Designing Inclusive Digital Capacity Building in Rural Innovation Contexts through Multi-Actor Platforms

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Abstract

Digitalisation is a central driver of regional transformation and a key dimension of the twin transition affecting European rural areas. Despite ambitious EU strategies, persistent digital divides remain: rural regions continue to lag behind urban areas not only in infrastructure provision but also in digital skills attainment and effective technology uptake. While DigComp has become the main institutional reference framework for digital competence development at EU level, limited empirical attention has been devoted to how such frameworks are operationalised within place-based innovation processes. This paper asks: how can a common digital competence framework be operationalised through a Capacity Building process that combines methodological standardisation with negotiated adaptation to heterogeneous rural contexts? We adopt DigComp 3.0 as a common competence framework that provides a shared vocabulary while allowing competence requirements to be translated into technology- and context-specific learning pathways. The study examines six rural Multi-Actor Pilots (MAPs) within the interdisciplinary Horizon Europe project FUTURAL, which prototypes community-led Smart Solutions addressing local societal, environmental, and economic challenges. The MAPs function as territorially embedded innovation platforms where digital competence development is linked to technological deployment through co-created training strategies. Methodologically, the research applies a multi-sited comparative design based on mixed methods, combining structured post-workshop surveys with qualitative data from workshops, pilot documentation, and MAP leaders' reflections. A harmonised capacity-building framework has been used to ensure comparability, while training design remains context-sensitive, incorporating literacy adaptation, accessibility measures, multilingual materials, and differentiated competence levels. Preliminary findings indicate that competence building strategies are calibrated to the intended user base of each Smart Solution, ranging from specialised stakeholders to broader community groups. The results illustrate how participatory approaches grounded in DigComp can support place-based human capital formation, reinforcing the role of capacity building as a driver of rural digital transition.

1. Introduction and conceptual framing

Digitalisation has become a central driver of regional transformation in Europe and, together with the environmental transition, represents a major component of the twin transition affecting rural areas (Brunori 2022). Its territorial effects, however, remain uneven. Rural regions continue to lag behind urban areas not only in the availability and quality of digital infrastructure but also in digital competence and the effective uptake of technologies (Salemink et al. 2017). According to Eurostat (2025), in 2023 only 47.5% of people aged 16–74 living in rural areas possessed at least basic digital skills, compared with 62.6% in urban areas across 24 of the 27 EU Member States. Disparities are particularly evident in more advanced areas such as digital content creation.

The European Union has responded through the 2030 Digital Decade Policy Programme and related policy frameworks, including the Digital Education Action Plan, the European Skills Agenda and the Long-Term Vision for Rural Areas. These initiatives recognise a digitally skilled population, secure and sustainable infrastructure, the digital transformation of businesses and the digitalisation of public services as interconnected objectives. Nevertheless, implementation remains uneven across rural regions, where digitalisation is shaped by different demographic structures, institutional capacities, economic conditions and levels of technological preparedness (Feurich et al. 2024).

These differences demonstrate that regional digital preparedness cannot be reduced to connectivity or to a general measure of individual digital literacy. The capacity to adopt a technology also depends on its complexity and usability, the functions users are expected to perform, the organisational setting in which it is introduced and the support available locally. Digital preparedness is relational: it emerges from the fit between a particular technology, its intended users and the territorial and institutional environment in which it is expected to operate. From a rural innovation ecosystem perspective, this fit is continuously shaped through the interaction, negotiation and adaptation of local and extra-local actors involved in digital innovation processes (Giua et al., 2026).

The European Digital Competence Framework for Citizens, DigComp, provides the principal institutional reference for digital competence development at European level. First introduced in 2013 (Ferrari 2013) and subsequently updated (Vuorikari et al. 2022; Cosgrove and Cachia 2025), DigComp organises digital competence into five areas: information and data literacy; communication and collaboration; digital content creation; safety; and problem solving. These areas are articulated through progressive proficiency levels and can be applied across different learning and policy contexts.

DigComp, however, does not prescribe how competence development should be organised in a particular territory or around a specific technology. Its practical value depends on how its general categories are translated into learning objectives and activities that are meaningful to particular users.

Despite increasing policy attention to digital skills, limited empirical research has examined how a shared competence framework can be operationalised systematically within territorially embedded innovation processes (Ashmore et al. 2021; Rundel and Salemink 2021). Capacity Building can address this gap when it is integrated into the innovation process. It is understood here as a structured process for strengthening the knowledge, competences and resources that individuals, organisations and communities need to engage with change (Giua and Moretti 2024). It connects technological development to human-capital formation by making explicit what intended users need to know and be able to do to apply a technology in practice. This link cannot be taken for granted. Technological deployment does not automatically result in adoption or innovation-driven territorial transformation (Stojanova et al. 2022; Ofori et al. 2025), while generic digital-skills programmes may have limited value when disconnected from concrete technologies, professional practices and local problems.

Rural Capacity Building therefore requires more than the transfer of predetermined technical knowledge from technology providers to end users. It must connect at least three forms of expertise: methodological knowledge concerning competence development and training design; technical knowledge of the functions and requirements of the digital solution; and territorial knowledge concerning users, organisations, existing capacities and constraints. Designing Capacity Building in this way becomes a transdisciplinary process: competence needs and learning pathways are jointly interpreted and negotiated by research, technical and territorial actors.

This perspective connects the digitalisation challenge to the call for more evidence “on how researchers on the ground interpret and enact TD principles” (Thompson et al. 2017, cited in Vañó-Agulló et al. 2026, 2763). Vañó-Agulló et al. (2026) identify structured feedback, iterative learning and methodological flexibility as important conditions for transdisciplinary work in EU Horizon projects. Predetermined project structures can support coordination and accountability, but they must coexist with methods capable of responding to stakeholder needs and contextual differences. Transdisciplinary knowledge production similarly depends on integrating scientific, professional and contextual knowledge through dialogue and shared decision-making.

The present study examines how these principles inform the design of a Capacity Building programme that supports digital innovation in diverse rural contexts. It focuses on FUTURAL, an interdisciplinary Horizon Europe project that prototypes, tests and demonstrates community-led social, technological and business innovations in rural areas. FUTURAL is organised around six Multi-Actor Pilots (MAPs) located in Birda, Durangaldea, Jonava, Kythira, Pongau and Westhoek. The MAPs bring together research organisations, Smart Solution providers, public administrations, businesses, community organisations and other stakeholders to develop and test digital solutions in real-world settings. The Smart Solutions vary considerably in purpose, technical complexity and intended users. They include

applications supporting public-service accessibility, crowd-sensing, circular-bioeconomy planning, vacant-building reuse, wildlife monitoring, e-government, climate adaptation, hydrological modelling, resilience planning, trail management and e-learning. Intended users range from school pupils and rural citizens to farmers, municipal employees, planners, environmental specialists and technical professionals. These differences make FUTURAL a useful setting in which to examine how a common competence framework is operationalised without assuming that all users possess the same skills or that all technologies impose equivalent requirements.

The study addresses the following research question: how can a common digital competence framework be operationalised through a Capacity Building process that combines methodological standardisation with negotiated adaptation to heterogeneous rural contexts? The paper offers a reflexive analysis of the programme. Its contribution is twofold. First, it documents the iterative process through which methodological, technological and territorial knowledge were brought together to translate DigComp into Smart Solution-specific learning pathways. Second, it examines the emerging balance between a shared project architecture and adaptation to users, technologies and place. We refer to this provisional analytical formulation as structured flexibility.

This is a work-in-progress paper prepared for discussion at the ERSA Congress 2026. At the time of writing, not all Capacity Building workshops and project activities have been completed. The analysis focuses on the programme developed so far and on preliminary patterns from the available evidence. The final analysis will be extended once all workshops have been implemented and the last phase of FUTURAL has concluded.

2. Research approach, author positionality and empirical material

This study adopts a reflexive, multi-sited comparative case-study approach across the six FUTURAL MAPs. It combines descriptive analysis of post-workshop questionnaires with qualitative analysis of Capacity Building strategies, workshop plans and materials, monitoring records, MAP leaders' accounts, peer-review meetings and collective reflection activities.

The authors occupy a dual position in relation to the process examined. As researchers responsible for leading activities within the Work Package on Community-led Innovations and Capacity Building, they contributed to designing the Capacity Building methodology, developing shared templates and monitoring tools, supporting MAP leaders and Smart Solution providers, monitoring MAP progress, facilitating cross-MAP exchange and coordinating the collection and interpretation of evidence. This role provided a longitudinal vantage point across territories and enabled observation of how methodological guidance was understood, negotiated and modified during implementation.

The same position also means that the authors were not external observers. They participated in the process that they analyse, including decisions concerning the structure of the strategies, the translation of DigComp, the organisation of peer feedback and evaluation. The paper is a reflexive account of methodological practice within an ongoing innovation project. This positioning is analytically relevant because it makes visible the practical work through which transdisciplinary principles were enacted: clarifying concepts, mediating between different forms of expertise, responding to implementation difficulties and adjusting tools as the project progressed.

The dual role also requires caution. Researchers' involvement can privilege the programme logic they helped establish, while monitoring responsibilities create pressure to obtain comparable information without disrupting the pace and autonomy of activities. To reduce this risk, the analysis triangulates several sources, including strategies jointly prepared by MAP leaders and Smart Solution providers, records of collective discussion, workshop documentation, participant feedback and reflections shared with the wider consortium. Participant questionnaires are interpreted as self-reported perceptions and differences in sample size, audiences and Smart Solutions are retained rather than obscured through pooled statistical claims.

The evidence base remains incomplete. The current dataset includes 97 post-training questionnaires from activities completed at the time of drafting, but instruments and participant groups vary across workshops. Some MAPs have completed more activities than others, and the final Demonstration phase is ongoing. The purpose of the present analysis is to reconstruct the emerging Capacity Building process, identify cross-case patterns and generate propositions for further examination when the full project cycle is available.

3. The Capacity Building programme as an iterative feedback process

Capacity Building was developed as a sequence of connected activites. A shared methodological architecture coordinated the process across MAPs, but feedback at each stage could modify the following stage. The sequence moved from identifying users and needs to mapping competences, jointly planning training, delivering workshops, collecting participant feedback and reflecting collectively at project level. Feedback was intended to inform both subsequent training and the continuing refinement and adoption of Smart Solutions.

3.1 Identifying target groups and learning needs

MAP leaders began by identifying the target groups for each Smart Solution and the tasks that prospective users would need to perform. This territorial mapping was essential because the Smart Solutions addressed different problems and user communities. MAPs identified professional or

institutional users but also, where relevant, rural citizens, farmers, pupils, young people and older residents. For each group, MAP leaders described existing experience, likely barriers and learning needs in relation to the solution.

This first step prevented the programme from beginning with an assumed generic "rural user". It connected Capacity Building to the actor composition of each innovation ecosystem and established the basis for discussing who might otherwise be excluded. It also made clear that learning needs were partly technological and partly contextual: the same platform function could require different support depending on language, connectivity, age, professional practice or previous digital experience.

3.2 Translating Smart Solution tasks into competence requirements

The target group and learning needs analysis was shared in a collective workshop involving MAP leaders, Smart Solution providers and research partners. A participatory competence mapping activity was then conducted using Scaffold Cards (Joint Research Centre, 2004). These were structured facilitation aids representing DigComp competences. Each card provided a competence label, a short definition and prompts that helped participants connect an abstract competence to an action that users would need to carry out with a Smart Solution. The cards "scaffolded" the discussion by breaking a complex framework into smaller choices that could be handled collaboratively.

Working across territorial and technical roles, participants considered questions such as: What will the user need to find or interpret? What will they need to upload, create or share? Which safety issues may arise? What problems should they be able to recognise or solve? The activity enabled Smart Solution providers to clarify functional requirements while MAP leaders assessed whether the proposed competences and levels were realistic for their users.

The workshop also exposed a difficulty. Formal DigComp definitions were not always immediately understandable to MAP members and were even less suitable for direct communication with end users. The research team translated the framework into plain-language definitions and Smart Solution-related examples at low, intermediate and high proficiency levels. This was not a simplification of competence to "clicking buttons"; rather, it connected progression in competence to recognisable actions, from following guidance to acting independently, evaluating information and supporting others.

Table 1. Illustrative translation of DigComp into Smart Solution-related actions

DigComp area	Plain-language focus	Low proficiency example	Intermediate proficiency example	High proficiency example
Information and data literacy	Finding, evaluating and organising information in a platform	Open a menu and use one simple search term with guidance	Use filters and compare information from two platform sections	Evaluate the reliability of different sources and organise data for later

DigComp area	Plain-language focus	Low proficiency example	Intermediate proficiency example	High proficiency example
				use
Communication and collaboration	Interacting, sharing and participating through digital tools	Send a short message or upload one item	Contribute to a shared form, map or group discussion	Select appropriate communication tools and coordinate collaborative tasks
Digital content creation	Producing and modifying digital material	Take a photograph, record a note or complete a simple report	Add labels, edit content or combine different formats	Produce a structured report, map, instruction sequence or video
Safety	Protecting devices, personal data and well-being	Use a secure PIN and avoid sharing passwords	Review permissions, update applications and adjust accessibility settings	Assess privacy options and support others in safer use
Problem solving	Responding to technical problems and selecting suitable tools	Close and reopen an application or ask for help	Check connectivity and select the appropriate feature for a task	Diagnose recurring problems, propose improvements and identify new learning goals

The translation was itself part of the iterative methodology. A difficulty encountered in applying the common competence framework generated a researcher-led adaptation, which was then made available to the other actors. It illustrates how a standard framework became usable through mediation and feedback.

3.3 Joint preparation and peer review of training strategies

Following competence mapping, MAP leaders and Smart Solution providers jointly prepared one Capacity Building strategy for each Smart Solution using a shared template developed by the University of Pisa. The template required them to specify target groups and learning needs, learning objectives, relevant DigComp competences, intended proficiency levels, training methods, delivery arrangements, accessibility measures, links to real-life situations and expected learning outputs.

Draft strategies were presented during collective MAP meetings before delivery. Other MAPs reviewed the proposed approaches, and project partners provided feedback on the coherence between users, competences, activities and outputs. These meetings served both a quality-assurance and a learning function. MAPs could compare approaches, recognise shared challenges and adapt ideas used elsewhere, while retaining responsibility for the final design.

3.4 Local delivery through a shared workshop logic

Capacity Building workshops were organised locally by MAP leaders in collaboration with Smart Solution providers. Delivery followed a workshop template. Sessions generally included an introduction to the challenge and Smart Solution, a demonstration of its principal functions, guided practice, individual or collaborative exercises, questions and reflection, and an assessment or feedback activity.

Within that sequence, methods varied. Workshops used live demonstrations, field exercises, platform simulations, real datasets, peer support, gamification, practical worksheets and discussion of local scenarios. Delivery could be on site, online or hybrid depending on the technology and the participation of providers. Technology providers produced at least one reusable learning output, such as a presentation, user guide, step-by-step manual or video tutorial, so that participants could revisit the training afterwards.

The “real-life links” section of the strategy was particularly important. It required organisers to connect digital functions to familiar territorial problems, avoiding to present the technology in the abstract. Examples included flood scenarios from the Birda-Barzava River, accessibility and mobility situations in Durango and Amorebieta-Etxano, wildlife monitoring in local forests, the Diakofti Bridge in Kythira, data from a wastewater-treatment plant in Pongau and hydrological challenges in Westhoek.

Pongau also experimented with graphic recording, a live visual narrative through which an illustrator captured discussion, relationships and emerging insights during a workshop on the circular-bioeconomy platform. Graphic recording is not itself a digital competence. Its relevance lay in mediating a complex phenomenon and providing a shared visual account that participants with different technical backgrounds could discuss. It illustrates that building capacity for digital innovation may also require methods that make systems, trade-offs and technical information more communicable.

3.5 Participant feedback and MAP reflection

Evaluation was standardised through a standard post-training questionnaire. It assessed satisfaction, engagement, clarity and relevance; understanding of the Smart Solution and its potential risks; perceived development of digital competences; confidence and autonomy; and the accessibility of the learning process. Questions addressed the five DigComp areas and examined the clarity of language, pace, time for practice, accessibility of materials and need for additional support. MAPs could translate the instrument into local languages, while maintaining its core questions and order.

Feedback was not conceived as an endpoint. It provided information on whether participants understood the technology, whether training methods were appropriate, and whether usability or accessibility problems persisted. MAP leaders and Smart Solution providers could use these results to

revise materials, provide additional support and communicate user difficulties to the teams refining the Smart Solutions.

3.6 Cross-MAP reflection and return to the project cycle

Results and methodological reflections were brought back to project level during the Annual Knowledge Sharing meeting held in Jonava (May 2026) involving MAP representatives and consortium partners. Completed activities were discussed comparatively, with attention to organisation and adaptation, training methods and learning, participant feedback and overall effectiveness. Practical demonstrations, context-based examples, local facilitation, peer support and simplified communication were identified as recurring enabling practices.

This final stage closed one cycle while opening the next. Lessons from delivery and feedback could inform subsequent Capacity Building activities, demonstration events and the refinement of Smart Solutions. The programme can be represented as a feedback loop: users and needs → competence mapping → joint strategy → delivery → participant feedback → collective reflection → adaptation of training and innovation activities.

4. Inclusion, accessibility and participation by design

Inclusion and accessibility were incorporated during planning. The initial mapping asked MAPs to identify also groups that might be less represented in rural innovation processes. Particular attention was given to women and young people, as well as to older people, participants with low literacy or limited digital experience and people with disabilities. This was important because project monitoring indicated uneven gender balance and difficulties involving non-technical and civil-society actors when workshop discussions became highly specialised.

Inclusive design involved both recruitment and pedagogy. MAPs were encouraged to broaden participation, but attendance alone was insufficient if materials, venues, technologies or facilitation practices prevented meaningful engagement. Strategies considered clear language, visual explanation, step-by-step guidance, multilingual resources, printed and digital alternatives, low-connectivity access, subtitles or audio support, high-contrast materials, accessible venues, additional facilitation and adjustment of pace.

The practical translation of DigComp also incorporated accessibility. For example, searching for information could be taught through voice search or enlarged text for participants with visual impairments; managing a profile could include screen-reader or zoom functions; and digital content creation could use a photo-based report rather than a spoken explanation for participants with hearing

difficulties. These examples linked accessibility features to the competence being developed instead of treating accessibility as a separate technical checklist.

Table 2. Examples of planned inclusion and accessibility adaptations across MAPs

MAP	Examples included in Capacity Building planning
Birda	Parallel or differentiated activities for adults and children; simplified educational content; visual materials and emoji-based feedback; individual assistance; printed and digital materials; examples connected to drinking water, agriculture, irrigation and environmental protection
Durangaldea	Clear language and visual explanations; step-by-step instructions; downloadable materials for low-connectivity settings; Spanish and Basque user guidance; scenarios drawn from local co-creation
Jonava	Participation opportunities for young people, older people and other interested groups; practical training in natural and institutional settings; demonstrations linked to data collection and platform use
Kythira	Targeted engagement of younger audiences; scheduling during periods of greater local presence; hybrid participation for external experts; practical testing and digital worksheets
Pongau	Support provided according to participant need; collaborative and individual learning; real scenarios and data from the local wastewater-treatment context; graphic recording to communicate system complexity
Westhoek	Differentiated training pathways for different user profiles; local hydrological and accessibility scenarios; practice-based exercises for specialised and institutional users

The strategies show that inclusion did not always mean bringing every social group into every technical workshop. Some Smart Solutions legitimately required specialised professional users. The inclusive challenge was instead to make participation appropriate to the solution's purpose, avoid unnecessary exclusion, and identify when wider groups needed alternative forms of engagement or communication. This distinction is important for interpreting the results: a technically focused workshop cannot be evaluated against the same participation profile as an e-learning activity for children and community members.

5. Preliminary findings

5.1 A shared process with differentiated implementation

The first finding is that a Capacity Building process could be established across different Smart Solutions and territories. MAPs and Smart Solution providers followed the same sequence for identifying target groups and needs, mapping competences, preparing and reviewing strategies, organising workshops and collecting feedback. DigComp and the shared templates made key assumptions visible: organisers had to

specify who would use the solution, which competences were required, the expected proficiency level, how learning would occur and which accessibility barriers might arise.

Standardisation did not produce identical training. The strategies revealed substantial differences in target groups, starting competences, technological functions and territorial conditions. These differences led to differentiated learning objectives, methods, materials, pace and delivery formats. What became standardised was the process through which these choices were made, discussed and evaluated; what remained flexible was their local operationalisation.

The difficulty experienced with formal DigComp definitions is particularly revealing. The initial tool did not automatically create a shared understanding. Researchers had to translate competence descriptions into practical examples and proficiency levels connected to Smart Solution tasks. This adaptation shows that a framework can coordinate diverse actors only when active mediation makes it intelligible and usable.

5.2 Emerging participant outcomes

The currently available activities generated 97 post-training questionnaires: Birda (N=38), Durangaldea (N=18), Jonava (N=21), Kythira (N=20), and Pongau (N=13). The workshops differed in audience, technology, format and, in some cases, the precise evaluation questions. Across cases, the most consistent positive assessments concerned understanding how to use the Smart Solutions and recognising their relevance to local or professional activities. Perceived acquisition of new digital competences was more variable. Two explanations recur across the cases: participants' starting competence and the complexity of the technology.

In Durangaldea, respondents positively assessed training on the service-accessibility and crowd-sensing solutions. Almost all reported improved understanding of how the platforms could be used, their potential usefulness and the risks associated with their application. Responses concerning new digital skills were more differentiated, suggesting that the principal outcome was the application of existing abilities to new tools and planning situations.

Pongau involved mainly technical participants from regional authorities and wastewater-treatment organisations with intermediate or advanced digital competences. The training strengthened participants' understanding of the circular-bioeconomy platform and its relevance to their professional activities, while the perceived acquisition of broad new digital skills was less pronounced. Given participants' existing expertise, the principal learning outcome was not necessarily the development of general digital competence, but the ability to interpret and apply a specific decision-support tool.

Jonava provides clearer evidence of development across several DigComp areas. Activities related to an e-government application and wildlife eco-monitoring included data entry, mapping, alerts, documentation and drone-supported observation. Practical exercises, field-based activities and real-life cases were associated with greater reported confidence and autonomy, including competence development in information and data literacy, communication and collaboration, digital content creation, safety and problem solving.

Kythira illustrates variation between Smart Solutions within one territory. Training on the hiking-trail reporting platform was evaluated positively for practical usefulness and ease of application, although perceived acquisition of new digital competences was less consistent. The more specialised resilience application was considered relevant but presented greater accessibility and usability challenges. E-learning activities, by contrast, generated strongly positive assessments of understanding, usefulness and digital-skill development. Digital preparedness varied between territories, technologies and user groups within the same MAP.

In Birda, Capacity Building addressed institutional users of a climate-adaptation platform and a wider intergenerational group using an e-learning environment. For the latter, participants assessed materials as clear, relevant and accessible and expressed high confidence in using digital platforms. Practical activities and worksheets were particularly appreciated. Parallel adult and child activities, visual material, simplified content and individual support show how planning for inclusion translated into delivery.

5.3 Learning from the collective reflection

During the Annual Knowledge Sharing, MAPS presented their learning journeys, reflecting patterns emerging from the questionnaires and workshop documentation. Across MAPs, participants highlighted hands-on practice, live demonstrations, real-life examples, peer support, local facilitation and simplified communication. These practices were especially important where digital experience was differentiated or the technology was technically complex. The reflection also showed that Capacity Building generated knowledge relevant to innovation beyond the workshop itself. Questions about difficulty, accessibility and confidence revealed where a solution required better explanation, further user support or interface refinement. Capacity Building consequently operated as both a learning intervention and a feedback mechanism within the innovation process.

6. Discussion

The preliminary findings highlight a central tension in developing digital preparedness across heterogeneous rural innovation ecosystems: the need for methodological coherence without the

imposition of uniform interventions on different users, technologies and territories. FUTURAL suggests that these requirements can be complementary when they are applied to different dimensions of the Capacity Building process.

Standardisation concerned the architecture of the process. The competence framework, target-group analysis, scaffold-card activity, training-strategy template, peer-review meetings, workshop logic and post-training evaluation created a shared sequence for identifying, discussing and assessing competence needs. Flexibility concerned the operationalisation of that architecture. Competence levels, methods, materials, examples, delivery formats and accessibility measures were negotiated in relation to a Smart Solution and its intended context of use.

We provisionally conceptualise this combination as structured flexibility. The formulation is informed by Vañó-Agulló et al.'s (2026) emphasis on structured feedback, iterative learning and methodological flexibility in transdisciplinary research. The FUTURAL case extends this discussion to Capacity Building for rural digital innovation. Its emerging evidence indicates that flexibility is not simply a pedagogical preference. It is required because users do not start from equivalent positions and digital technologies do not impose equivalent competence demands.

The iterative programme also clarifies how flexibility was produced. Training strategies did not result from a linear transfer of expertise from researchers or technology providers. They integrated methodological knowledge from research partners, technical knowledge from Smart Solution providers and territorial knowledge from MAP actors. The Scaffold Cards, strategy template and peer-review meetings functioned as practical devices for organising this integration. The translation of formal DigComp definitions into task-based examples demonstrates that joint work also required mediation: common terminology alone was insufficient. This observation refines the role attributed to DigComp. By asking actors to distinguish areas and proficiency levels, DigComp helped prevent training planners from assuming that users already possessed the abilities required by a Smart Solution. Its value emerged through translation into real-life tasks, discussion with technical and territorial actors and adaptation to accessibility needs.

The findings further support a relational interpretation of digital preparedness. A person may be well prepared to use one digital service but require considerable support for another. A territory may contain highly skilled technical organisations while other social groups remain excluded from digital participation. Even advanced general competence may be insufficient when a technology requires specialised disciplinary knowledge or has unresolved usability barriers. The rural digital divide therefore concerns not only infrastructure and access but also competence, usability, technological complexity, organisational resources and the local capacity to mediate adoption.

Inclusivity needs to be understood within this relational perspective. It cannot be reduced to increasing attendance. Meaningful participation depends on whether the intended users can understand the purpose of a solution, access materials, take part in exercises and connect the technology to their needs. Planning for language, literacy, disability, age and connectivity before delivery created opportunities to address these barriers. The MAP examples nevertheless show that inclusion remains uneven and requires active recruitment of women, young people, and vulnerable groups, particularly where technical workshops tend to narrow participation. Pongau's graphic recording broadens the understanding of what Capacity Building for digital innovation may require. This method enabled participants to follow and discuss a complex system and its trade-offs. This suggests that digital preparedness can also depend on communicative and interpretive conditions that allow non-specialists and specialists to construct a shared understanding of the problem around which a digital tool is organised.

Capacity Building should be positioned as part of innovation. Target group analysis confronted technological ambitions with user capacities. Competence mapping translated functions into learning requirements. Workshops tested whether intended users could understand and apply the tools. Feedback identified needs for further explanation, support or technological refinement. Collective reflection returned these lessons to the wider project. The process linked human capital formation to the continuing development of the Smart Solutions.

This has implications for regional digitalisation policy. Investments in infrastructure and technology are unlikely to produce inclusive uptake when competence requirements are left implicit. Generic training may also be insufficient when disconnected from concrete tools and territorial practices. European frameworks can strengthen quality, comparability and shared language, but they require intermediary arrangements capable of integrating research, technical and territorial knowledge. MAPs and similar place-based innovation platforms can perform this mediating role, provided they have the time, resources and facilitation capacity to involve a sufficiently broad range of actors.

7. Limitations and next steps

The analysis is preliminary and has several limitations. First, FUTURAL is ongoing. Not all Capacity Building workshops and demonstration activities have been completed, and the current evidence reflects different stages of implementation across MAPs. Second, questionnaire samples are small and diverse. They concern different Smart Solutions and audiences and cannot be treated as a single statistical population. Third, the measures concern perceived understanding, confidence and competence development rather than independently tested proficiency or long-term adoption. Fourth,

the authors' role in designing and monitoring the programme provides valuable longitudinal access but also requires continued reflexivity and triangulation.

The final phase of the study will incorporate the remaining workshops and evaluation data, examine changes made following participant feedback, and compare more systematically how competence profiles, training methods and accessibility measures relate to perceived outcomes. It will also consider whether Capacity Building supported continued use of the Smart Solutions after training and whether the feedback loop influenced the final technologies and their adoption strategies.

The concept of structured flexibility should be treated as an emerging proposition and not as a final explanatory model. Its further elaboration will require the complete project evidence and a clearer assessment of where local adaptation enhanced learning and where variation weakened comparability or implementation quality.

8. Conclusion

This work-in-progress study shows how a digital competence framework can be operationalised through an iterative and transdisciplinary Capacity Building process. FUTURAL combined a shared methodological architecture with negotiated adaptation to different users, technologies and rural contexts. The process moved from target-group and learning needs identification to collaborative competence mapping, joint strategy development, peer review, local delivery, participant feedback and project-level reflection.

DigComp helped make competence requirements explicit and discouraged assumptions that intended users already possessed the skills demanded by a Smart Solution. Its implementation nevertheless required translation. Plain-language examples, real-life scenarios and proficiency levels connected the framework to concrete actions, while accessibility planning extended the analysis to the conditions under which different groups could participate meaningfully.

This initial evidence suggests that this combination of structure, negotiation and feedback can support territorially embedded digital competence development. It also shows that competence gains cannot be expected to be uniform: starting proficiency, technological complexity, professional knowledge and accessibility all influence what participants gain from training. Once the final workshops and project phases are complete, the study will be able to assess these relationships more systematically and refine the proposed concept of structured flexibility.

References

Ashmore, Fiona, Jane Deville, and Liz Price. 2021. *CORA Policy Brief 3: Enhancing Digital Skills in Rural Areas*. University of Lincoln. https://repository.lincoln.ac.uk/articles/report/CORA_Policy_Brief_3_Enhancing_digital_skills_in_rural_areas/24396730/4.

Brunori, Gianluca. 2022. "Agriculture and Rural Areas Facing the 'Twin Transition': Principles for a Sustainable Rural Digitalisation." *Italian Review of Agricultural Economics* 77 (3): 3–14. https://doi.org/10.36253/REA-13983.

Cosgrove, J., and R. Cachia. 2025. *DigComp 3.0 European Digital Competence Framework*. European Union, Joint Research Centre. https://joint-research-centre.ec.europa.eu.

European Commission. Joint Research Centre., 2024. "Scaffold", a deck of cards to design competence-oriented learning experiences: a practical guide for educators. Publications Office, LU.

Eurostat. 2025. *Urban-Rural Europe—Digital Society*. Statistics Explained. https://ec.europa.eu/eurostat/statistics-explained/.

Ferrari, Anusca. 2013. *DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe*. Joint Research Centre. https://doi.org/10.2788/52966.

Feurich, Marek, Jana Kourilova, Martin Pelucha, and Edward Kasabov. 2024. "Bridging the Urban-Rural Digital Divide: Taxonomy of the Best Practice and Critical Reflection of the EU Countries' Approach." *European Planning Studies* 32 (3): 483–505. https://doi.org/10.1080/09654313.2023.2186167.

Giua, Carlo, and Michele Moretti. 2024. *D2.5—Capacity Building Guidelines and Material A*. FUTURAL Horizon Europe, Grant Agreement 101083958. https://futural-project.eu/wp-content/uploads/2025/07/FUTURAL_D2.5-Capacity-building-guidelines-and-material-A.pdf.

Giua, Carlo, Brigida Marovelli, Michele Moretti, and Gianluca Brunori. "Navigating Rural Digital Transition: Lessons from Innovation Ecosystems in Practice." *Sustainability Science*, ahead of print, 2026. https://doi.org/10.1007/s11625-026-01873-1.

Ofori, Adwoa Serwaa, Karen Keaveney, Ainhoa Gonzalez del Campo, and Dominic Robinson. 2025. "Rural Transformation Through Digitalisation? Understanding the Digital in the Context of Rural Change." *European Countryside* 17 (1): 91–110. https://doi.org/10.2478/euco-2025-0005.

Pertoldi, Martina, Carlotta Fioretti, Fabrizio Guzzo, et al. 2022. *Handbook of Territorial and Local Development Strategies*. Joint Research Centre. https://doi.org/10.2760/57919.

Roberts, Elisabeth, Brett Anne Anderson, Sarah Skerratt, and John Farrington. 2017. "A Review of the Rural-Digital Policy Agenda from a Community Resilience Perspective." *Journal of Rural Studies* 54: 372–85. https://doi.org/10.1016/j.jrurstud.2016.03.001.

Rundel, Christina, and Koen Salemink. 2021. “Hubs, Hopes and High Stakes for a Relatively Disadvantaged Low Tech Place.” *Local Economy* 36 (7–8): 650–68. https://doi.org/10.1177/02690942221077120.

Salemink, Koen, Dirk Strijker, and Gary Bosworth. 2017. “Rural Development in the Digital Age: A Systematic Literature Review on Unequal ICT Availability, Adoption, and Use in Rural Areas.” *Journal of Rural Studies* 54: 360–71. https://doi.org/10.1016/j.jrurstud.2015.09.001.

Stojanova, Simona, Nina Cvar, Jurij Verhovnik, et al. 2022. “Rural Digital Innovation Hubs as a Paradigm for Sustainable Business Models in Europe’s Rural Areas.” *Sustainability* 14 (21): 14620. https://doi.org/10.3390/su142114620.

Vañó-Agulló, Carles, Ana Prades, Josep Espluga, and Markku Lehtonen. 2026. “Transdisciplinarity From Principles to Practice: Insights From EU Horizon Research Projects on Sustainability.” *Sustainable Development* 34 (2): 2762–79. https://doi.org/10.1002/sd.70411.

Vuorikari, Riina, Stefano Kluzer, and Yves Punie. 2022. *DigComp 2.2: The Digital Competence Framework for Citizens—with New Examples of Knowledge, Skills and Attitudes*. Joint Research Centre. https://doi.org/10.2760/115376.