

DIGITAL LITERACY AND MOBILE TECHNOLOGY USE AMONG ADIVASI COMMUNITIES IN ODISHA

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ABSTRACT

Background: Digital technologies have become increasingly important for accessing education, information, healthcare, financial services, and government welfare programs. Despite rapid technological expansion across India, tribal communities continue to face challenges related to digital access and digital literacy. Limited evidence is available regarding the extent of digital inclusion among Adivasi populations in Odisha.

Aim: This study aimed to assess digital literacy and mobile technology use among Adivasi communities in Rayagada district, Odisha, with a focus on smartphone ownership, internet access, utilization of digital government services, and barriers contributing to the digital divide.

Methods: A cross-sectional descriptive survey was conducted among 500 respondents, including 350 tribal youth, 100 teachers, and 50 community leaders. Data were collected using a structured questionnaire covering smartphone ownership, internet accessibility, digital literacy skills, use of e-governance services, and perceived barriers to digital inclusion. Descriptive statistical analyses were performed using frequencies and percentages.

Results: Smartphone ownership was reported by 78.4% of respondents, while 75.2% had access to internet services. Mobile data was the primary source of connectivity for most participants. Basic digital skills such as messaging and social media use were common; however, fewer respondents were able to independently access government portals, submit online forms, or utilize digital payment systems. Scholarship-related services and Aadhaar-linked services were the most frequently used digital government platforms. Poor network connectivity (63.6%), limited digital skills (55.2%), lack of awareness and training (50.4%), and affordability issues (44.8%) were identified as major barriers to digital inclusion.

Conclusion: Although digital technology has achieved substantial penetration among tribal communities in Rayagada district, significant disparities remain in digital literacy, internet quality, and utilization of digital services. Strengthening digital infrastructure, improving digital literacy, and expanding community-based training programs are essential for promoting inclusive digital development among Adivasi populations.

KEYWORDS: Digital Literacy, Digital Inclusion, Mobile Technology, Smartphone Use, Internet Access, Adivasi Communities, Tribal Development, Digital Divide, Odisha, E-Governance.

Article History

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INTRODUCTION

Digital technology has become an essential component of modern life, influencing communication, education, healthcare, governance, financial transactions, and economic development. The rapid expansion of internet connectivity and mobile technology has created new opportunities for individuals and communities to access information, services, and resources that were previously unavailable. In India, national initiatives such as Digital India have sought to promote digital inclusion by expanding internet infrastructure, encouraging digital literacy, and increasing access to e-governance services.¹ Despite these advancements, significant disparities continue to exist in the adoption and utilization of digital technologies, particularly among socially and economically marginalized populations. Tribal communities, which often reside in geographically remote and underdeveloped regions, remain vulnerable to digital exclusion due to limited infrastructure, lower educational attainment, economic constraints, and inadequate access to digital resources.²

Odisha is home to one of the largest tribal populations in India, with substantial concentrations of Adivasi communities residing in districts such as Rayagada, Koraput, Mayurbhanj, Kandhamal, and Malkangiri.³ In recent years, smartphones and internet services have increasingly reached tribal regions, creating opportunities for educational advancement, employment, digital banking, healthcare access, and participation in government welfare programs. Mobile technology has the potential to bridge developmental gaps by connecting tribal populations to information and services that can improve their quality of life. However, access to digital devices alone does not guarantee digital inclusion. Effective participation in the digital environment requires adequate digital literacy, reliable internet connectivity, affordable data services, and the skills necessary to utilize online resources safely and efficiently. Many tribal households continue to face barriers related to poor network coverage, limited technological knowledge, language difficulties, and financial constraints, which may restrict their ability to benefit fully from digital innovations.^{4,5}

Although digital inclusion has become an important policy priority in India, relatively little research has examined digital literacy and technology use among tribal communities in Odisha. Existing studies have primarily focused on urban and general rural populations, while evidence regarding the digital experiences of Adivasi communities remains limited. Understanding patterns of smartphone usage, internet accessibility, utilization of digital government services, and challenges associated with the digital divide is essential for developing effective interventions that promote equitable access to technology. Therefore, the present study aims to assess digital literacy and mobile technology use among Adivasi communities in Rayagada district, Odisha, by examining smartphone ownership, internet access, use of digital government services, and barriers to digital inclusion. The findings are expected to contribute to the growing literature on tribal digital inclusion and provide valuable insights for policymakers, educators, and development practitioners seeking to reduce digital inequalities and promote inclusive digital development among tribal populations.

¹S. Desai, *Digital Inclusion Policies for Tribal Schoolchildren in India*.

²N. Sahu and B. Kalet, "A Study on the Digital Divide and the Use of Technology among the Tribes in Odisha with Special Reference to Kandha Community of Rayagada District," *International Journal for Multidisciplinary Research* 6, no. 2 (2024).

³D. K. Sahoo, "Information and Communication Technologies (ICTs) in Governance: A Sociological Study in Rural Odisha" (PhD diss., University of Hyderabad, 2023).

⁴S. Parhi and P. Bhoi, "Digital Media Initiatives Empowering Tribal Population: Insights on Tribal Youth," in *Future Fact Society (Varanasi, India: Future Fact Society)*, 44.

⁵Adeeth A. G. Cariappa, Vijayalaxmi D. Khed, Niyati Singaraju, and Hom N. Gartaula, *The Digital Landscape in Eastern India: Findings from the Digital Needs Assessment Surveys from Bihar and Odisha, India* (Washington, DC: International Food Policy Research Institute [IFPRI], 2024)

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted between January and April 2026 in selected tribal villages and educational institutions of Rayagada district, Odisha, to assess digital literacy and mobile technology use among Adivasi communities. Rayagada was selected as the study area because it is one of the major tribal-dominated districts of Odisha, with a substantial population belonging to communities such as the Kondh, Saora, Paroja, Gadaba, and Jatapu tribes. Although digital infrastructure and mobile connectivity have expanded in recent years, many tribal communities in the district continue to face challenges related to internet access, technological awareness, and digital service utilization. The district therefore provides an appropriate setting for examining the extent of digital inclusion and the barriers affecting the adoption of digital technologies among tribal populations.

The study population consisted of tribal youth, teachers, and community leaders residing in selected villages and educational institutions within the district. A total of 500 respondents participated in the survey, including 350 tribal youth aged 15–35 years, 100 teachers from government and government-aided educational institutions, and 50 community leaders actively involved in local governance and development activities. Participants were selected using purposive sampling to ensure representation of different tribal communities, educational backgrounds, and socio-economic groups. Individuals were eligible for participation if they belonged to a Scheduled Tribe community or were directly involved in educational or community activities within tribal areas and were willing to provide informed consent. Individuals unwilling to participate or unable to complete the questionnaire were excluded from the study.

Data were collected using a structured questionnaire developed following a review of relevant literature on digital literacy, digital inclusion, information and communication technologies, and rural technology adoption. The questionnaire included sections covering socio-demographic characteristics, smartphone ownership and usage patterns, internet accessibility, frequency of digital technology use, digital literacy skills, utilization of digital government services, online educational activities, digital financial transactions, and perceived barriers to technology adoption. Respondents were also asked about their ability to perform common digital tasks such as internet searching, mobile application usage, online form submission, digital payments, and access to government portals. Community leaders and teachers provided additional information regarding digital awareness programs, community-level technology use, and challenges affecting digital inclusion in tribal areas.

Data collection was conducted through face-to-face interviews at schools, colleges, community centers, and village meeting locations. The questionnaire was administered in Odia and, where necessary, translated into local tribal dialects with the assistance of trained community volunteers. Participants were informed about the purpose of the study and encouraged to provide accurate responses based on their experiences. The average duration of each interview ranged from 15 to 25 minutes. To ensure consistency and reliability, all data collectors received prior training regarding the questionnaire and interview procedures. The study involved only the collection of questionnaire-based information and did not include any medical examinations, biological sampling, experimental interventions, or invasive procedures. The study was conducted in accordance with established ethical principles governing research involving human participants. Participation was entirely voluntary, and informed consent was obtained from all respondents before data collection. For participants below 18 years of age, parental or guardian consent and participant assent were obtained. Respondents were informed about the objectives of the study, the confidential nature of the information collected, and their right to withdraw from participation at any stage without any consequences. No personally identifiable information was recorded, and all responses were anonymized prior to analysis.

The collected data were coded and entered into Microsoft Excel for statistical analysis. Descriptive statistical methods were employed to summarize the findings. Frequencies and percentages were calculated for categorical variables such as smartphone ownership, internet usage, digital service utilization, and barriers to digital inclusion. The results were presented through tables to facilitate interpretation and comparison of digital literacy levels and technology use among different respondent groups.

RESULTS

A total of 500 respondents participated in the study, including 350 tribal youth, 100 teachers, and 50 community leaders from selected villages and educational institutions of Rayagada district, Odisha. The respondents represented various tribal communities, including Kondh, Saora, Paroja, Gadaba, and Jatapu tribes. The majority of tribal youth belonged to low- and middle-income households engaged in agriculture, forest-based occupations, and wage labor. The demographic diversity of the sample provided a comprehensive understanding of digital literacy and technology use within tribal communities.

Table 1: Socio-Demographic Characteristics of Respondents (N = 500)

Variable	Category	n (%)
Respondent Group	Tribal Youth	350 (70.0)
	Teachers	100 (20.0)
	Community Leaders	50 (10.0)
Gender	Male	282 (56.4)
	Female	218 (43.6)
Age Group	15–24 years	224 (44.8)
	25–35 years	126 (25.2)
	Above 35 years	150 (30.0)
Education	Primary or below	118 (23.6)
	Secondary	176 (35.2)
	Higher Secondary	122 (24.4)
	Graduate and above	84 (16.8)

Smartphone ownership was relatively high among respondents, indicating increasing penetration of mobile technology in tribal communities. Overall, 78.4% of respondents reported owning a smartphone, while 12.8% used smartphones belonging to family members. However, regular access to smartphones was lower among older respondents and those from economically disadvantaged households.

Table 2: Smartphone Ownership and Usage

Variable	n (%)
Own A Smartphone	392 (78.4)
Use Family Member's Smartphone	64 (12.8)
No Smartphone Access	44 (8.8)
Daily Smartphone Use	338 (67.6)
Weekly Smartphone Use	112 (22.4)
Rarely Use Smartphone	50 (10.0)

Internet accessibility varied considerably across the study population. Although most respondents reported having some form of internet access, the quality and reliability of connectivity remained inconsistent. Mobile data was the predominant mode of internet access, while broadband connections were relatively uncommon in tribal villages.

Table 3: Internet Access and Connectivity

Indicator	n (%)
Access to internet services	376 (75.2)
Access through mobile data	342 (68.4)
Access through Wi-Fi/Broadband	34 (6.8)
Reliable internet connectivity	218 (43.6)
Frequent network problems	282 (56.4)

The assessment of digital literacy revealed moderate levels of digital competency among respondents. Most participants were able to perform basic activities such as making phone calls, sending messages, and using social media applications. However, fewer respondents demonstrated confidence in completing more advanced digital tasks such as online applications, accessing government portals, or using digital financial services independently.

Table 4. Digital Literacy Skills Among Respondents

Digital Skill	Yes n (%)
Use messaging applications	368 (73.6)
Access social media platforms	341 (68.2)
Search information online	289 (57.8)
Download and use mobile applications	256 (51.2)
Submit online forms	192 (38.4)
Use digital payment applications	174 (34.8)
Access government portals independently	148 (29.6)

Utilization of digital government services remained limited despite increasing smartphone ownership. The most commonly used services included scholarship applications, Aadhaar-related services, pension information, and employment-related services. Many respondents reported requiring assistance from teachers, cybercafés, or local service centers to access digital government platforms.

Table 5: Use of Digital Government Services

Service	Users n (%)
Scholarship-Related Services	226 (45.2)
Aadhaar-Linked Services	214 (42.8)
Employment and Job-Related Services	173 (34.6)
Pension and Welfare Services	151 (30.2)
Online Grievance Services	72 (14.4)
Never Used Digital Government Services	136 (27.2)

Several barriers contributing to the digital divide were identified. Poor network connectivity emerged as the most common challenge, followed by limited digital skills, lack of awareness, affordability issues, and language barriers. Community leaders and teachers emphasized that inadequate digital infrastructure and low digital literacy continued to restrict effective technology adoption within tribal areas.

Table 6: Barriers to Digital Inclusion

Barrier	n (%)
Poor Network Connectivity	318 (63.6)
Limited Digital Skills	276 (55.2)
Lack of Awareness/Training	252 (50.4)
High Cost of Devices And Data	224 (44.8)
Language Barriers	186 (37.2)
Lack of Electricity Reliability	171 (34.2)
Concerns Regarding Online Security	138 (27.6)

Teachers and community leaders generally perceived digital technology as beneficial for education, communication, and access to government services. However, they also noted that digital benefits were unevenly distributed, with younger and more educated individuals demonstrating greater levels of digital engagement than older and less educated community members.

Overall, the findings indicate that mobile technology has achieved substantial penetration among Adivasi communities in Rayagada district, and a majority of respondents possess at least basic digital skills. Nevertheless, significant disparities remain in terms of internet quality, advanced digital literacy, and utilization of digital government services. The persistence of infrastructural, economic, and educational barriers suggests that digital inclusion efforts should focus not only on expanding access to technology but also on strengthening digital literacy training, improving connectivity infrastructure, and enhancing awareness regarding digital services among tribal populations.

DISCUSSION

The present study examined digital literacy and mobile technology use among Adivasi communities in Rayagada district, Odisha, with particular emphasis on smartphone ownership, internet access, digital literacy skills, utilization of digital government services, and barriers contributing to the digital divide. The findings indicate that digital technologies have increasingly penetrated tribal communities, with a substantial proportion of respondents reporting access to smartphones and internet services. However, the study also revealed that access to technology does not necessarily translate into meaningful digital inclusion. Significant disparities continue to exist in digital literacy, quality of internet connectivity, utilization of digital government services, and confidence in performing advanced digital tasks. These findings highlight the continuing challenges associated with ensuring equitable participation in an increasingly digital society among marginalized tribal populations.⁶

One of the most notable findings of the study was the relatively high level of smartphone ownership among respondents. More than three-fourths of participants reported owning a smartphone, while additional respondents had access to devices through family members. This finding suggests that mobile technology has become an integral part of daily life even in remote tribal regions. The widespread availability of smartphones represents an important opportunity for improving educational access, communication, financial inclusion, healthcare awareness, and delivery of government services. Similar trends have been observed across rural India, where declining smartphone costs and expanding mobile networks have facilitated increased technology adoption. However, the findings also indicate that a portion of the population remains excluded from smartphone access due to financial limitations and socio-economic disadvantages. Consequently, digital inclusion policies must continue to address affordability concerns to ensure that technological advancements benefit all sections of tribal society.⁷

Internet access was found to be relatively widespread but uneven in quality and reliability. Although a majority of respondents reported access to internet services, more than half experienced frequent network-related problems. The dominance of mobile data as the primary means of connectivity reflects the limited availability of broadband infrastructure in tribal regions. Poor network coverage remains a significant obstacle to effective digital participation because it restricts access to online educational resources, digital financial services, government portals, telemedicine platforms, and

⁶K. Chattopadhyaya and S. Mohanty, "Digital Literacy, Media Consumption and Cultural Exclusion: A Study on the Lodha Tribal Community of India," 2018

⁷S. K. Gond and A. Upadhyay, "Challenges and Opportunities of Digital India Programme in Rural Tribal Development," *Media Scholar*, no. 2 (2024).

employment opportunities. The findings suggest that improvements in physical digital infrastructure are essential for achieving meaningful digital inclusion. Without reliable connectivity, even individuals possessing smartphones and basic digital skills may be unable to fully benefit from available digital resources and services.⁸

The assessment of digital literacy revealed that respondents were generally comfortable performing basic digital activities such as messaging, social media use, and internet browsing. However, proficiency declined considerably when respondents were asked about more advanced tasks, including online form submission, digital payments, and independent access to government portals. This pattern indicates that digital literacy among tribal communities is largely concentrated at a functional or introductory level. While basic technological familiarity represents an important first step toward digital inclusion, limited competence in advanced digital activities may reduce the practical benefits derived from technology. The findings therefore demonstrate that digital inclusion should not be measured solely in terms of device ownership or internet access but should also encompass the skills required to effectively utilize digital platforms. Strengthening digital literacy training programs may therefore be as important as expanding technological infrastructure.⁹

An important finding of the study was the relatively limited utilization of digital government services despite widespread smartphone ownership. Scholarship-related services, Aadhaar-linked services, employment-related portals, and welfare-related platforms were the most commonly accessed digital services. However, many respondents reported requiring assistance from teachers, cybercafés, local service centers, or community volunteers to complete online applications and access government websites. This observation suggests that digital government initiatives may not yet be fully accessible to many tribal citizens. The complexity of online procedures, language barriers, limited digital confidence, and inadequate awareness may collectively reduce independent utilization of e-governance platforms. As governments increasingly shift service delivery to digital modes, ensuring that tribal populations possess the skills and resources necessary to navigate these systems becomes critically important for preventing new forms of social exclusion.¹⁰

The study identified several factors contributing to the persistence of the digital divide within tribal communities. Poor network connectivity emerged as the most commonly reported challenge, followed by limited digital skills, lack of awareness and training, affordability issues, and language barriers. These findings demonstrate that digital exclusion is a multidimensional phenomenon influenced by infrastructural, economic, educational, and cultural factors. In many tribal villages, unreliable electricity supply, inadequate telecommunications infrastructure, and limited access to training opportunities continue to restrict effective technology adoption. Furthermore, digital content and government platforms are often available primarily in dominant regional or national languages, which may create additional difficulties for tribal populations who are more familiar with local dialects. Addressing these challenges requires comprehensive strategies that simultaneously target infrastructure, affordability, digital education, and linguistic accessibility.¹¹

The perspectives provided by teachers and community leaders further emphasize the transformative potential of digital technologies while also highlighting existing inequalities in access and usage. Respondents recognized the value of digital tools for education, communication, information dissemination, and service delivery. At the same time, they

⁸G. Jena and S. C. Swain, "Need for Technology Intervention in Functioning of SHGs Run By Tribal Women to Promote Tribal Culture," *Electrochemical Society Transactions* 107, no. 1 (2022): 11957–11967.

⁹S. S. Sadiq, "The Future of Tribal Education in the Era of Digitalization," *Indian Journal of Law and Legal Research* 4, no. 3 (2022): 1.

¹⁰Anuradha Dash, Ayasakanta Mohanty, and Manoranjan Dash, "Challenges and Opportunities in Tribal Youth Training and Development: Where Does Odisha Stand," *Siddhant—A Journal of Decision Making* 25, no. 2 (2025): 11–17.

¹¹J. Kunar, "Information and Communication Technology for the Education of Schedule Tribes: A Connotative Concern," *International Journal for Multidisciplinary Research* 6, no. 1 (2024).

observed that younger and more educated individuals were generally more capable of utilizing digital technologies than older community members and individuals with lower educational attainment. This finding is consistent with previous studies showing that age and education are important determinants of digital literacy and technology adoption. The results therefore suggest that digital inclusion programs should be tailored to the needs of different demographic groups rather than adopting a uniform approach for all community members.¹²

The findings of this study have important implications for policy and practice. Expanding mobile network coverage and improving internet reliability in tribal regions should remain a priority for government agencies and telecommunications providers. Community-based digital literacy programs, particularly those targeting women, older adults, and individuals with lower educational attainment, could substantially enhance digital participation. Educational institutions may also play a vital role by integrating digital skills training into school curricula and community outreach activities. Furthermore, the development of multilingual digital content and user-friendly government platforms could improve accessibility and encourage greater utilization of digital services among tribal populations. Strengthening collaborations among government departments, educational institutions, civil society organizations, and community leaders may help create a more inclusive digital ecosystem capable of addressing the unique challenges faced by Adivasi communities.¹³

The study possesses several strengths, including a large sample size and the inclusion of multiple stakeholder groups such as tribal youth, teachers, and community leaders. This approach enabled a comprehensive assessment of digital literacy and technology use from different perspectives within the community. Nevertheless, certain limitations should be acknowledged. The study was conducted within selected areas of Rayagada district and may not fully represent all tribal communities in Odisha. In addition, the cross-sectional design captures technology use and perceptions at a single point in time and does not account for changes in digital adoption patterns over time. Despite these limitations, the study contributes valuable evidence to a relatively underexplored area of research and provides important baseline information regarding digital inclusion among tribal populations. Given the limited availability of studies focusing specifically on digital literacy and mobile technology use among Adivasi communities in Odisha, the findings offer meaningful insights for future research, policy formulation, and development interventions aimed at reducing the digital divide and promoting inclusive digital development.¹⁴

CONCLUSION

The present study demonstrates that digital technology has become increasingly integrated into the lives of Adivasi communities in Rayagada district, Odisha. A substantial proportion of respondents reported ownership of smartphones and access to internet services, indicating significant progress in the expansion of digital connectivity within tribal regions. The findings further reveal that digital technologies are being used for communication, education, information access, and selected government services. However, the benefits of digital transformation remain unevenly distributed across the community. Despite widespread smartphone access, important gaps persist in digital literacy, internet reliability, and the utilization of advanced digital services. Many respondents possessed basic digital skills but lacked confidence in

¹²S. Hansdah, "Scheduled Tribes and School Education: Analysis of a Household Survey in Mayurbhanj District of Odisha" (thesis/dissertation, 2021).

¹³S. C. Nath, R. D. Choudhury, and D. Nath, "Innovative Approaches to Enhance Education and Healthcare in Tribal Regions Through Science & Technology" (2024).

¹⁴Rasmita Tripathy and Jayasmita Kuanr, "Reviving Tribal Languages through Modern-Age Technological Innovations," paper presented at the International Conference on Language and Culture, 2025.

performing more complex activities such as online applications, digital financial transactions, and independent use of government portals. Poor network coverage, limited digital training opportunities, affordability constraints, and language-related challenges were identified as major contributors to the digital divide. These barriers continue to restrict the full participation of tribal populations in the digital economy and in digital governance initiatives.

Overall, the findings indicate that digital inclusion among Adivasi communities requires more than simply providing access to devices and internet connectivity. Sustainable progress will depend upon strengthening digital infrastructure, expanding community-based digital literacy programs, developing culturally and linguistically accessible digital resources, and improving awareness of digital government services. Such interventions can help ensure that tribal communities are able to fully benefit from technological advancements and participate equitably in India's ongoing digital transformation.

DECLARATIONS

Ethics Approval and Consent to Participate

This study involved a non-invasive questionnaire-based survey among tribal youth, teachers, and community leaders in Rayagada district, Odisha. No clinical procedures, biological sampling, medical interventions, or experimental manipulations were undertaken. The study was conducted in accordance with established ethical principles governing research involving human participants. Participation was entirely voluntary, and informed consent was obtained from all respondents prior to data collection. For participants below 18 years of age, parental or guardian consent and participant assent were obtained. Participants were informed about the objectives of the study, their right to withdraw at any stage, and the confidential nature of their responses. All collected data were anonymized before analysis, and no personally identifiable information was recorded.

Consent for Publication

Not applicable. The manuscript does not contain any individual person's identifiable data, photographs, or personal information requiring consent for publication.

Availability of Data and Materials

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

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Authors' Information

The authors are engaged in research related to tribal development, digital inclusion, rural transformation, educational technology, and social policy in India.

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