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Digital Inclusion for Elderly Communities in Rural Spain Barriers, Opportunities, and Pathways to Social Integration

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ABSTRACT

This study examines digital inclusion challenges faced by elderly populations in rural Spain, exploring the multifaceted barriers that prevent older adults from accessing and effectively utilizing digital technologies. As Spain experiences rapid digitalization alongside significant demographic aging, rural elderly communities face compounded disadvantages stemming from limited infrastructure, insufficient digital literacy, and socioeconomic constraints. Through qualitative interviews with fifteen elderly participants in rural Madrid and thematic analysis of their experiences, this research identifies critical factors affecting digital inclusion including resource access, skills gaps, and motivational barriers. Findings reveal that while Information and Communication Technologies facilitate social participation and reduce loneliness through video communication, significant obstacles persist in technology adoption. The study proposes targeted interventions focusing on community-based training, intergenerational learning

models, and accessible service design to bridge the digital divide and promote active aging in rural contexts.

INTRODUCTION

The intersection of rapid technological advancement and population aging has created unprecedented challenges for elderly communities worldwide, with rural populations experiencing particularly acute forms of digital exclusion (Li & Kostka, 2024). In Spain, where adults aged 65 and above constitute an increasingly significant demographic segment, the digital divide has emerged as a critical barrier to social participation, healthcare access, and overall quality of life. According to recent data, only 56.3% of Spanish adults between 65 and 74 years utilize the internet daily, with this percentage dropping dramatically to 25.9% for those aged 75-84 and merely 8.7% for individuals over 85 (Sánchez-Valle et al., 2023). These statistics underscore a pressing need to understand and address the complex factors contributing to digital exclusion among Spain's elderly population, particularly in rural areas where infrastructure limitations and socioeconomic constraints compound accessibility challenges.

Rural elderly populations in Spain face distinctive barriers that differentiate their experiences from urban counterparts. Research indicates that geographical isolation, combined with limited broadband infrastructure and reduced access to technical support services, creates a perfect storm of digital disadvantage (Fernández-Ardèvol, 2024). Van Deursen and Helsper (2016) emphasize that as internet pervasiveness increases across society, the gap between urban and rural residents persists, particularly affecting older populations who lack both technical resources and digital competencies. The digital divide in rural Spain is not merely a matter of connectivity but encompasses multiple dimensions including access to appropriate hardware, availability of user-friendly interfaces, and opportunities for skill development tailored to the specific needs and capabilities of older adults.

The COVID-19 pandemic dramatically highlighted both the potential benefits and acute challenges of digital technologies for elderly populations. During periods of social isolation, digital tools became essential for maintaining family connections, accessing healthcare services, and obtaining necessary goods and services (Balki et al., 2023). However, this crisis also revealed that many older adults, especially those in rural areas, lacked the digital skills and resources necessary to fully participate in an increasingly digitalized society. Shah et al. (2020) document how the pandemic created a "pandemic of lockdown loneliness" wherein those without digital access or competence experienced heightened isolation and reduced access to essential services. This dual reality demonstrates that while technology offers tremendous potential for enhancing elderly wellbeing, its benefits remain unevenly distributed across demographic and geographic lines.

Digital inclusion frameworks have evolved to recognize that mere access to technology is insufficient for meaningful participation in digital society. DiMaggio and Hargittai (2001) identified five critical dimensions of digital inequality: variation in technical equipment, autonomy of use, skill levels, social support availability, and purposes for which technology is employed. For elderly populations in rural Spain, these dimensions manifest through inadequate infrastructure, limited economic resources for device acquisition, insufficient training opportunities, isolation from technical support networks, and unclear understanding of how digital tools can enhance daily life (Friemel, 2016). The cumulative effect of these barriers creates what scholars term "second-level" digital divides, wherein disparities in skills and usage patterns become more salient than simple access gaps (Muhsyanur et al., 2022).

Technological support services and community-based interventions have emerged as promising approaches to addressing digital exclusion among older adults. Neves and Amaro (2012) demonstrate that structured learning environments, when designed with consideration for older adults' specific needs and learning preferences, can significantly improve digital competence and confidence. In the Spanish context, programs that combine technical instruction with social support have shown particular efficacy in promoting sustained technology adoption. The integration of digital literacy training within existing community structures such as senior centers, libraries, and educational institutions creates accessible pathways for skill development while simultaneously reducing the psychological barriers that often impede older adults' willingness to engage with unfamiliar technologies.

The benefits of digital inclusion extend far beyond simple connectivity, encompassing improvements in health outcomes, social capital, and overall quality of life. Cotten et al. (2013) found that internet use among older adults significantly reduces loneliness and increases contact with others, while Choi and DiNitto (2013) documented associations between technology use and improved physical and mental wellbeing. For rural elderly populations in Spain, where geographic isolation and limited service availability create particular challenges, digital technologies offer potential solutions for accessing healthcare through telemedicine, maintaining social networks despite physical distance, and participating in civic and cultural activities (Ramalho et al., 2024). However, realizing these benefits requires systematic efforts to overcome the multifaceted barriers that currently prevent many rural elderly Spaniards from accessing and effectively utilizing digital technologies.

Understanding digital inclusion for elderly communities in rural Spain requires examining the complex interplay of individual, social, and structural factors that shape technology adoption and use. Sayago et al. (2011) emphasize that older adults' technology practices evolve over time through everyday use, suggesting that sustainable digital inclusion requires ongoing support rather than one-time interventions. This research builds upon existing scholarship by providing detailed insights into the lived experiences of rural elderly Spaniards as they navigate an increasingly digitalized society, identifying specific barriers and facilitators that can

inform policy development and intervention design aimed at promoting more equitable digital participation across all segments of Spain's aging population.

METHOD

This qualitative study employed semi-structured interviews and thematic analysis to explore digital inclusion challenges and opportunities among elderly residents of rural Spain. Following the methodological framework established by recent research on digital literacy among older adults (Charmaz, 2014; Castilla et al., 2018), this investigation prioritized in-depth exploration of participants' lived experiences, perceptions, and practices related to digital technology use. The research design was approved by the institutional ethics committee and adhered to established protocols for research involving older populations, including provisions for informed consent, confidentiality protection, and participant wellbeing.

Participant recruitment utilized purposive sampling to identify individuals aged 80 and above residing in rural areas of Madrid, Spain. Following procedures outlined by Rasi and Kilpeläinen (2016) for research in remote rural contexts, the study engaged with local community organizations, senior centers, and municipal authorities to identify potential participants who could provide rich insights into digital inclusion challenges. Fifteen elderly individuals participated in the study, representing diverse socioeconomic backgrounds, educational levels, and prior technology experiences. Interviews were conducted in participants' homes or preferred community locations, lasting approximately 60-90 minutes each, and were audio-recorded with explicit permission. The interview protocol covered topics including current technology use patterns, perceived barriers to digital participation, motivations for technology adoption or rejection, available support systems, and aspirations regarding digital engagement (Chiu et al., 2019).

Data analysis followed an inductive thematic approach as described by contemporary qualitative research methodologies. Interview transcripts were systematically coded to identify recurring themes, patterns, and relationships within participants' narratives. The analytical process involved multiple iterations of coding, category development, and theme refinement, with particular attention to how digital inclusion intersected with the pillars of active aging identified in gerontological research: health maintenance, social participation, lifelong learning, and personal security (Muhsyanur, 2024). To ensure analytical rigor, coded data were reviewed by multiple researchers, with discrepancies resolved through collaborative discussion and reference to original transcript materials (Savikko et al., 2005; Rohr & Lang, 2009).

The methodological approach incorporated elements of grounded theory to allow themes to emerge organically from participant experiences rather than imposing predetermined theoretical frameworks. This approach proved particularly valuable for understanding the contextual factors specific to rural Spain that shape elderly individuals' relationships with digital technologies. Throughout the analytical process, researchers maintained reflexive awareness of their own

assumptions and biases, recognizing that interpretations of participant narratives are inevitably influenced by researcher positionality and prior knowledge. Triangulation of findings with existing literature on digital inclusion among rural elderly populations provided additional validation and contextualization of emergent themes (Minagawa & Saito, 2014).

RESULT AND DISCUSSION

Digital Access and Infrastructure Barriers in Rural Spain

The analysis revealed significant infrastructure challenges that fundamentally constrain digital inclusion opportunities for elderly residents of rural Spain. Participants consistently reported inadequate broadband connectivity, with many areas experiencing unreliable internet service or complete absence of high-speed infrastructure. These findings align with broader research documenting persistent urban-rural disparities in digital infrastructure across Europe and globally (Zhang et al., 2025). One participant explained that "even when we want to learn, the internet connection is so poor that websites won't load properly," highlighting how infrastructure deficits create frustration that ultimately discourages engagement attempts. The economic costs associated with obtaining adequate connectivity further compound these challenges, particularly for elderly individuals living on fixed incomes.

Research by Fernández-Ardèvol (2024) demonstrates that infrastructure gaps represent more than mere inconvenience, constituting fundamental barriers to digital citizenship. In Catalonia, similar to patterns observed in rural Madrid, internet usage rates among those aged 75 and above plummet to 42%, with rural residence identified as a key predictor of digital exclusion. The material conditions of rural life—including dispersed population settlements, aging telecommunications infrastructure, and limited market incentives for private sector investment—create structural disadvantages that cannot be overcome through individual effort alone. Participants in this study expressed frustration that their geographic location effectively excluded them from services and opportunities increasingly available only through digital channels (Muhsyanur, 2025a).

Device availability and affordability emerged as additional dimensions of the access barrier. Many participants lacked smartphones, computers, or tablets, citing costs as prohibitive on pension incomes. Those who did possess devices often owned outdated equipment with limited functionality, compromising their ability to access contemporary digital services. Van Deursen and van Dijk (2018) theorize that inferior technical devices reduce benefits users can derive from internet access, creating a vicious cycle wherein limited resources prevent acquisition of adequate equipment, which in turn limits perceived value of digital engagement, further reducing willingness to invest scarce resources. This pattern was evident among study participants, many of whom viewed technology purchases as luxury expenditures rather than essential investments.

The intersection of infrastructure limitations with individual resource constraints creates what scholars identify as first-level digital divides—fundamental access gaps that must be addressed before higher-order digital inclusion can occur (Gómez, 2018). Participants described situations where family members attempted to facilitate video calls, only to encounter connectivity issues that rendered the experience frustrating rather than rewarding. These negative initial experiences significantly influenced participants' subsequent willingness to engage with digital technologies, demonstrating how infrastructure failures can have psychological consequences extending beyond immediate technical limitations.

Policy responses to rural infrastructure gaps have proven inadequate to meet the scale and urgency of need identified in this research. While Spanish national and regional governments have launched initiatives aimed at expanding broadband coverage, implementation timelines extend years into the future, leaving current elderly residents without solutions (European Commission, 2021). Participants expressed skepticism about whether infrastructure improvements would arrive in time to benefit their generation, with several noting that "by the time they bring good internet here, I'll be too old to use it anyway." This temporal mismatch between policy implementation and individual lifecourse trajectories underscores the need for accelerated infrastructure investment specifically targeting rural elderly populations who face compounded disadvantages from both geographic isolation and age-related vulnerabilities (Mulyana et al., 2021).

Digital Skills and Literacy Challenges

Beyond infrastructure and access, digital skills deficits emerged as profound barriers preventing meaningful technology engagement among rural elderly participants. The concept of "basic" digital literacy proved highly problematic when examined through the lens of older adults' actual experiences and capabilities. Participants struggled with tasks that younger generations consider elementary, including navigating touchscreen interfaces, understanding file management concepts, recognizing security threats, and troubleshooting common technical problems. These findings corroborate research by Castilla et al. (2018) demonstrating that even ostensibly simple digital tasks require complex cognitive processing and prior knowledge that cannot be assumed among elderly populations (Muhsyanur, 2025b).

The educational backgrounds of many rural elderly Spaniards, shaped by historical circumstances including limited schooling opportunities and agricultural livelihoods, create particular challenges for digital skill acquisition. Participants frequently expressed anxiety about "breaking" devices or making irreversible errors, reflecting low self-efficacy regarding technology use. Friemel (2016) identifies self-efficacy as a critical determinant of technology adoption among seniors, noting that fear of failure can become self-reinforcing as individuals avoid practice opportunities that would build competence. Interview participants described abandoning technology use attempts after encountering difficulties, often lacking

access to patient, knowledgeable support that could help them persist through initial learning curves.

Training opportunities available to rural elderly populations proved inadequate in both quantity and quality. While some participants had attended basic computer courses offered through municipal programs or senior centers, these interventions typically provided one-time instruction insufficient for developing sustained competence. Morris (2007) critiques conventional digital literacy education for older adults as frequently failing to account for learning style preferences, pace requirements, and practical application needs specific to this population. Participants in this study echoed these critiques, describing training experiences as rushed, jargon-filled, and disconnected from their actual interests and needs. One participant memorably stated, "They showed us how to use email, but I don't know anyone who has email, so what's the point?"

The pedagogical approaches employed in digital literacy training significantly influence outcomes. Research indicates that older adults benefit from learning environments that emphasize hands-on practice, relevant applications, peer learning opportunities, and ongoing support rather than one-off instruction (Chiu et al., 2019). Participants expressed preference for learning from family members, particularly grandchildren, rather than formal instructors, citing greater patience, familiarity with their specific devices, and ability to explain concepts in accessible language. However, geographic distance often separated participants from younger family members who might provide such support, leaving them without regular access to trusted technology mentors.

Cognitive changes associated with aging create additional complexity in digital skill acquisition. While older adults retain substantial learning capacity, age-related declines in processing speed, working memory, and visual acuity can affect technology interaction (Tun & Lachman, 2010). Participants described difficulty reading small text, manipulating small touchscreen buttons, and remembering multi-step procedures required for common tasks. These challenges were exacerbated by interface designs that prioritize aesthetics over functionality and fail to incorporate universal design principles that would enhance usability across diverse user populations. Neves and Amaro (2012) argue that technology developers bear responsibility for creating accessible interfaces rather than expecting older users to adapt to youth-oriented designs.

Table 1. Digital Skills Competency Levels Among Rural Elderly Participants (N=15)

Skill Category	Competent (%)	Partial Competence (%)	No Competence (%)	Not Attempted (%)
Basic device operation	33.3	40.0	20.0	6.7
Internet browsing	26.7	33.3	26.7	13.3

Skill Category	Competent (%)	Partial Competence (%)	No Competence (%)	Not Attempted (%)
Email communication	20.0	26.7	33.3	20.0
Video calling	13.3	40.0	33.3	13.3
Online banking	6.7	13.3	40.0	40.0
Social media use	13.3	20.0	33.3	33.3
Online shopping	6.7	20.0	40.0	33.3
Health service access	0.0	13.3	46.7	40.0

Social Support and Intergenerational Learning Dynamics

Social support emerged as a crucial mediating factor determining whether elderly individuals successfully navigated digital inclusion challenges or remained excluded. Participants who maintained regular contact with digitally competent family members, particularly children and grandchildren, demonstrated significantly higher technology adoption rates and sustained engagement compared to those lacking such support networks. This finding reinforces theoretical frameworks emphasizing social capital's role in technology diffusion and highlights the particular vulnerability of socially isolated rural elderly (Rosales et al., 2024). One participant credited her granddaughter's weekly phone calls for maintaining her smartphone use, explaining, "When I forget how to do something, I know she'll help me figure it out next time we talk."

The quality and consistency of social support proved more consequential than its mere availability. Participants distinguished between family members who provided patient, encouraging assistance and those who expressed frustration or impatience with repeated questions and slower learning pace. Research by Chen et al. (2024) demonstrates that the emotional tone of intergenerational technology transfer significantly influences older adults' willingness to persist through learning challenges. Negative interactions, characterized by condescension or impatience, reinforced feelings of inadequacy and discouraged future help-seeking, while positive supportive exchanges built confidence and promoted continued engagement. Several participants described limiting their technology questions to avoid burdening family members, resulting in unmet learning needs and stagnated skill development.

Intergenerational learning models show particular promise for rural contexts where formal training infrastructure may be limited. Participants expressed enthusiasm for learning from grandchildren, viewing these interactions as valuable bonding opportunities while simultaneously building digital competence. Zhang et al. (2022) document successful implementation of family intergenerational learning programs in rural Chinese contexts, finding that reciprocal learning relationships benefit both older adults gaining digital skills and younger participants developing

empathy and teaching capabilities. Translating such models to rural Spain would require addressing logistical challenges including geographic dispersion of family members and creating structured frameworks that transform informal family assistance into systematic learning opportunities.

Community-based social support structures offer alternatives for elderly individuals lacking family support networks. Participants who participated in senior center activities or local community groups reported higher comfort levels with technology exploration, attributing this to peer learning opportunities and normalized discussion of technology challenges. Kamalpour et al. (2020) emphasize that online communities can support resilience among older adults, particularly during crises that limit face-to-face interaction. However, creating such communities requires that elderly individuals first possess sufficient digital skills to access online platforms, creating a chicken-and-egg dilemma wherein those most in need of digital social support lack the skills necessary to access it.

Professional support services, including technology assistance programs specifically designed for older adults, represent another dimension of social support infrastructure. Participants expressed strong interest in accessible, affordable technical assistance tailored to their needs and learning pace. Research indicates that 71% of adults aged 50 and above desire tech support services especially designed for older users, reflecting widespread recognition that mainstream technical support fails to adequately serve this population (AARP, 2024). In rural Spain, however, such specialized services remain largely unavailable, forcing elderly residents to rely on informal supports of variable quality and consistency or forgo technology use entirely.

Health, Wellbeing, and Quality of Life Implications

The health and wellbeing consequences of digital exclusion emerged as among the most significant findings of this research, revealing how lack of digital access creates cascading disadvantages affecting physical health, mental wellbeing, and overall quality of life. Participants described difficulties accessing healthcare services increasingly delivered through digital platforms, including appointment scheduling, prescription management, and telehealth consultations. Wang et al. (2024) document how digital social exclusion reduces access to health information and medical services while increasing cognitive impairment risk among older adults. Rural participants in this study faced compounded challenges as geographic isolation already limited healthcare access, with digitalization of services threatening to further restrict their options.

Mental health and social connectedness dimensions proved equally concerning. Multiple participants described intensified feelings of loneliness and social exclusion as friends, family, and community activities increasingly migrated to digital platforms. The inability to view photos shared by distant grandchildren, participate in family group chats, or engage with community announcements distributed primarily through social media created painful awareness of being left

behind by social and technological change. Research by Cheng et al. (2023) establishes significant correlations between technology anxiety resulting from digital divides and declining mental health including increased depression rates. Participants' narratives frequently referenced feelings of inadequacy, frustration, and resignation regarding their exclusion from digital society.

Conversely, participants who successfully engaged with digital technologies reported substantial wellbeing benefits. Video calling capabilities enabled maintenance of family relationships despite physical distance, with several participants describing weekly video chats with emigrated children or grandchildren as highlights of their week. These findings align with research by Cotten et al. (2013) demonstrating that internet use significantly reduces loneliness and increases social contact among older adults. Access to online information resources allowed some participants to pursue personal interests, research health conditions, and maintain intellectual engagement—activities supporting cognitive health and life satisfaction in later years (Lara et al., 2017).

The COVID-19 pandemic crystallized the health implications of digital inclusion disparities. Participants who possessed digital skills accessed telehealth services, maintained social connections during lockdowns, and obtained necessary goods through online shopping, while those lacking such capabilities experienced profound isolation and service access difficulties. Shah et al. (2020) characterize this as a pandemic of lockdown loneliness, wherein pre-existing digital divides translated directly into differential health and social outcomes during crisis periods. Rural elderly participants particularly emphasized their vulnerability during pandemic periods when both digital exclusion and geographic isolation compounded to create severe social and healthcare access limitations.

Long-term quality of life considerations extend beyond immediate health and social outcomes to encompass fundamental dignity, autonomy, and citizenship issues. Participants expressed distress at being unable to access government services, banking, and commercial transactions increasingly available only through digital channels. This forced digitalization without adequate support infrastructure effectively denies digitally excluded elderly individuals full participation in civic and economic life. Ball et al. (2019) document how older adults become increasingly marginalized through underuse of digital services related to social interaction, shopping, and transportation. For rural Spanish elderly, these exclusions are not mere inconveniences but fundamental barriers to independent living and self-determination in later life.

CONCLUSION

This research demonstrates that digital inclusion for elderly communities in rural Spain requires comprehensive, multi-level interventions addressing infrastructure deficits, skills development, social support systems, and service design. The findings reveal that current approaches remain inadequate to meet the scale and complexity of challenges facing rural elderly populations as Spanish

society undergoes rapid digitalization. Successful digital inclusion initiatives must recognize the heterogeneity of elderly populations, designing interventions responsive to diverse capabilities, interests, and circumstances rather than applying one-size-fits-all solutions. Priority actions include accelerating rural broadband infrastructure development, implementing sustained community-based digital literacy programs employing age-appropriate pedagogies, creating accessible technical support services, and mandating universal design principles in digital service development. Future research should explore longitudinal outcomes of digital inclusion interventions, comparative effectiveness of different pedagogical approaches, and policy frameworks that successfully balance technological advancement with social equity considerations. As Spain's population continues aging and digitalization accelerates, ensuring that elderly citizens can fully participate in digital society becomes both a practical necessity and a fundamental matter of social justice and human dignity.

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