



Article

Community Digital Nets: Mutual Support as Key to Tech Appropriation

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Abstract

This study examines the processes of technology adoption and appropriation among older adults participating in two community-based digital inclusion workshops (LAB65+) in Madrid, exploring how digital technologies are appropriated within community learning environments and identifying the social, relational, and pedagogical factors that shape this process, with particular attention to the role of mutual support, warm experts, and community learning dynamics. Drawing on a series of workshops and group interaction recordings conducted with regular attendees, the research identifies a set of factors that consistently shape participants' engagement with digital tools. Particular attention is given to socio-educational background, previous work experience, and prior exposure to technology, as well as to the everyday motivations associated with the use of mobile phones for communication through WhatsApp, online purchasing, access to health services, and routine banking procedures. Across both labs, the findings reveal that successful and sustained engagement with technology among older adults depends less on technical training per se than on elements related to motivation, self-efficacy, meaningful instruction, and the creation or reinforcement of social ties in familiar environments. Although minor differences emerge between the two settings, the evidence consistently underscores the centrality of these relational and contextual factors over purely operational or skill-based considerations. The study highlights the need for community-oriented approaches that recognize and build upon the social dimensions of learning and using technology in later life.

Keywords: technology appropriation; digital inclusion; older adults; mutual support; warm experts; community-based learning

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1. Introduction

The rapid expansion of digital technologies across virtually all spheres of everyday life has transformed access to essential services from a matter of personal preference into a structural necessity. Banking, healthcare, public administration, transportation, and so-

cial communication are now largely structured through digital systems that presuppose a degree of familiarity and competence that significant portions of the population have not had the opportunity to develop (Friemel 2016; Helsper 2021). Among these, older adults—broadly defined as individuals aged 65 and above—constitute a group that faces specific and compounding challenges in this process. Barriers such as technology-related anxiety, perceived obsolescence, limited prior exposure, and unequal access to support networks continue to shape differentiated adoption trajectories, generating persistent disparities not only in access but in the capacity to integrate technologies into meaningful daily routines (Van Deursen and Helsper 2015; Van Deursen and Van Dijk 2019).

These dynamics unfold within what Bauman (Bauman 2013) conceptualised as liquid modernity—a condition characterized by accelerated social change, institutional instability, and the erosion of durable support structures. In this context, technological systems evolve continuously through software updates, interface redesigns, and the ongoing digitalisation of essential services. Qualitative research shows that older adults frequently experience these transformations as destabilizing, generating frustration and perceptions of rapid obsolescence (Rosales and Fernández-Ardèvol 2020). The shift toward digital-by-default service provision reduces opportunities for face-to-face assistance, disproportionately affecting those with lower digital literacy (Friemel 2016; Seifert et al. 2021). In this environment, digital exclusion in later life emerges as a salient social risk: technological participation becomes closely tied to the exercise of rights, access to services, and social belonging, while responsibility for maintaining digital competence is progressively individualized (Alonso González et al. 2026).

The concept of the digital divide has evolved considerably in response to these realities. Contemporary approaches distinguish between first-level divides—concerning physical access to devices and networks—and second- and third-level divides, which address differences in the skills, motivations, and outcomes associated with technology use (Van Deursen and Helsper 2015; Van Deursen and Van Dijk 2019). For older adults, these deeper dimensions are often more consequential than the question of access per se: many possess smartphones and internet connections yet struggle to engage with digital tools in ways that are autonomous and sustained over time. Understanding what enables or hinders this deeper form of appropriation—as distinct from mere adoption—has become a central concern in the literature on ageing and digital inclusion.

This complexity is further illustrated by research examining older adults' experiences with information and communication technology (ICT) support services during and after the COVID-19 pandemic. Drawing on survey data from low-income older adults in New York City who received devices, internet connectivity, and training, (Finkelstein et al. 2023) found that although access to technology and support services facilitated initial adoption, newly acquired skills did not necessarily translate into broader or sustained technology use. Their findings suggest that the effectiveness of digital inclusion initiatives depends not only on the provision of devices and training but also on individuals' pre-existing levels of digital competence, personal interests, and the extent to which support is tailored to their specific needs. This reinforces the argument that meaningful digital inclusion requires moving beyond access-based approaches toward a more nuanced understanding of the social and experiential conditions that enable long-term technological engagement.

Recent empirical work further reinforces this relational perspective. For instance, analyse everyday digital support encounters in naturalistic settings, showing how assistance is co-constructed through situated interactions, emotional reassurance, and the negotiation of autonomy. Their findings highlight that digital learning is embedded in ongoing social practices rather than discrete instructional events, underscoring the need to exam-

ine support as a dynamic, relational process rather than a purely individual cognitive task (Sharifi and Chattopadhyay 2023).

Established technology adoption models such as TAM (Davis 1989), UTAUT (Venkatesh et al. 2003), and STAM (Chen and Chan 2014) have provided robust explanations of the cognitive and age-related determinants of adoption, including perceived usefulness, effort expectancy, self-efficacy, and gerontechnological anxiety. However, these frameworks share a common structural limitation: adoption is predominantly framed as an individual-level process, while the relational processes through which technological engagement is learned, stabilized, and sustained over time remain analytically underdeveloped (Alonso González et al. 2026). Recent work has begun to address this gap by foregrounding the role of informal social networks—and particularly of warm experts—in mediating technology adoption among older adults (Hänninen 2025; Hänninen et al. 2021; Korpela et al. 2024). The concept of the warm expert, originally introduced by Bakardjieva (Bakardjieva 2005), refers to knowledgeable individuals from within a person's social environment who provide personalized and non-institutionalized assistance with digital tools, translating jargon, demonstrating procedures, and normalizing uncertainty through trust and shared experience.

While family members—particularly younger relatives—have traditionally been identified as the primary warm experts in older adults' lives, research has documented significant limitations in this dynamic: family support is frequently substitutive rather than pedagogical, leaving older adults dependent on repeated intervention rather than building independent competence (Ávila-Muñoz et al. 2026; Díaz-Catalán et al. 2024). At the same time, community-based peer learning environments have emerged in the literature as a promising alternative: settings in which mutual support, shared generational experience, and the normalization of error collectively sustain engagement in ways that family-based assistance often cannot (Neves et al. 2013; Schlomann et al. 2022). Despite this, the qualitative dimensions of what happens within community digital inclusion programmes—the pedagogical dynamics, the social bonds formed, the motivational structures that sustain engagement—remain comparatively understudied.

The findings contribute to an emerging body of work that understands digital inclusion not as a technical problem to be solved through skills training, but as a social and relational process that requires community-oriented approaches attentive to the contexts, histories, and motivations of older learners (Alonso González et al. 2026; Hänninen 2025). By foregrounding what participants themselves identify as meaningful and effective, the study offers empirically grounded insights for the design of digital inclusion interventions that move beyond operational instruction toward the cultivation of genuine technological appropriation in later life.

2. Materials and Methods

2.1. Research Design

This exploratory study employed a qualitative research design aimed at examining the processes of technology adoption and appropriation among older adults participating in two community-based digital inclusion workshops in Madrid (LAB65+). The research was conducted within the framework of the project *Technology Adoption, Warm Experts and Digital Education in Older Adults* (ADOPTIC65+), carried out under the auspices of the Complutense University of Madrid. Ethical approval was granted by the Ethics Committee from Complutense University of Madrid [CE_20260122_25_SOC]. All participants gave written informed consent prior to their involvement, acknowledging that their personal data would be collected and processed anonymously and used exclusively for research purposes.

The design is grounded in an interpretive approach that seeks to understand how participants give meaning to technology use in everyday life, with particular attention to relational, emotional, and contextual dimensions rather than to technical competence alone. In line with the logic of the present study, the workshops were conceived as spaces of mutual learning and support, where the role of the facilitators was not to act as formal technical experts but to promote a “warm expert” environment oriented toward learning by doing, peer assistance, and the discussion of everyday difficulties. This approach is consistent with the study’s interest in how adoption is shaped by social support, self-efficacy, and practical relevance in later life.

The structured overview of the research process is presented in Table 1, which outlines the stages developed in this study and will be explained in the following sections.

Table 1. Research process.

Study Stage	Description
1. Study Setting and participants	Two community-based digital inclusion workshops (LAB65+) conducted in Villaverde and Chamberí with adults aged 65+. Open-group format with variable attendance.
2. Data collection	Weekly sessions between Nov 2025–Apr 2026; 32 sessions (~2h each). Audio-recorded and transcribed. Additional materials produced by facilitators.
3. Familiarisation with the corpus	Full reading of all transcripts and field materials by the research team.
4. Exploratory mapping	NotebookLM used to generate mind maps of recurrent concepts using the prompt described in the Section 2.
5. Initial coding	Iterative coding focused on learning practices, emotional responses, support dynamics, prior experience, and digital exclusion.
6. Team comparison and refinement	Discussion of preliminary codes; grouping into broader categories; clarification of overlaps and boundaries.
7. Final thematic structure	Four thematic axes and eleven sub-themes defined through constant comparison and iterative refinement.

Source: Developed by authors.

2.2. Participants

The study was developed in two neighborhoods with markedly different socioeconomic profiles: Villaverde, a district historically associated with lower income levels and greater social vulnerability, and Chamberí, a district characterized by substantially higher socioeconomic status. In Villaverde, the workshop was held at the *María Moliner Public Library*. In Chamberí, the workshop took place at the premises of the neighborhood association *Casa de Cultura y Participación Ciudadana de Chamberí*, whose representatives helped recruit participants from among members and nearby associations. The workshops were organized under a warm-experts logic, in which the facilitators—social workers rather than technology specialists—promoted learning by doing, peer support, and the discussion of emotional and relational dimensions of technology use alongside technical issues. This design allowed the study to capture not only operational aspects of digital learning, but also the social and contextual conditions through which technology becomes meaningful in later life.

Participants were adults aged 65 years and older who attended the two workshops on a regular basis. The groups were open, although attendance tended to be relatively stable, with occasional rotations or dropouts, and overall adherence was very good. Across both settings, between 10 and 20 people participated in each session, with a notable

presence of women and a somewhat higher proportion of men than is commonly found in similar interventions, possibly due to the technological focus of the workshops and their connection with other neighborhood associations and local projects. For example, some men participated because they were also members of a traditional game group known as *Peña del Chito*. The sessions included 32 meetings in total, distributed between Villaverde and Chamberí. The participants formed a heterogeneous group in terms of socioeconomic background, educational experience, and prior exposure to technology, which was consistent with the exploratory nature of the study and with its aim of understanding how these differences shape digital appropriation in everyday life.

Based on the workshop field diaries and session transcripts, a total of 43 unique participants were identified across the two LAB65+ sites. Although attendance fluctuated from session to session due to the open and voluntary nature of the initiative, these participants constituted the overall population engaged in the workshops throughout the study period. The sample comprised 31 women and 12 men, reflecting the predominance of women commonly observed in community-based educational initiatives involving older adults.

The Chamberí workshop involved 20 unique participants, including 14 women and 6 men. Attendance ranged from a minimum of six to a maximum of twelve participants per session. The group was characterised by relatively fluid participation and a heterogeneous composition. Participants displayed diverse levels of digital competence, ranging from individuals with advanced technical knowledge who frequently supported their peers to others who expressed significant uncertainty and resistance toward digital technologies.

The Villaverde workshop involved 23 unique participants, including 17 women and 6 men. Attendance varied considerably across sessions, reaching a maximum of fifteen participants, although one session recorded only three attendees. Compared with Chamberí, this group was characterised by stronger pre-existing social ties.

Across both sites, participants were older adults aged 65 and over and represented a wide range of educational, occupational, and technological backgrounds. Previous professional experiences included scientific and technical occupations, laboratory work, business ownership, artistic and cultural activities, community engagement, and service-sector employment. Levels of digital confidence varied considerably, ranging from participants who assumed informal peer-support roles (“warm experts”) to others who reported technology-related anxiety, accessibility needs, concerns about privacy and security, or difficulties adapting to increasingly digitalised services.

Although an informed consent form and a brief sociodemographic questionnaire were completed at the beginning of each group—and whenever a new participant joined—the community-based and open-group structure meant that attendance varied across sessions, with participants joining or leaving at different points in the process. For this reason, individual participant identifiers were not systematically collected, and the conversational dynamics of the workshops did not allow for reliable attribution of specific quotations to particular individuals. Moreover, the dataset comprises transcripts of 32 sessions of approximately two hours each, making any attempt at retrospective individual identification highly complex and potentially inaccurate. For these reasons, quotations are presented as anonymised excerpts rather than being linked to pseudonyms or participant codes.

2.3. Data Collection

The workshops began in November 2025 and have continued on a weekly basis to the present, with each session lasting approximately two hours. Each meeting was prepared in advance according to the needs and concerns expressed by participants in previ-

ous sessions, allowing the content to be continuously adapted to the group's evolving interests. Each workshop session was audio-recorded using two mobile devices placed at different locations within the room. The use of multiple recording devices was intended to improve audio quality and ensure that contributions from all participants were captured, particularly during group discussions involving multiple speakers. The recordings were subsequently transcribed using *TurboScribe* (San Francisco, CA, USA) and reviewed by the research team. In addition to the audio recordings and transcripts, the research team generated multiple materials during the fieldwork process, including preparation sheets for each session, a field diary maintained by the facilitators, and supporting didactic materials such as slides, notes, and other resources used to organize and conduct the workshops. These materials were used to document both the content of the sessions and the interactional dynamics that emerged within them. The final corpus for this study comprised 32 workshop sessions conducted between November 2025 and April 2026, with between 10 and 20 participants per session, providing a rich and varied dataset for qualitative analysis.

2.4. Analysis and Interpretation

The analysis was based on qualitative content analysis of multiple sources of material, including the session transcripts, the preparation sheets used to plan each workshop, and a field diary completed by the facilitators, in which brief observations, impressions, and contextual notes were systematically recorded after each session. Following transcription, all workshop-session transcripts, field notes, preparation sheets and supporting materials were read in full by the research team. Given the volume of material generated across the two workshops, *NotebookLM* (Google LLC, Mountain View, CA, USA) was used as a support tool to produce *mind maps* of recurrent concepts and relationships across the corpus. The prompt used for this step was: "*Identify the main recurring themes, concerns, learning barriers and support mechanisms discussed by participants in the workshops and produce a thematic mind map.*" The only materials uploaded to *NotebookLM* were the workshop-session transcripts; no slides, preparation sheets, or fieldnotes were included. These outputs were used as an analytical aid, but the final thematic structure was reviewed, refined, and defined by the research team.

Initial codes were generated through iterative reading of the original materials and focused on recurring issues related to learning practices, emotional responses to technology, social support dynamics, prior experiences and forms of digital exclusion. The research team subsequently compared and discussed these preliminary codes, grouping conceptually related codes into broader categories. Through repeated consultation of the original data, overlapping categories were identified, thematic boundaries were clarified, and category labels were refined. The interpretive process privileged the social meaning of technology use and the practical conditions under which adoption becomes sustained and meaningful in everyday life.

This iterative process—grounded in systematic reading, team discussion, and constant comparison—resulted in the thematic axes and associated subthemes. The final thematic structure comprised four major axes: (1) instructional and learning strategies; (2) socio-cultural profile and personal background; (3) the social dimension of learning; and (4) contextual factors [see Table 2].

Table 2. Thematic Structure of the Qualitative Analysis.

Theme	Sub-Themes
1. Instructional and learning strategies	1.1 Practice-based learning: preference for real-problem solving over formal instruction
	1.2 Normalisation of error: reducing self-demand and building self-efficacy
	1.3 Physical supports: notebooks, printed guides, and plain-language materials
2. Socio-cultural profile and personal background	2.1 Prior work experience as a foundation for (and source of friction in) digital learning
	2.2 The analogue-to-digital transition: generational identity and critical perspectives on technology
	2.3 Educational background and the barrier of technical language and anglicisms
3. The social dimension of learning	3.1 Family support and its pedagogical limits: help without learning
	3.2 Peer support and warm experts: horizontal, affect-laden knowledge transmission
	3.3 The workshop as a space of sociability, community, and resistance to isolation
4. Contextual factors	4.1 Between settings: group cohesion, prior social capital, and facilitation needs
	4.2 Digital exclusion as structural imposition: forced adoption, linguistic gatekeeping, and market logic

Source: Developed by authors.

This coding framework informed the organization of the Section 3, enabling a systematic yet interpretive representation of the social, pedagogical, and cultural processes shaping digital adoption among older adults.

3. Results and Discussion

3.1. Instructional and Learning Strategies: What Makes Learning Meaningful

This section examines the instructional conditions that participants identified as most conducive to meaningful and sustained digital learning. The analysis draws on recurring patterns across both labs to identify three interconnected strategies: the prioritisation of practice-based learning over formal instruction, the normalisation of error as an inherent part of the learning process, and the use of physical note-taking supports as scaffolding devices for autonomous practice between sessions.

Certain pedagogical approaches proved significantly more effective than others in fostering confidence, retention, and continued use of digital tools. Three interconnected strategies emerged as particularly salient: the prioritisation of practice-based learning over formal instruction, the normalisation of error as an inherent part of the learning process, and the use of physical note-taking supports.

These preferences resonate with adult learning and experiential learning theories that emphasise problem-centered, self-directed and situated learning in later life (Knowles et al. 2020; Kolb 2014; Lave and Wenger 1991).

3.1.1. Practice-Based Learning: Solving Real Problems over Formal Instruction

Participants consistently expressed a strong preference for learning through the resolution of concrete, everyday problems rather than through abstract or lecture-based instruction. This pragmatic orientation is summarized in the desire to “do it oneself” under

guidance: “I don’t like [the teacher] to do it, but rather for the other person to do it... for them to do it, right? For me to do it myself... that’s the way to learn”.

Across both labs, sessions that centered on tasks directly connected to participants’ daily lives—such as pinning important contacts in WhatsApp (Meta Platforms Inc., Menlo Park, CA, USA), using CityMapper for public transport planning, managing Gmail inboxes, or making purchases through Amazon or Zara—generated notably higher engagement (see Table 3; A more detailed table can be found in Table S1). Participants were not primarily interested in understanding digital systems in general terms; they were motivated by vital needs: “I need many things. For example, ordering tickets, getting a ticket for a trip... I’ve managed the doctor thing myself... now I have to give the gas reading via mobile, send the photo”. This focus on authentic, real-world tasks is consistent with research on community-based adult learning and digital justice, which stresses that learning is most meaningful when it connects directly to learners’ everyday practices and needs (Smythe 2022).

Table 3. Topics Covered in the community-based workshops.

Category	Specific Topics and Functions
WhatsApp	Messaging, contact and chat management, media sharing, privacy settings, and account security features
Settings & Accessibility	Accessibility options, sound and notification settings, device maintenance, software updates, and connectivity management.
Digital Security & Privacy	Passwords, online safety, scam awareness, privacy protection, digital certificates, and access to e-government and e-health services.
File Management & Storage	File organisation, cloud storage, device cleaning, document management, scanning, and PDF creation.
Tools & Applications	App installation and management, email use, transport applications, online shopping, digital payments, and QR codes.
Artificial Intelligence (AI)	Generative AI tools, prompt writing, image generation, practical applications, and ethical implications of AI.
Social Media & Leisure	Social media platforms, online content consumption and creation, digital participation, and educational games.

Source: Developed by authors.

Participants generally perceived instruction as meaningful only when it was linked to concrete tasks and everyday needs. By contrast, more abstract or theoretical explanations often generated initial resistance. As one participant described, the first reaction to some digital topics was “a kind of brutal denial... Resistance. I can’t”. However, this reluctance frequently diminished once learning was connected to practical and personally relevant activities. This was particularly evident in the sessions devoted to artificial intelligence. Participants initially referred to AI as a “bug” or a “beast”, reflecting feelings of uncertainty and distrust. Yet these attitudes changed when they were invited to experiment with the technology themselves, for example by asking questions related to their own lives, such as requesting recipes for a grandchild with food allergies.

This shift from resistance to engagement was closely linked to the workshops’ practice-based learning approach. Participants gained confidence when they were encouraged to explore digital tools directly rather than simply observe demonstrations. A key component of this approach was helping participants overcome the widespread “fear of breaking the device.” Facilitators consistently reinforced the idea that mistakes were part of the learning process, encouraging participants to “tinker with things, we hope nothing breaks” and to “experiment and test and lose the fear of things”. The importance attributed by participants to patient guidance, emotional reassurance, and personalised support is consistent with findings by (Finkelstein et al. 2023), who emphasise that effective digital pedagogy

for older adults requires facilitators capable of adapting learning processes to participants' experiences, concerns, and learning rhythms.

In this context, hands-on engagement became one of the main drivers of meaningful learning. Participants reported greater satisfaction when they could perform tasks themselves and gradually develop autonomy. By contrast, when relatives or other helpers simply *"did it for them,"* participants often remained dependent on external support and felt frustrated by their inability to reproduce the task independently. This frustration was compounded by the perception that many contemporary digital devices lack intuitive design. This finding is consistent with (Geerts et al. 2024), who identify a recurrent mismatch between the forms of ICT support available to older adults and the types of assistance they actually require. In our case, participants often valued support that enabled learning and autonomy, rather than solutions that simply completed the task on their behalf.

As one participant explained, *"something appears and you start hitting all the buttons until it disappears, but in reality, it doesn't seem intuitive at all"*.

A fundamental element of this practice-based approach was the use of physical supports to facilitate later autonomous use, as discussed in Section 3.1.3.

3.1.2. Normalising Error: Reducing Self-Demand and Building Confidence

Another factor that participants identified as central to their learning experience was the explicit normalization of error within the workshop environment. Many attendees arrived at the labs with significant anxiety about using digital devices, often rooted in a fear of causing irreversible damage. One participant vividly described this tension, stating, *"it feels like I'm going to shoot someone every time I [touch a button]"*. Feelings of techno-anxiety and low self-efficacy among older adults have been widely documented in relation to digital services and online banking (Friemel 2016; Helsper 2021; Helsper and Reisdorf 2017; van Deursen and van Dijk 2014).

This anxiety was frequently linked to self-deprecating remarks when mistakes occurred; for instance, after accidentally losing a contact, one participant remarked, *"I kept saying to myself: I'm an imbecile, I'm an imbecile, but I just didn't know how to do it"*.

This distress was often compounded by prior negative experiences when seeking help from family members, who were sometimes described as *"not very pedagogical"* or lacking patience. Participants noted that younger relatives often *"do it for you"* rather than teaching the steps, which leaves the learner feeling inadequate and without autonomy.

Within the workshop setting, participants valued the space to attempt tasks and ask questions without embarrassment. Facilitators were perceived as effective when they explicitly communicated that *"errors are a normal and expected part of the learning process"*. Approaches that legitimise error as part of adult learning can enhance self-efficacy and persistence, particularly when combined with supportive feedback (Knowles et al. 2020).

Encouragement such as *"tinker with things; we hope nothing breaks"* and *"you have to experiment and test and lose the fear"* was crucial for lowering defensive barriers. The recurring acknowledgement that the device does not always respond as expected—and that this is a property of the technology rather than a user failure—was both reassuring and empowering.

This normalization of error had practical consequences for sustained engagement and recalibrating self-efficacy. Participants reported that what they learned in the workshops *"removes a barrier and takes away the fear"*. By reducing self-demand and validating the mistake as a legitimate step in learning, the labs fostered a *"kinder and more flexible relationship with technology"*. This reduction in anxiety functioned as a prerequisite for autonomous practice, with participants feeling more capable of *"tinkering"* independently at home. This echoes findings that reducing perceived techno-complexity and techno-risk is

key for older adults' ongoing use of e-government and online services (Chen and Chan 2014).

The workshop thus served as a context for a gradual shift in perspective, moving from seeing the device as a source of potential disaster to viewing it as a tool that can be mastered through guided trial and error.

3.1.3. Physical Supports: Notebooks and Written Notes

One of the most widespread and spontaneous practices observed among participants was the use of handwritten notes to record step-by-step procedures covered during the sessions. Rather than relying on memory or on the device itself—which some felt could “idiotize” people who stop performing mental exercises—attendees consistently brought personal notebooks and annotated each action sequence as it was demonstrated. This behaviour was particularly prevalent for tasks involving multiple steps or infrequent use, such as configuring privacy settings in WhatsApp, managing application permissions, or navigating the *Cl@ve Pin* digital certificate system.

Participants explained this practice in terms of the gap between what is learned in the workshop and what can be independently reproduced at home. The irregular frequency of use of many digital functions made written records an essential compensatory tool. As one participant explained: “We are going to need it because we don't do it every day... so the notes are very convenient. Touch here, touch there... I go to my notebook and then [I can do it].” For many, the notebook served as a *cheat sheet* to combat the feeling that they were not “children who were born with the button in their hand.” The importance of these physical supports was frequently compared to other everyday skills, such as cooking. One participant offered a vivid analogy: “What happens with cooking recipes? You say: ‘It's been a long time since I've done it.’ And you are going to go and you have it there... ‘I already knew I was missing something’”. Having a physical record of the exact steps provided a sense of security and autonomy between sessions, particularly given the perception that the device does not always behave predictably and can be “hard to deal with” or “not intuitive at all”.

Note-taking also functioned as a form of agency, allowing participants to revisit and rehearse procedures at their own pace. This was particularly evident when participants requested that others take notes on their behalf if they had to miss a session due to illness, reflecting a deep concern about losing continuity in the learning process. Attendees operated under the shared principle that “*practice makes perfect*,” and by maintaining these personal cheat sheets they were able to transform complex digital procedures—from two-step verification to using AI tools—into manageable, reproducible tasks that could be practised outside the guided environment of the lab. Similar strategies have been documented in digital health and cybersecurity training, where written guides help older adults translate workshop content into autonomous practice in everyday life (Quialheiro et al. 2023; Seaton et al. 2023).

In response to this observed need, the workshop facilitators made a strategic decision to provide pre-prepared printed materials alongside participants' own handwritten notes. The proposal was framed by the team as a way to enhance the learning experience: “We can think about some sessions where we give you the notes already prepared, for example. With the instructions. It could be quite interesting.” Participants responded with immediate relief, describing the initiative as “brilliant.” Crucially, these materials were not designed as conventional technical manuals but were developed according to the principles of plain language, with simplified and accessible content intended to avoid overwhelming users. A key feature of this approach was device-specific personalisation: separate reference sheets were produced for Android and iPhone users, acknowledging that identical steps often differ across operating systems and that confusion between platforms was a recurring source of frustration. According to the facilitators, the purpose of distributing these doc-

uments was to ensure that participants could “*manage comfortably*” outside the workshop, preventing the loss of knowledge once they left the classroom. This attention to plain language and device-specific guidance is consistent with recommendations for age-friendly digital public services, which call for simplified texts and tailored instructions to reduce cognitive load for older users (Helsper 2021; van Deursen and van Dijk 2014).

This institutional response directly validated what participants had already identified through their own spontaneous behaviour: that a reliable, tangible reference—whether a personal notebook or a printed guide—is not a crutch or a sign of inadequacy, but a necessary extension of digital competence for adults whose engagement with technology is characterised by meaningful but infrequent use. The notebook and the printed sheet, in this sense, function less as remedial tools and more as scaffolding devices that sustain autonomous practice between sessions, enabling older adults to engage with digital technology on their own terms and at their own pace.

3.2. Socio-Cultural Profile and Personal Background

This section examines how participants’ prior life trajectories shaped their engagement with digital technology in the workshop context. Three dimensions of personal background emerged as particularly significant: prior work experience and its uneven transfer to digital environments, the generational transition from analogue to digital technological cultures, and the role of educational background in mediating the linguistic demands of digital interfaces. These dimensions mirror broader analyses of digital inequality that link skills and motivations to life-course experiences, not just to access (Helsper 2021; Van Dijk 2005).

A recurring theme across both labs was that participants did not approach digital technology as blank slates. Their engagement with digital tools was consistently mediated by prior life experience—professional trajectories, educational backgrounds, and formative encounters with earlier technologies—which shaped both their practical competencies and their affective relationship with learning in later life.

3.2.1. Prior Work Experience as a Foundation for Digital Competence

Participants frequently drew on their professional histories to make sense of digital devices, using occupational experience as an interpretive anchor for new learning. This was not, however, a straightforward advantage: while prior exposure to technology-adjacent work reduced initial resistance for some, it also generated specific forms of frustration when the logic of familiar systems failed to transfer to smartphones and mobile interfaces.

Those with administrative or office-based backgrounds had typically encountered computers in professional contexts and were familiar with the underlying logic of file management and structured workflows. Yet many reported that this prior competence offered limited purchase when navigating mobile devices. As one participant put it: “*I used the computer for work... but with the mobile phone I get completely lost.*” The smartphone, with its gesture-based interface, non-linear navigation, and reliance on app ecosystems, represented a sufficiently distinct paradigm that prior computing experience did not always translate into confidence. Research on older adults’ ICT use similarly shows that prior exposure to workplace technologies does not automatically guarantee confidence with newer mobile, app-based ecosystems (Helsper 2021; van Deursen and van Dijk 2014).

Participants with scientific or technical backgrounds described a somewhat different experience. Their previous professional trajectories often provided conceptual resources for understanding technology, but did not necessarily translate into confidence when using contemporary digital devices. For example, one participant who had worked in chemical laboratories explained that she had been responsible for developing maintenance protocols during her professional career. Despite this experience, she now experienced what

she called “*panic at the buttons*”, reflecting a fear of unintentionally changing settings or misconfiguring her smartphone. This illustrates how technical expertise acquired in one context does not automatically transfer to new digital environments.

At the same time, professional experience continued to shape how some participants interpreted technological systems. One participant who identified herself as a “*professional chemist*” frequently drew on this background when discussing issues related to data management and digital control. Although she did not necessarily possess greater practical digital skills than other participants, her scientific training provided a framework for thinking about and analysing technological processes. These examples suggest that previous professional identities remained important resources through which participants made sense of digital technologies, even when their occupational expertise did not directly facilitate the use of contemporary devices.

For those whose working lives had been primarily manual or trade-based, digital technology had simply been absent from daily labour. One participant stated directly: “*In my work... technology was surplus to requirements because I am more of a hands-on person*”. Yet this manual orientation was not without its own form of technical confidence. The same participant recalled having fabricated a custom screwdriver in order to disassemble and repair a games console—a form of problem-solving ingenuity that, while rooted in a different register, reflected a disposition toward understanding and intervening in technical systems rather than passively consuming them.

3.2.2. The Transition from Analogue to Digital

Participants’ perceptions of contemporary digital complexity were consistently shaped by implicit and explicit comparisons with the technologies of their earlier lives. This generational vantage point produced a distinctive critical perspective on present-day devices, one defined not by simple nostalgia but by a coherent contrast between a technological culture perceived as comprehensible and repairable and one experienced as opaque and disposable. Such accounts resonate with critiques of “adverse digital incorporation”, which emphasise how people can be drawn into opaque, market-driven digital systems on unequal terms (Van Dijk 2005).

Several participants recalled with evident satisfaction a world in which broken objects could be opened, understood, and fixed. The transistor radio held together with elastic bands, the appliance taken apart and reassembled—these recollections were not merely sentimental but carried an implicit critique of contemporary design. Participants noted that current devices are built so that “*the screws are no longer visible*”, and that the prevailing logic is replacement rather than repair. This shift was experienced not only as an inconvenience but as a form of exclusion: a technological culture that resists intervention by the user.

The transition in media formats was also described with considerable awareness. Participants articulated the generational shift as the move “*from the cassette tape generation to the generation of virtual memory*”—a formulation that captures both the material and conceptual dimensions of the change. Some had engaged actively with this transition, digitising home video recordings originally captured on 8mm magnetic tape and uploading the results to YouTube, demonstrating a capacity for technological adaptation that complicates any straightforward narrative of older adults as passive or resistant.

At the same time, many participants explicitly identified as “*analogue*” in their orientations, a self-description that functioned less as a statement of incapacity than as a claim to a different but valid form of competence. The ability to navigate using printed maps and solar orientation—“*I still use maps... there are people who have a mobile phone but don’t know how to find their way*”—was invoked with evident pride, positioning analogue skills

not as deficits to be overcome but as capabilities that the digital environment had rendered invisible.

3.2.3. Educational Background and the Barrier of Technical Language

A third dimension of participants' backgrounds that consistently shaped their experience of the workshops was the relationship between educational level and the linguistic demands of digital environments. Across both labs, the pervasive use of English-derived terminology and opaque technical vocabulary emerged as a significant source of exclusion—one that operated not merely as a practical obstacle but as an affective one, generating feelings of inadequacy and self-doubt. Studies of digital inequalities stress that language, literacy and interface design are central mechanisms through which social stratification is reproduced online (Helsper 2021; Tsatsou 2022).

The use of English terms in everyday digital interfaces was experienced by many participants as a form of structural exclusion. As one participant stated plainly: *"If you don't know English, you have been excluded... there are many everyday things in English"*. The substitution of familiar words with anglicised alternatives was a particular source of frustration. This linguistic displacement reinforced the sense that digital systems had not been designed with them in mind.

Technical concepts introduced during the workshops—including cookies, links, prompts, and deepfakes—were frequently experienced as opaque and alienating. One participant described her response to cookie consent requests as a combination of incomprehension and fear: *"I don't know what you're asking me... faced with fear, you just close it"*. The continual introduction of new terminology was experienced as deliberate obscurantism: *"They invent new made-up words every day"*. This linguistic barrier was compounded by the implicit assumptions embedded in digital systems, which routinely presupposed a level of familiarity that many participants did not share. Being expected to locate a PIN code during a live phone call, for instance, was described as leaving users feeling foolish—a moment in which the gap between the system's assumptions and the user's experience became sharply and uncomfortably visible.

The cumulative effect of these experiences was a tendency toward self-described *"digital illiteracy"*—a label that participants applied to themselves with a mixture of resignation and frustration. This self-perception was further compounded by the pace of technological change, which imposed a cycle of constant relearning and rendered previous efforts at digital competence temporarily obsolete with each major software update. For many participants, the workshops represented not only a space for acquiring new skills but an opportunity to reframe this experience—to understand their difficulties as a reasonable response to poorly designed systems rather than as evidence of personal inadequacy. This reframing is consistent with intersectional approaches to digital inequality that locate *"illiteracy"* in structural design and policy rather than in individual deficits (Helsper 2021; Zheng and Walsham 2021).

3.3. The Social Dimension of Learning

A consistent finding across both labs was that successful and sustained engagement with digital technology depended less on technical instruction alone than on the relational fabric within which that instruction took place. The workshop environment functioned as a social ecosystem in which affective support, mutual trust, and a sense of shared experience acted as foundational conditions for learning. This section examines three dimensions of that social architecture: the role of family support and its limitations, the emergence of peer-based mutual assistance, and the function of the workshop as a space of sociability and community. This emphasis on relationality echoes research showing that

social support and community embeddedness are key predictors of older adults' digital engagement (Smythe 2022; Van Deursen and Van Dijk 2019).

3.3.1. Family Support and Its Pedagogical Limits

Participants consistently identified family members—particularly children and grandchildren—as their primary resource for digital help in everyday life. Yet this reliance was accompanied by a set of recurring frustrations that significantly constrained its pedagogical value. The central tension was between the need for assistance and the desire to maintain personal autonomy; a tension that family dynamics frequently failed to resolve.

The most commonly cited complaint was that family members tended to solve technical problems on behalf of participants rather than guiding them through the process. As one participant described: *"The people we ask for help, our family and others, either don't have enough patience or they say, 'Don't worry, I'll just do it for you'"*. This pattern, however well-intentioned, effectively short-circuited the learning process, leaving participants dependent on repeated intervention rather than building independent competence. One participant noted that although her husband reliably resolved her technical questions, he was *"not very pedagogical"* in his approach—attentive to the problem but not to the learning opportunity it represented. These dynamics closely resemble what the literature terms *"warm expert"* support, in which relatives act as intermediaries to technology but may prioritise problem-solving over meaningful learning (Bakardjieva 2005; Hänninen 2025).

Several participants described approaching family members as a last resort, conscious of imposing on their time. Younger relatives were perceived as impatient or simply unavailable: *"My nephew never picks up the phone"*. This combination of inaccessibility and pedagogical inadequacy reinforced the importance of the workshops as an alternative space for learning—one that could provide what family support, despite its goodwill, often could not: patient, step-by-step guidance oriented toward understanding rather than mere resolution.

3.3.2. Peer Support and the Role of Warm Experts

In contrast to the dynamics that characterised family-based help, the workshop environment generated a markedly different relational pattern—one defined by horizontality, patience, and mutual recognition. Within this setting, participants with greater digital familiarity naturally assumed a supportive role toward those with less experience, enacting what the literature describes as *"warm expert"* dynamics: knowledgeable peers who share not only information but social proximity, affective attunement, and a common generational frame of reference. Empirical studies highlight that such warm experts can both enhance and, if support is unevenly distributed, hinder older adults' independent digital use (Hänninen 2025; Hänninen et al. 2021, 2023; Korpela et al. 2024).

This peer leadership emerged organically rather than through formal assignment. Certain participants were recognised by the group for their relative command of specific functions and were informally called upon to explain them. One such participant was acknowledged by her peers for her familiarity with WhatsApp features such as disappearing messages and automatic media downloads, and regularly took on an explanatory role within the group. Similarly, another participant shared his personal YouTube channel with fellow attendees as a concrete demonstration that creating original digital content was an achievable goal—a gesture that functioned simultaneously as a practical example and as a source of collective motivation.

The exchange of practical tips and personal discoveries constituted a central mode of learning in this peer register. Participants taught one another to delete files, manage contacts, and navigate privacy settings; they also collectively discovered new tools, such as the Brave browser as a means of managing cookie consent. This collaborative mode of

knowledge-sharing stood in marked contrast to the unidirectional, solution-focused help typically provided by family members. Crucially, participation in this dynamic had transformative effects on participants' self-perception. Those who had arrived at the workshops describing themselves as "digital illiterates" gradually came to see themselves as capable of transmitting knowledge to others. As one facilitator articulated the aspiration: *"The idea is that you also become those small experts"*. The shift from learner to peer teacher, even in modest and informal terms, represented a meaningful reconfiguration of participants' relationship to digital technology and to their own competence. This transition from peripheral participation to more central, teaching roles can be read through the lens of communities of practice, where learning is inseparable from evolving forms of participation (Lave and Wenger 1991).

3.3.3. The Workshop as a Space of Sociability and Community

Beyond its function as a site of technical learning, the workshop served a broader social purpose that participants articulated with considerable clarity and feeling. For many attendees, the sessions represented a valued interruption of daily routine—an opportunity to spend time with neighbours who shared similar concerns and curiosities, and to experience a form of community that extended well beyond the digital content of any given session. Similar digital literacy initiatives have been conceptualised as spaces of "conviviality" where social connection and mutual recognition are as important as skill acquisition (Smythe 2022).

This social dimension was evident in the texture of the sessions themselves. Technical learning was consistently interwoven with personal anecdote, collective memory, and shared humour. Participants exchanged stories about the transition from cassette tapes to virtual memory, recalled transistor radios held together with elastic bands, and laughed together at their own digital mishaps—a socialisation of error that served to normalise difficulty and reduce the isolation of individual frustration. Structured activities using tools such as *Dixit* cards created moments of genuine intimacy, enabling participants to articulate their hopes, uncertainties, and anxieties about the contemporary technological landscape in a supported group context.

The conversations that took place within the workshop were not confined to digital topics. Discussions ranged across a variety of everyday concerns—exchanges that underscore the extent to which the workshop functioned as a community forum as much as a training space. Participants valued it as a place to *"change the routine"* and to remain connected to a social world beyond the domestic sphere. In this sense, the digital was less the object of learning than its occasion: the technology provided a shared purpose around which a community of peers could gather, support one another, and resist the social isolation that many older adults experience in later life. As participants themselves expressed it, the workshop was ultimately a tool for *"being in the world"*—for remaining present, connected, and recognised within a rapidly changing social and technological environment.

3.4. Contextual Factors: Environment, Community, and Digital Exclusion

The qualitative analysis of both labs demonstrates that learning does not occur in a vacuum. The physical setting, the prior social ties among participants, and the broader structural conditions in which digital adoption takes place all exert a significant influence on the dynamics of each group and on the depth of the support networks that emerge within them. Contemporary research on digital inclusion similarly insists on situating skills training within wider social, spatial and policy contexts (Helsper 2021; Tsatsou 2022).

3.4.1. Differences Between the Two Labs: Group Cohesion and Social Context

Although both labs shared the same pedagogical objectives, their group dynamics differed in ways that reflected the distinct social fabrics of their respective neighbourhoods and venues.

In the first lab, hosted at a cultural centre, attendance patterns were characterised by fluidity and heterogeneity. As one facilitator observed, *“the group keeps changing—there is no stable group”*, which produced a dynamic oriented more toward the resolution of individual needs than toward the gradual construction of collective bonds. A spirit of companionship was nonetheless present, though the wide variation in participants’ starting points—from those approaching digital devices entirely for the first time to others who already served informally as guides for their peers—occasionally generated tension, with some attendees feeling that personalised attention to others slowed the pace of the session for the group as a whole.

The second lab, based at a public library in a different neighbourhood, presented a markedly different picture. Six of the seven regular attendees—all men—belonged to a local traditional games association, a pre-existing social network rooted in shared leisure and neighbourhood life. This prior bond created a foundation of trust and familiarity that significantly shaped the group’s learning dynamic: horizontal mutual support emerged naturally, and the space was experienced as an extension of an already cohesive community. Participants described the library as an *“oasis for conviviality,”* a place where not only technical questions but also neighbourhood experiences and personal concerns were shared. The contrast between the two settings illustrates how prior social capital can function as a powerful enabling condition for peer-based digital learning—and how the absence of such pre-existing ties may require more deliberate facilitation strategies to achieve comparable levels of group cohesion. This finding aligns with evidence that existing social networks structure who receives informal digital support and how consistently it is available (Hänninen 2025; Hänninen et al. 2023; Helsper and Reisdorf 2017).

3.4.2. Digital Exclusion as a Form of Social Marginality

A theme that surfaced with considerable force across both labs was participants’ perception of digitalisation not as a freely chosen process of modernisation but as a structural imposition—one that generated new and tangible forms of social exclusion for those unable or unwilling to comply with its demands. Scholars of digital inequality similarly argue that the “digital divide” is better understood as a set of structural processes that deepen existing forms of social marginality (Helsper 2021; Van Dijk 2005).

The compulsory dimension of digital adoption was a source of widespread frustration. Participants described being effectively required to use mobile applications and online platforms to access essential services—banking, medical appointments, public transport—with little or no analogue alternative available. One participant articulated this experience with particular clarity: *“These are products launched for a certain type of person and for certain ages, and those who are not within that age range are simply left out of many areas of life”*. Systems such as the Cl@ve Pin digital identity platform and the Virtual Health Card were cited as concrete examples of bureaucratic processes that presupposed a level of digital fluency that many older adults had not yet acquired, and that provided insufficient support for those who had not. Recent work on e-government warns that, without careful design, online public services can become regressive, shifting costs and risks onto those with the least digital capital (Dodel 2016; Dodel and Aguirre 2018).

The linguistic dimension of this exclusion, already examined in relation to educational background, took on an additional political charge in participants’ accounts of the broader digital environment. The pervasive use of English-derived terminology was experienced not merely as a practical inconvenience but as a deliberate form of gatekeeping,

as discussed in Section 3.2.3. The substitution of plain, familiar terms with technical Anglicisms—was read as evidence that digital systems had been designed without older users in mind, or indeed in active indifference to their needs.

Participants also directed sustained criticism at the economic logic underpinning contemporary technology. The deliberate shortening of device lifespans, the inaccessibility of repair, and the relentless pace of software updates were all identified as instruments of a market logic oriented toward continuous consumption rather than durable utility. The contrast with earlier technologies was invoked repeatedly: the transistor radio held together with elastic bands, the appliance that could be opened and fixed, stood as symbols of a technological culture in which users retained a degree of control and agency. Contemporary devices, by contrast, were seen as deliberately sealed against intervention—“*the screws are no longer visible*”—compelling users to replace rather than repair, and thereby sustaining a cycle of expenditure and dependency that many participants found both financially burdensome and ethically objectionable. These critiques echo broader analyses of “digital vulnerability”, which highlight how design, commercial strategies and policy choices expose certain groups to heightened risks and dependencies (Helsper and Reisdorf 2017).

This context of structural exclusion lends additional significance to the function of the labs beyond their role as sites of technical instruction. For participants, learning to navigate digital tools was not simply a matter of acquiring new skills but of resisting a form of marginalisation—of coming to know, as one participant put it, “*the beast*” well enough not to be controlled by it. The workshops thus emerged as spaces of quiet but meaningful empowerment: places where older adults could engage with digital technology on their own terms, supported by peers and facilitators who understood not only the technical challenges involved but the social and political stakes that surrounded them.

4. Conclusions

Taken together, the findings from both labs suggest that digital appropriation in later life cannot be reduced to the transmission of decontextualized technical skills, but rests on the articulation of three interdependent dimensions: experiential, problem-centred pedagogies; biographical trajectories that shape dispositions toward technology; and a relational ecosystem that provides affective and practical support for learning. The combination of situated practice, explicit normalisation of error and the systematic use of material supports operates as a form of scaffolding that enables participants to reconfigure fear of “breaking the device” into a more playful, experimental stance, while notebooks and printed guides function as legitimate extensions of digital competence in contexts of infrequent but meaningful use. In this sense, the workshops do more than remediate individual skill deficits; they foster communities of practice in which older adults can move from self-ascribed “digital illiteracy” towards positions of “small experts” who are able to support peers, thereby recalibrating their sense of efficacy and social value.

At the same time, the analysis underscores that older adults’ digital exclusion is less an effect of chronological age per se than of how digitalisation policies, interface design and market logics sediment and intensify pre-existing social inequalities. The compulsory turn to digital channels for accessing essential services, the routine use of opaque Anglicised terminology and the dynamics of planned obsolescence situate these workshops in an ambivalent position: they are spaces of care, conviviality and empowerment, but also compensatory mechanisms in the face of a sociotechnical order experienced as imposed rather than chosen. From a social justice and critical gerontology perspective, the findings therefore point to the need to complement community-based digital literacy initiatives with structural reforms in the design of public services, plain-language policies and the

regulation of technological markets, if digital inclusion in later life is to mean more than individual adaptation to a “beast” defined by others.

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Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/socsci15070450/s1>, Table S1: Topics covered in the community-based workshops.

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