00%	0.00%	1
High School	94.40%	5.60%	18
Higher Secondary	100.00%	0.00%	7
Illiterate	100.00%	0.00%	28
Primary	100.00%	0.00%	26
Upper Primary	93.80%	6.20%	16

The survey of 96 respondents revealed a severe digital divide, with only 2.1 percent having received computer training. The breakdown by education level shows a lack of training across all levels, including graduates (100 percent) and higher secondary students (100 percent). Illiterate and primary groups have zero training, while high school and upper primary groups show some hope with at least one person receiving training. To address this issue, recommendations include introducing digital literacy programs, government or NGO intervention, incorporating basic computer education in schools, and focusing on women and marginalized groups. These initiatives can help bridge the digital gap and ensure equal access to digital literacy for all. The findings highlight the need for urgent action to address the digital divide and promote digital inclusion.

Table 1.6 Gender and Digital Gap Data

Response	Count	Percentage (%)
Yes	56	58.33%
No	40	41.67%

The data analysis indicates that 58.3 percent of respondents agree that gender is a factor contributing to the digital gap between males and females, whereas 41.7 percent disagree. This suggests that a majority perceive gender-based barriers in accessing and utilizing digital resources. The digital gap can be influenced by socio-cultural norms, economic constraints, and educational disparities that limit women's access to technology. However, a significant portion (41.7 percent) does not consider gender a decisive factor, which may imply that other variables, such as economic background or geographical location, are also crucial. This mixed perception highlights the need for further investigation into the root causes of digital inequality and the implementation of inclusive policies to bridge the gap. Addressing these disparities through education, digital literacy programs, and policy reforms can help ensure equal opportunities for both genders in the digital space.

Table 1.7 Women and Digital Access

Response	Count	Percentage
Yes	69	71.88%
No	27	28.13%

The data shows that 71.9 percent of respondents agree that women must have digital access, whereas 28.1 percent do not support this view. The majority acknowledges the importance of digital inclusion for women, which is crucial for education, employment, and overall empowerment. However, the 28.1 percent who disagree indicate persisting societal or cultural barriers that restrict women's access to digital tools. Addressing these challenges through awareness programs, policy interventions, and affordable digital infrastructure can bridge the gender digital divide. Ensuring equal digital access will enhance women's participation in the modern economy and promote overall societal progress.

Table 1.8 Women and ICT Knowledge based on Education

Educational Qualification	ICT Knowledge - No (%)	ICT Knowledge - Yes (%)

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High School	16.67	2.08
Higher Secondary	3.13	4.17
Illiterate	29.17	0
Primary	25	2.08
Upper Primary	13.54	3.13
Graduation	0	1.04

The data shows that 87.5 percent of respondents lack ICT knowledge, while only 12.5 percent possess it. Among those without ICT knowledge, the largest group is illiterate (29.17 percent), followed by primary (25 percent) and high school (16.67 percent) educated individuals. This suggests that lower education levels correlate with a lack of ICT knowledge. Conversely, those with ICT knowledge are predominantly from higher secondary (4.17 percent), upper primary (3.13 percent), and high school (2.08 percent) backgrounds. A very small fraction (1.04 percent) of ICT-literate individuals hold a graduation degree. The results highlight a strong connection between education and ICT proficiency. Efforts should focus on integrating ICT training at all educational levels, especially among less educated groups, to bridge the digital divide.

Table 1.9 Women and Access to Government services through ICT

Educational Qualification	Aware (Yes)	Aware (No)	Total	% Aware
Illiterate	0	28	28	0.00 %
Primary	6	20	26	23.10 %
Upper Primary	5	11	16	31.30 %
High School	10	8	18	55.60 %
Higher Secondary	7	0	7	100.00%
Graduation	1	0	1	100.00%

The data reveals a strong correlation between educational qualification and awareness of accessing government websites. Among illiterate individuals, none are aware of how to access these sites. Awareness gradually increases with education: only 23.1 percent of those with primary education are aware, rising to 31.3 percent for upper primary and 55.6 percent for high school graduates. Notably, full awareness is observed among individuals with higher secondary education and above, reflecting 100 percent awareness in both categories. Overall, only 30.2 percent of the total respondents are aware, indicating a significant digital awareness gap, especially among those with lower educational backgrounds. Targeted digital literacy programs could bridge this divide.

Table 1.10 Women and knowledge of online payment through UPI based on Education

Educational Qualification	Unable to Use UPI (%)	Able to Use UPI (%)
Graduation	1.08	0
High School	13.98	5.38

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Higher Secondary	2.15	5.38
Illiterate	30.11	0
Primary	22.58	5.38
Upper Primary	13.98	0

According to the research, just 16.13 percent of respondents can use a UPI payment app to transfer money, whilst 83.87 percent cannot. The biggest percentage of people who are illiterate (30.11 percent) are followed by those with only a primary education (22.58 percent) and those who have completed high school (13.98 percent). This implies that a lack of digital financial literacy is correlated with poorer educational attainment. In contrast, the majority of those who are able to send money via UPI are primary-, higher-, and high school-educated (5.38 percent, 5.38 percent, and 5.38 percent, respectively). The findings highlight how crucial it is to advance digital financial literacy, particularly among undereducated populations. The results show a glaring digital gap, which calls for targeted financial technology training to boost the use of digital payments at all educational levels.

Table 1.11 Women and Awareness on CSC

Educational Qualification	CSC Awareness - No (%)	CSC Awareness - Yes (%)
High School	14.58	4.17
Higher Secondary	2.08	5.21
Illiterate	28.12	1.04
Primary	25	2.08
Upper Primary	13.54	3.12
Graduation	0	1.04

According to the research, just 16.67 percent of respondents are aware of Common Service Centers (CSCs), while 83.33 percent are not. Illiterate people are the most likely to be uninformed of CSCs (28.12 percent), followed by those with elementary education (25 percent), and high school education (14.58 percent). This suggests that those with less education have a sizable lack of digital awareness. On the other hand, those with higher secondary (5.21 percent), high school (4.17 percent), and upper primary (3.12 percent) education levels are more aware of CSCs. Just 1.04 percent of graduates and illiterate people are also aware of CSCs. This research emphasizes how important it is to raise knowledge of CSC, especially among the less educated people. Wider access to digital services may be ensured by bridging the knowledge gap through focused outreach campaigns and digital literacy efforts.

Table 1.12 Gender-Based Digital Access

Response	Count	Percentage (%)
Yes	65	67.71%
No	31	32.29%

According to the statistics, just 32.29 percent of respondents disagree with the statement that males in the household have greater access to digital technology than females, while 67.71 percent of respondents agree. This notable disparity draws attention to the perceived gender gap in the digital sphere, where men are thought to have greater access to and influence over digital tools and technology. Social standards, women's limited digital exposure, or a lack of investment in women's digital literacy might all contribute to this impression. The findings indicate that in order to lessen this digital disparity, gender-inclusive digital empowerment initiatives are required, guaranteeing equitable access and training opportunities for female household members.

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Table 1.13 Barriers to Women's Digital Access – Social & Economic Factors

Response	Count	Percentage (%)
Yes	64	66.67%
No	32	33.33%

According to the findings, 33.33 percent of respondents dispute that societal customs and financial constraints prevent women from using the internet, whereas 66.67 percent of respondents hold this view. This implies that financial constraints, patriarchal ideals, and cultural standards are generally seen as major obstacles preventing women from utilizing digital technology. These limitations may restrict women's access to economic and educational possibilities, hence perpetuating gender and digital inequality. Designing inclusive policies that encourage women's engagement in the digital sphere requires an understanding of these systemic constraints. Financial support systems, gender-sensitive computer literacy initiatives, and community awareness should all be the focus of interventions.

Table 1.14 Urban vs. Rural Women's Digital Access

Response	Count	Percentage (%)
Yes	58	60.42%
No	38	39.58%

According to the research, 60.42 percent of respondents think metropolitan women have greater access to internet resources than their rural counterparts, while 39.58 percent disagree. This suggests that there is a widespread belief that women's access to digital resources is divided between urban and rural locations. Higher levels of digital access may result from the improved infrastructure, education, and exposure to digital services that urban settings frequently provide. However, rural women may encounter obstacles such as insufficient digital literacy, poor connectivity, and sociocultural constraints that hinder their ability to interact with digital platforms. Targeted interventions in remote regions are necessary to close this gap, including initiatives for women's digital literacy, upgrades to digital infrastructure, and community support for women's engagement in the digital sphere.

Table1.15 Impact of Geographical Location on Digital Gap Among Women

Response	Count	Percentage (%)
Yes	66	68.75%
No	30	31.25%

The data shows that 31.25 percent of respondents disagree with the statement that geographic location has a significant role in the digital divide between women, while 68.75 percent of respondents agree. This demonstrates unequivocally the widespread belief that a woman's access to digital resources is greatly influenced by her residential location, whether it be urban or rural. The accessibility of training, the cost of digital tools, and the availability of digital infrastructure are frequently impacted by geographic differences. The digital gap is exacerbated for women in rural or isolated areas, who may face societal constraints, less educational possibilities, and poor internet connectivity. Localized initiatives are needed to close this gap, such as enhancing internet access in rural areas, setting up digital training at the community level, and addressing issues unique to a certain area that affect women.

Suggestion

Research and data analysis indicate that gender and education are the two main causes of social inequalities, particularly when it comes to involvement in the digital economy and access to digital services. Indigenous and underprivileged groups are most affected by the digital gap, which is made worse by gender inequality. Women have several obstacles while trying to access and use government e-services, especially those from rural and tribal areas.

One of the report's main conclusions is how gender significantly hinders indigenous communities' capacity to gain from e-governance programs. These populations are unable to engage in an increasingly digitalized administrative system due to a combination of factors, including poor educational attainment, economic

hardship, limited exposure to cellphones and computers, and a lack of digital literacy. For women, who are frequently disproportionately impacted by early marriage, traditional gender roles, and restricted mobility, this issue is made worse. Rural areas, particularly those with tribal inhabitants, are still generally cut off from ICT-based government, in contrast to metropolitan areas where digital penetration is comparatively greater. These villages are further isolated by the absence of essential infrastructure like transportation, internet access, and power. Thus, in addition to gender and education, physical location becomes a crucial element in widening the digital gap. The government must implement comprehensive, multifaceted policies that empower rural and tribal women in order to solve this urgent issue. This entails providing culturally sensitive, locally language-available, and customized e-learning and digital literacy programs in addition to guaranteeing access to formal education. In order to promote active involvement, these programs should also be offered via mobile units, community-based training facilities, and digital resource hubs run by women. To guarantee that government e-services are physically accessible to the underprivileged, additional Seva Kendras (service centers) must be built in rural and tribal areas. To promote diversity and trust, these centers should be manned by qualified individuals, including local women. The government should also make investments in the development of infrastructure, such as expanding internet networks and offering subsidies for reasonably priced digital gadgets. It is imperative that equal access to digital services be acknowledged as a basic right rather than a privilege. Digital literacy should be incorporated into the curriculum from a young age to ensure long-term sustainability, particularly in government-run and rural schools. Regardless of gender or origin, this will help cultivate a generation that is digitally literate and able to interact with e-governance systems. Additionally, the government has to create focused awareness efforts to educate the public—especially women—about the advantages and accessibility of e-services. Social stigmas should be addressed in these initiatives, and families should be urged to support women's access to digital services and education. Alternative service delivery methods, including community radio, satellite-based communication, and mobile vans, might temporarily fill the void left by infrastructure constraints that prevent digital services from being provided. Public-private partnerships should be investigated in the long run to introduce creative solutions to places that are difficult to access. In summary, closing the gender-based digital divide is a social and developmental necessity rather than only a technical problem. For all people, regardless of background, the promise of e-governance can only be fully fulfilled via inclusive, gender-sensitive, and location-specific solutions.

Ethical Statement

The paper has not been submitted to any other journals for simultaneous consideration. The submitted work is original and has not been previously published in any form or language, either partially or fully. It is not an expansion of past work.

The study not divided into different pieces in order to enhance the number of submissions and submit them to multiple journals or one publication. The submitted paper was clearly and honestly prepared without fabrication, falsification, or inappropriate data modification.

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