

Digital Literacy and Social Capital in Rural Women

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Abstract— The expansion of mobile internet and digital government services into rural areas has created new opportunities for women to build and mobilize social capital, yet persistent gaps in digital literacy continue to constrain how fully rural women can participate in this transformation. This paper examines the relationship between digital literacy and social capital among rural women, drawing on development studies, gender and technology research, and social capital theory to interpret how digital skills shape rural women's access to information, economic opportunity, and community networks. Using a qualitative, literature-based approach, the paper synthesizes classical social capital theory with contemporary empirical research on the gender digital divide, digital literacy interventions, and rural women's technology use in South Asia, China, and other developing-country contexts. The paper argues that digital literacy functions as a critical precondition for the conversion of digital access into meaningful social capital, enabling rural women to extend bonding ties within family and community while also building new bridging ties to markets, institutions, and information networks beyond the village. At the same time, the literature indicates that entrenched sociocultural norms, unequal household bargaining power, and inadequate contextualized training continue to limit the social capital returns to digital access for many rural women. The paper concludes with implications for digital literacy programming and policy design aimed at converting digital inclusion into durable social capital gains for rural women.

Keywords— digital literacy, social capital, rural women, gender digital divide, digital inclusion, women's empowerment

Introduction

Digital technologies have become deeply embedded in rural economic and social life over the past two decades, driven by the rapid expansion of mobile phone networks, falling smartphone prices, and the growth of digital government and financial services. For rural populations historically underserved by physical infrastructure, digital connectivity holds particular promise as a means of accessing markets, information, and institutional services that were previously available only through costly travel to urban centers. This promise, however, has been unevenly realized, and one of the most persistent patterns documented in the literature is a pronounced gender gap in digital access, skills, and use, commonly referred to as the gender digital divide (Antonio & Tuffley, 2014).

Rural women occupy a particularly disadvantaged position within this broader pattern. They typically face compounded barriers to digital inclusion arising from lower baseline literacy and education, more limited household bargaining power over shared devices, restrictive sociocultural norms governing women's mobility and technology use, and a scarcity of digital literacy training programs designed with rural women's specific constraints in mind (Kumar, Kumar, & Devi, 2024). At the same time, a growing body of empirical research suggests that



when rural women do acquire digital skills, meaningful benefits follow, including expanded access to information, greater participation in non-agricultural employment, and strengthened social and institutional networks (Duan & Dong, 2025).

This paper examines these dynamics through the conceptual lens of social capital, understood as the networks, norms, and trust that enable individuals to draw on their social relationships for information, support, and opportunity (Putnam, 2000). It asks how digital literacy, understood not merely as basic device operation but as the broader capacity to use digital tools purposefully and critically, shapes rural women's ability to build, maintain, and mobilize social capital. The paper proceeds as follows. It first reviews the literature on the gender digital divide, digital literacy interventions, and social capital theory as applied to rural and developing-country contexts. It then presents a theoretical framework combining social capital theory with the digital literacy and digital divide literatures. It describes the paper's literature-based methodology before turning to a thematic discussion of how digital literacy shapes bonding social capital within family and community, bridging social capital connecting rural women to markets and institutions, and the persistent barriers that limit these gains. The paper concludes with implications for digital literacy programming and policy.



Literature Review

Robert Putnam's foundational work on social capital defined the concept as the networks, norms of reciprocity, and trust that facilitate coordination and cooperation for mutual benefit, and distinguished between "bonding" social capital, the strong ties within homogenous groups such as family and close community, and "bridging" social capital, the weaker but more diverse ties that connect individuals to people and resources outside their immediate social circle (Putnam, 2000). Although Putnam's original analysis was concerned primarily with civic associational life in the United States, the bonding and bridging distinction has since been widely applied in development

studies to analyze how rural and marginalized populations access resources and opportunities through their social networks. Later communication research extended this framework directly into digital contexts, finding that digital platforms could support the maintenance and expansion of bridging social capital in particular, by lowering the cost of sustaining loose, geographically or socially distant ties (Ellison, Steinfield, & Lampe, 2007).

The gender digital divide literature provides an essential backdrop for understanding rural women's digital experiences. Antonio and Tuffley's (2014) widely cited review found that women in developing countries have significantly lower rates of technology access and use than men, a pattern the authors attribute to entrenched sociocultural attitudes about women's appropriate social roles, alongside more direct barriers such as lower disposable income, lower baseline literacy, and restrictions on women's independent mobility and internet use. Their review also emphasized that when women in developing countries do gain meaningful access to internet technology, a wide range of personal, family, and community benefits become possible, with access to online education functioning as a particularly important gateway that can set in motion a positive feedback loop of further empowerment.

Research focused specifically on rural India has extended this analysis into the domain of digital literacy and social participation. Gurumurthy and Chami's (2018) research on digital literacy and gender in rural India argued that meaningful digital inclusion requires attention not only to physical access to devices and connectivity but to the skills, confidence, and social permission needed for women to use digital technologies for substantive participation in economic and civic life, rather than only for limited, socially sanctioned purposes such as communicating with family members. This distinction between access and meaningful use recurs throughout the literature and is central to understanding why expanded mobile phone ownership among rural women has not automatically translated into equivalent gains in information access, economic opportunity, or social network expansion.

A recent quantitative study by Kumar, Kumar, and Devi (2024), based on a survey of 250 rural participants in Himachal Pradesh, India, found a significant positive relationship between digital literacy and women's empowerment, with education emerging as a particularly important factor shaping women's digital skill acquisition. Their findings using structural equation modeling reinforce the broader literature's emphasis on digital literacy, rather than mere access, as the operative mechanism connecting digital technology to tangible improvements in women's agency and social participation.

Research from China offers a complementary large-scale quantitative perspective on these dynamics. A recent study using nationally representative panel data from the China Family Panel Studies found that digital literacy significantly increases rural women's participation in non-agricultural employment, operating through pathways that include expanded human capital, improved access to information, and reduced time spent on unpaid household labor, with the employment-promoting effect of digital literacy found to be particularly pronounced for the rural female labor force relative to men. This research situates digital literacy within a broader dual-pathway framework combining social learning theory and digital empowerment theory, suggesting that digital skill acquisition operates simultaneously through psychological pathways, such as increased self-efficacy and confidence, and through more direct informational and economic pathways.

Complementary research on rural women's engagement with e-government services provides further insight into how digital literacy interacts with existing social structures. Duan and Dong's (2025) study of rural Chinese women's e-government usage behavior found that digital literacy shaped both the perceived usefulness and perceived ease of use of digital government platforms, and that this relationship was moderated by women's political and occupational status, such as membership in local political or administrative bodies. Their findings suggest that women with greater pre-existing social capital and institutional exposure, for instance through party membership or cadre roles, are better positioned to convert digital literacy into effective engagement with digital institutions, indicating a potentially self-reinforcing relationship in which existing social capital shapes the returns to digital literacy, which in turn generates further social capital.

Finally, qualitative research on rural women's digital literacy experiences in other national contexts underscores the importance of localized, life-history approaches to understanding digital inclusion. Qualitative research examining rural women's access to digital technologies for reading and writing in the American South similarly found that infrastructural barriers, limited and unreliable internet access, interacted with generational and educational factors to shape whether rural women could translate digital access into meaningful digital literacy and participation. Together, this literature indicates a broadly consistent finding across highly varied national contexts: digital access alone is insufficient to generate social capital gains for rural women, and digital literacy, understood as a socially embedded capability rather than a purely technical skill, is the more proximate determinant of whether digital technologies translate into expanded networks, information access, and social participation.

Theoretical Framework

This paper draws on two complementary theoretical traditions to interpret the relationship between digital literacy and social capital among rural women. The first is Putnam's (2000) social capital framework, particularly the distinction between bonding social capital, the strong, emotionally supportive ties within family and close community, and bridging social capital, the weaker but more diverse ties that connect individuals to markets, institutions, and information networks beyond their immediate community. This distinction is analytically useful because digital technologies appear to affect these two forms of capital differently: mobile phones and messaging applications often first reinforce existing bonding ties within the family and village, since these are typically the socially sanctioned uses of technology available to rural women, while more substantive digital literacy, including the ability to navigate government platforms, search for market information, or participate in online networks beyond the local community, is required to generate bridging social capital.

The second theoretical strand is the digital divide and digital literacy literature, which distinguishes between first-level divides in physical access to devices and connectivity, second-level divides in the skills and capabilities needed to use digital technologies effectively, and third-level divides in the tangible social and economic outcomes that result from digital use (Antonio & Tuffley, 2014; Gurumurthy & Chami, 2018). This framework is essential for understanding why closing the first-level access gap, for instance through subsidized smartphones or expanded rural connectivity infrastructure, does not automatically close the second- and third-level gaps in skills and outcomes. Combining these two frameworks suggests a conceptual model in which digital access is a necessary but insufficient condition for social capital gains; digital literacy functions as the critical mediating capability that determines whether access to digital technology is converted into expanded bonding ties, new bridging ties, or, in the absence of adequate literacy and social permission, no meaningful change in a rural woman's social network at all.

Methodology

This paper adopts a qualitative, literature-based methodology in the form of an integrative narrative review. Sources were selected according to three criteria: theoretical significance within social capital theory or digital divide research, direct empirical relevance to digital literacy or digital technology use among rural or developing-country women, and verifiability through peer-reviewed journals, university presses, or established academic publishers. Foundational theoretical sources, including Putnam's social capital framework and



Ellison, Steinfield, and Lampe's research on social capital in digital contexts, were combined with empirical studies focused specifically on rural women's digital literacy and technology use, including large-scale quantitative research from China published in *Economies* and SAGE Open, survey-based research from rural India published in *Global Knowledge, Memory and Communication*, the widely cited gender digital divide review by Antonio and Tuffley published in *Future Internet*, and Gurumurthy and Chami's research on digital literacy and gender in rural India published in *Gender, Technology and Development*. This approach allows the review to triangulate across theoretical, large-scale quantitative, and localized qualitative research traditions. As with all narrative reviews, this method does not support causal claims across all contexts and is limited by the scope of the literature selected; its purpose is instead to organize existing research into a coherent account of how digital literacy shapes social capital among rural women.

Digital Literacy and Bonding Social Capital within Family and Community

The literature indicates that mobile phones and basic digital literacy most commonly first affect bonding social capital, the close, emotionally supportive ties within the family and immediate community. For many rural women, initial engagement with digital technology is mediated through family relationships and remains focused on maintaining contact with migrant family members, coordinating household responsibilities, or communicating within existing kin networks, uses that are typically more socially sanctioned than more autonomous or public-facing digital activities (Gurumurthy & Chami, 2018). This pattern reflects the broader finding in the gender digital divide literature that women's technology use in developing-country contexts is frequently shaped and constrained by prevailing sociocultural norms about appropriate female behavior, with unsupervised or extensive internet use by women sometimes viewed with suspicion by other family or community members (Antonio & Tuffley, 2014).

Even within this constrained domain, however, the literature suggests that digital literacy can meaningfully strengthen bonding social capital. Improved digital skills allow rural women to participate more actively in family decision-making processes that increasingly involve digital tools, such as mobile banking, digital government benefit applications, or children's remote schooling, thereby reinforcing their position and perceived value within the household network rather than leaving them dependent on other family members to mediate these interactions. The Himachal Pradesh survey research by

Kumar, Kumar, and Devi (2024) found that digital literacy was associated with measurable increases in women's overall empowerment, a construct that in their study included dimensions of household decision-making participation consistent with strengthened bonding social capital.

Digital Literacy and Bridging Social Capital beyond the Village

Beyond the household and immediate community, the literature identifies digital literacy as a critical determinant of whether rural women can build bridging social capital, connections to markets, government institutions, and information networks beyond their local social circle. The China-based research on non-agricultural employment provides strong quantitative evidence for this pathway, finding that digital literacy significantly expands rural women's access to information about employment opportunities and markets outside the immediate village economy, thereby increasing their participation in non-agricultural work and reducing their economic dependence on purely local, agriculturally based social and economic networks.

Duan and Dong's (2025) research on e-government usage provides a particularly clear illustration of digital literacy's role in building institutional bridging capital. Their findings that digital literacy shapes rural women's ability and willingness to engage with digital government platforms suggest that digital skills function as a gateway to a form of institutional social capital, the ability to access government services, entitlements, and information channels, that would otherwise require costly in-person travel and navigation of bureaucratic processes less accessible to women with lower literacy or mobility. Notably, their finding that women with greater existing social or political capital, such as party membership or local leadership roles, derive greater benefit from digital literacy suggests that bridging social capital gains from digital literacy may be unevenly distributed even among rural women, compounding rather than equalizing pre-existing social advantages unless deliberately counteracted through inclusive programming.

Persistent Barriers to Converting Digital Access into Social Capital

Despite these documented benefits, the literature consistently identifies significant barriers that limit how fully rural women can convert digital access into social capital gains. The most frequently cited barrier is the gap between mere digital access and substantive digital literacy: rising smartphone ownership among rural women has not been matched by equivalent gains in the skills and confidence needed to use these devices for

information-seeking, economic participation, or civic engagement, rather than only for basic communication (Gurumurthy & Chami, 2018). A second barrier involves household-level control over shared devices and data plans, which frequently privileges male family members' internet access and use over that of women, constraining women's opportunities to independently practice and develop digital skills.

A third barrier concerns the design and availability of digital literacy training itself. The literature notes that many digital literacy interventions have not been designed with rural women's specific constraints in mind, including limited time due to household and agricultural labor responsibilities, lower baseline print literacy, and the need for training environments that are perceived as safe and socially acceptable for women's participation (Kumar, Kumar, & Devi, 2024). Finally, infrastructural constraints, including unreliable electricity, limited network coverage, and the cost of data, continue to disproportionately affect rural populations generally and rural women in particular, given their generally lower independent income and reduced bargaining power over household technology expenditures.

Discussion

Taken together, the literature reviewed in this paper suggests that the relationship between digital literacy and social capital among rural women should be understood as a conditional and unevenly distributed process rather than an automatic consequence of expanding digital access. Digital literacy appears to function as the critical mediating variable that determines whether digital access translates into meaningful social capital gains, consistent with the broader digital divide literature's distinction between access-level and outcome-level digital inequality (Antonio & Tuffley, 2014). Where digital literacy is present, the literature documents genuine gains in both bonding social capital, through strengthened participation in family and community decision-making, and bridging social capital, through expanded access to markets, employment information, and government institutions (Kumar, Kumar, & Devi, 2024; Duan & Dong, 2025).

At the same time, the finding that pre-existing social or institutional capital appears to moderate the returns to digital literacy, as in Duan and Dong's (2025) research on political and occupational status, raises the concern that digital literacy interventions alone may reinforce rather than reduce existing inequalities among rural women unless they are deliberately designed to reach women with the least pre-existing social capital. This suggests that digital literacy programming should

be understood not as a standalone technical intervention but as one component of a broader social capital-building strategy that also addresses household bargaining power, community norms around women's technology use, and the accessibility of training programs to the most socially and economically marginalized rural women.

Implications for Digital Literacy Programming and Policy

The findings synthesized in this review carry several implications for organizations and governments designing digital literacy interventions for rural women. First, programming should move beyond narrow, device-operation training toward curricula that build the confidence and practical skills needed for substantive digital participation, including navigating government service platforms, searching for market and employment information, and engaging in online financial transactions, rather than training limited to basic messaging and calling functions (Gurumurthy & Chami, 2018). Second, given the evidence that household-level control over shared devices constrains women's independent digital practice, programs may need to work simultaneously at the household level, engaging male family members and community leaders to build support for women's independent technology use, rather than targeting women in isolation from the household and community structures that shape their access.

Third, the finding that pre-existing social and institutional capital moderates the returns to digital literacy suggests that programs should specifically prioritize outreach to rural women with the least pre-existing institutional exposure, such as women without local leadership roles or political affiliations, since these women appear least likely to benefit from digital literacy gains without additional support (Duan & Dong, 2025). Finally, given persistent infrastructural barriers, digital literacy programming is unlikely to generate its full potential social capital benefits unless paired with continued investment in reliable rural connectivity and affordable data access, since even highly skilled users cannot convert digital literacy into social capital without functioning infrastructure to support consistent digital engagement.

Conclusion

Digital literacy plays a central role in determining whether the expansion of digital access to rural areas translates into genuine social capital gains for rural women. The evidence reviewed in this paper indicates that digital literacy can strengthen both bonding social capital within the family and community and bridging social capital connecting rural women to markets, employment opportunities, and government institutions beyond



the village, but that these gains remain constrained by persistent gaps between access and substantive digital literacy, unequal household control over technology, inadequately contextualized training programs, and continuing sociocultural restrictions on women's independent technology use. Future research should continue to investigate how digital literacy interventions interact with pre-existing social capital and institutional exposure, to ensure that digital inclusion efforts do not inadvertently privilege rural women who already possess greater social and political capital. Policy and programmatic responses should treat digital literacy not merely as a technical skill-building exercise but as an intervention embedded within, and shaped by, the broader social structures that govern rural women's access to networks, information, and opportunity.

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