DIGITALIZATION OF ENTREPRENEURSHIP CAPACITY BUILDING FOR RURAL AREAS OF THE REPUBLIC OF MOLDOVA

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Abstract. Rural areas are in greater need than ever to improve their quality of life through digital skills and competence. Purpose of the study: to explore European practices and approaches to entrepreneurship education based on digital skills and competencies that contribute to building entrepreneurial capacity in rural areas. Methodology: bibliographic study of the Living Lab approach, based on electronic interaction university - business, and university - public administration, result-oriented, allowing simulation of entrepreneurial situations in learning environments that contribute to the improvement of digital skills in the development of entrepreneurship. Research from European experience shows that this model of a cyber-physical system of electronic interaction between government agencies, farms, secondary school students, and universities, forming areas of smart infrastructure, can effectively influence the strengthening of the political and educational participation of civil society organizations and business in the decision-making process. Interdisciplinary research is needed to collaboratively track and measure the outcomes of digital entrepreneurship skills training using the Living Lab approach, organizations, and students after completion of projects and programs. Research results: for the effective implementation of the "European Village" program in the regions of the Republic of Moldova, it is proposed to use the effects of European and international influence on the development of local communities, such as: identifying the added value of using digital solutions and dividing them into target audiences: local administrations, technology providers and citizens; creating visual materials and infographics to help visualize complex technical characteristics of solutions and services. Targeted learning groups will be able to access new open educational resources (OER), massive open online courses (MOOCs), and other digital tools being developed by the EU Joint Research Centre.
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Introduction. In 2014, the European Commission (EC) created the Digital Enterprise Strategic Policy Forum (European Commission, 2014) as a powerful think tank comprising leaders from business, academia, international organizations, and policymakers. For two years, its mandate has been to shape a vision for the digital transformation of European industry. The forum discussed strategies for digital transformation in Europe, advised the EC on policy issues and actions to promote digital transformation, and contributed to EU policy development at national and regional levels.

By the end of its mandate, in July 2016, the Forum presented the following policy recommendations and reports:

- Accelerating the digital transformation of European industry and enterprises;
- Big data and digital B2B platforms: the next frontier for industry and enterprises in Europe;
- Charting cities and regions as launching pads for digital transformation;
- Skills development for European industry;
- A digital compass for decision-makers

The Forum's recommendations provided the basis for the JRC to initiate learning and skills projects covering a wide range of studies for the following target groups: citizens and learners (micro), teachers and educators (professionals), educational organizations (meso), and societies (macro). In Figure 1, the projects are developed in cooperation with sister services of the EC (education and culture, employment, and justice).

Figure 1. JRC training and skills projects (Mihai Iacob, Emanuela Proietti, 2016)
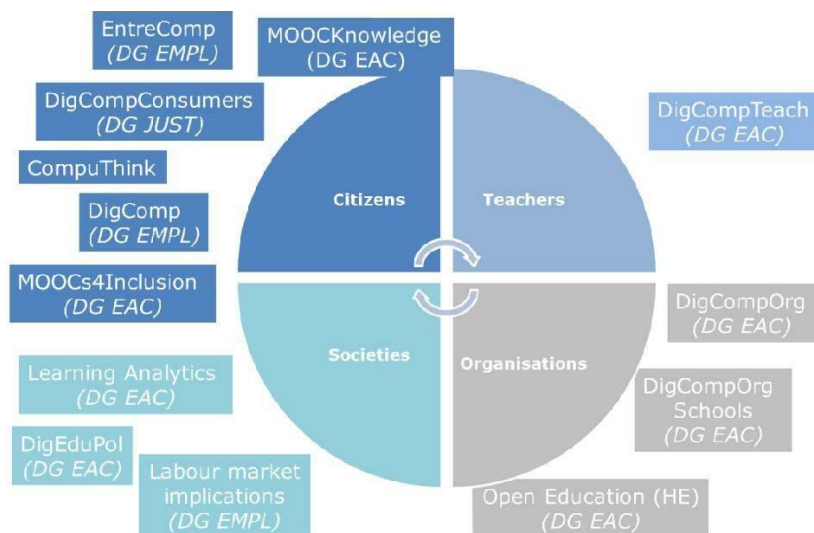
The JRC study includes projects:
- Digital competence of citizens (DigComp);
- Digital competence of consumers (DigCompConsumers);
- Entrepreneurial competence (EntreComp);
- Computing thinking research (CompuThink).

The article (Iacob & Proietti, 2016) presents the results of JRC research projects as a guide for teachers and education agencies. The Digital Education Action Plan 2021–2027 (European Commission, 2020) is key to realizing the vision of a European Education Area by 2025. It contributes to the objectives of the European Skills Agenda, the European Action Plan for the Social Dimension, and the «Digital Decade Policy Programme 2030» (European Parliament and Council, 2022).

Eastern European countries are digitally lagging behind in the integration of digital technologies in education and training (E&T). Consequently, for the regions of these countries, there is a need to ensure that the potential of digital technologies at the European level for rural entrepreneurship education is harnessed and effective learning is made possible for the target groups of concerned citizens and organizations through systemic and holistic change.

The research of the Innovation Centre Information Technologies for Business Application (IT4BA) at the Moldovan Academy of Economics (Babin Anatolie, Tutunaru Sergiu, Covalenco Ion, 2021) aims at finding proposals for cooperation in the development regions of Moldova as part of planning innovation cooperation with JRC.

Current studies focus on:
• Digital Competent Organizations (DigCompOrg);
• Digital Competence of Educators (DigCompEdu);
• Policy Reforms on Digital Integration in Education (DigEduPol);
• Learning analytics studies.

Previous studies have examined creativity and innovation (ICEAC), the use of ICT to assess key competences (COMPASS), including innovative learning and teaching (NMSeL; LEARNCOM; Learning & Ageing Society; Learning 2.0; 1:1 Learning; TeLLNet; SCALE CCR), and studies on the future of learning (eLFut; FutLearn; MATEL; Horizon Report Europe (JRC EU Commission, 2022).

Developing the entrepreneurial capacity of citizens and organizations has been one of the key policy objectives of the EU and candidate states for many years and one of the eight key competences for lifelong learning. The JRC, in partnership with DG Employment, Social Affairs, and Inclusion, has developed the Entrepreneurship Competence Framework EntreComp. EntreComp describes entrepreneurship as a lifelong competence, defines what elements make a person an entrepreneur, and describes them in order to create a common framework for initiatives related to entrepreneurship education.

According to the European Commission, "Entrepreneurship is a person's ability to turn ideas into action. It includes creativity, innovation, risk taking, the ability to plan and manage projects to achieve goals" (Institute of Entrepreneurship, 2021).

Turning ideas into shared value is equally relevant to career development, supporting a local sports team, or starting a new business. Creating entrepreneurial value and learning entrepreneurship can take place in any area of life. By focusing on developing competencies through the actual creation of entrepreneurial value, EntreComp breaks down the boundaries between education, work, and civic engagement. In this respect, EntreComp is cross-cutting to formal and informal learning contexts and is equally applicable to education and training systems, from

initial vocational education and training to unstructured learning contexts including civil society, local communities, youth and adult work, start-ups, and existing organizations such as corporations, non-governmental organizations, or public administrations. EntreComp was developed through a mixed-method approach involving a comprehensive review of both academic and popular literature as well as in-depth case studies and a series of iterative multi-stakeholder consultations.

The main issues EntreComp addresses are as follows:

• What elements define entrepreneurship as a cross-cutting competence?

• How can entrepreneurship be described in terms of learning outcomes from a lifelong learning perspective?

• How can entrepreneurship learning outcomes be grouped according to skill levels?

EtreComp aims to align with the EC's top priority 'Jobs, Growth, and Investment' as well as the flagship initiative 'Agenda for New Skills for New Jobs' (JRC EU Commission, Science Hub 2022). EntreComp builds on previous work carried out by the JRC to define another key competence for lifelong learning: digital competence (DigComp). Digital competence encompasses 'the confident, critical, and responsible use and interaction with digital technologies for learning, working, and participating in society. It is defined as a combination of knowledge, skills, and attitudes" (VUORIKARI Riina; KLUZER Stefano; PUNIE Yves, 2022).

Improving the future of rural areas through better territorial governance

In 2023, the Digital Decade 2030 policy agenda came into force—a monitoring and cooperation mechanism to achieve common goals for Europe's digital transformation by 2030 (EU Commission, 2023).

For the first time, the European Parliament, Member States, and the EC jointly set specific goals and targets in four key areas: digital skills, infrastructure, including connectivity, digitalization of business, and online public services, in accordance with the Declaration on European Digital Rights and Principles.

An iterative collaborative process to assess progress and identify milestones to achieve them by 2030 accompanies the goals and targets. The program also creates a new framework for international multistakeholder projects, which will allow Member States to join forces for digital initiatives. From 2023 until 2030, EU Member States, in cooperation with the European Parliament, the EU Council, and the EC, will shape their digital policies to achieve the goals in four areas:

• Improving citizens' basic and advanced digital skills;

• Adoption of new technologies such as artificial intelligence, data, and cloud technologies in EU companies, including small businesses;

• Further development of EU communications, computing, and data infrastructure;

• Online accessibility of public services and governance.

Similar to the strategic plans at the national level, which are more closely linked to the implementation tools within the UNDP thematic programs, the IT4BA researchers seek to inform local initiative groups and potential beneficiaries of the National Programme "European Village" about best practices from the regions of the

immediate Central and Eastern European EU Member States that demonstrate the benefits of implementing Regional Development and Cohesion Policy based on the Structural Funds program approach.

The flagship initiative "Research and Innovation (R&D) for Rural Communities" can help create synergies between national funds, international technical support from which European Rural Programme projects, and institutional research projects of the "Research and Development Programme 2020-2023" (Babin Anatolie, Tutunaru Sergiu, Covalenco Ion, Babina Ecaterina, 2021) that are funded. In the context of the above-mentioned initiative, the following activities are proposed for innovative public-private partnership projects:

• Rural-oriented research and development;
• Expertise and training centers for rural innovation;
• Smart solutions for rural communities in digital transformation;
• Innovation led by women;
• Spatial mobility analysis (accompanying action).

In order to unite rural innovation actors, the following are proposed:

• Integration into rural networks (ENRD, EIP-AGRI);
• Preparatory actions for smart villages;
• R&I smart specialization platforms;
• Annual forums of start-up villages.

The implementation in the Republic of Moldova of the flagship initiative "Research and Innovation for Rural Communities" (Alexia Rouby, 2021) can ensure the stimulation of adequate management of European integration processes based on the study of spatial, socio-economic, and behavioral factors of human settlements in the implementation of national programs and regional sector plans. The work streams of the flagship initiative, as part of the EU's long-term vision for rural areas, are territorial strengthening, connectivity, sustainability, and prosperity.

The following progress has been recorded since the launch of the National Programme for European Rural Development (Ministerul infrastructurii și dezvoltării regionalale (Ministry of Infrastructure and Regional Development) (2023):

• Over 22 thousand citizens from fifteen localities in the country benefit from quality water and sewage services.
• In 21 villages, almost 6,000 children, students, and teachers enjoy new and comfortable equipment, machinery, and furniture.
• Over 24 thousand inhabitants from twenty localities in the country benefit from more light and safety on the streets.
• In fourteen localities, over 30 thousand citizens enjoy modern equipment, machinery, and furniture in cultural centers;
• In six localities of the country, around four thousand children have more modern conditions for spending their free time;
• In two localities in the country, about four thousand citizens will have cleaner energy and lower electricity and heating bills.

Other project activities are aimed at developing a master urban plan for one locality and co-financing projects from external sources for two projects.

The objectives of the Innovation Center IT4BA at the Academy of Economic Studies of Moldova (AESM) to promote the digital economy and "smart education" (Babin, Covalenco, Tutunaru & Babina, 2022) in rural areas meet the objectives of the flagship initiative in the R&D sector:

• Supporting the development of innovations by and for rural communities;

• Training and knowledge exchange to accelerate the diffusion and adoption of innovations;

• Strengthening innovation ecosystems and analyzing the drivers of innovation in rural areas.

The Digital Economy Phased Plan for Moldova has been updated and aims to expand virtual government-to-business (G2B) relations, digitalize the economy, and improve e-commerce infrastructure. Developed in 2020, the milestone plan is updated annually based on recommendations from business associations and research supported by development partners.

The updated phase plan for digitalization of the economy and trade for 2023 (EU4Digital Facility, 2023) has the following objectives:

• Development of remote interaction with authorities and digital services for companies;

• Development of e-commerce infrastructure;

• Simplification of tax and customs procedures for the development of the digital economy, e-commerce, and exports;

Specific actions envisaged in this plan are aimed at:

• Creation of a universal technological platform for remote customer identification;

• Revising the procedure for issuing personal IDNP codes to foreign investors;

• providing digital notary services for entrepreneurs, diaspora, and foreign investors;

• clarifying the legal aspects of remote working;

• supporting the development of e-commerce logistics infrastructure;

• stimulating the market for electronic payment services;

• promoting a digital education program and enhancing access to financial services;

• promoting the dissemination of electronic invoices, tax receipts, etc.

It is also expected that the implementation of the contactless business management tool will simplify remote G2B interaction.

Entrepreneurship is a valuable skill for EU citizens, both for their personal and professional development. Entrepreneurship education plays a key role in ensuring European competitiveness and the continued growth of the European economy. Promoting entrepreneurship in education as a key competence encourages EU citizens to be entrepreneurial, formulate innovative solutions to social problems, and develop products with added social and economic value. Entrepreneurship is supported through a number of actions within the Erasmus+ Program, both for those

who study and train and for those who participate in strategic partnership projects abroad. The EU has developed a set of guidelines to support the development of entrepreneurship in education and training. In addition, a number of instruments have been created to support the development of innovative entrepreneurial thinking among EU citizens, among them HEInnovate for higher education institutions (Initiative of the European Commission and OECD, 2017).

An example of the cooperation of villages with the academic community in the Republic of Moldova is the project "Rural 3.0: Service Learning (SL) for Rural Development" (ERASMUS+RURASL, 2021). The project results provide the basis for a comprehensive transnational approach of the RURASL Knowledge Alliance (Figure 2) to academic teaching and learning, contributing to rural development, meeting their needs, and stimulating innovation in these areas through innovative methodology and community-university partnerships (GALSINMA Local Action Group, 2021).

Figure 2. RURASL University - Rural Knowledge Alliances (GALSINMA LAG, 2021)
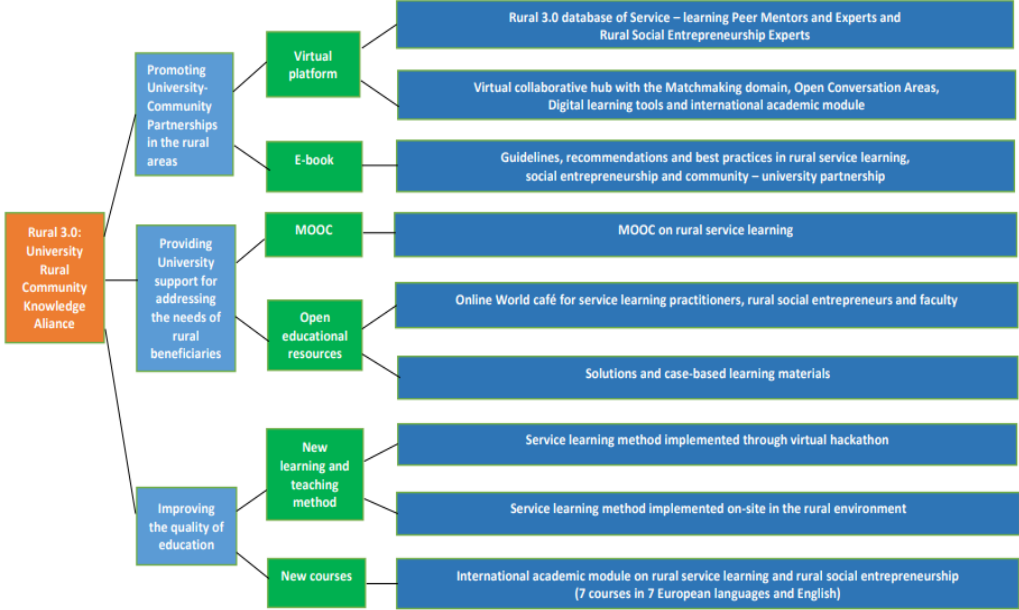
Rural 3.0's local and regional impact takes into account the needs of rural communities by creating community-university partnerships within the Hub. Each service learning practice includes multiple stakeholders, responding to the needs of the most disadvantaged collectives and ensuring the sharing, flow, and co-creation of knowledge. The regional partner universities all represent SL centers of local action groups (LAGs) and, by extending their civic engagement to rural communities, have become regional models of good practice.

The main benefits of the RURASL project (Figure 3) are:

• Forming rural communities that promote the education and entrepreneurship of people in rural areas by bringing together higher education

institutions and rural social enterprises to work together on a common issue—developing the knowledge and skills needed to change rural communities;

• strengthening the skills and innovative capacity of adult rural social entrepreneurs (SP);

• Providing practical training and social entrepreneurship services to university students in specific rural contexts;

• Development of basic skills and SP among high-potential rural communities in a sustainable, environmentally and socially sound manner.

Figure 3. European and international impact of the RURASL Project
(Linda Saraiva, Joana Padrão, Marijeta Čalić, 2021)
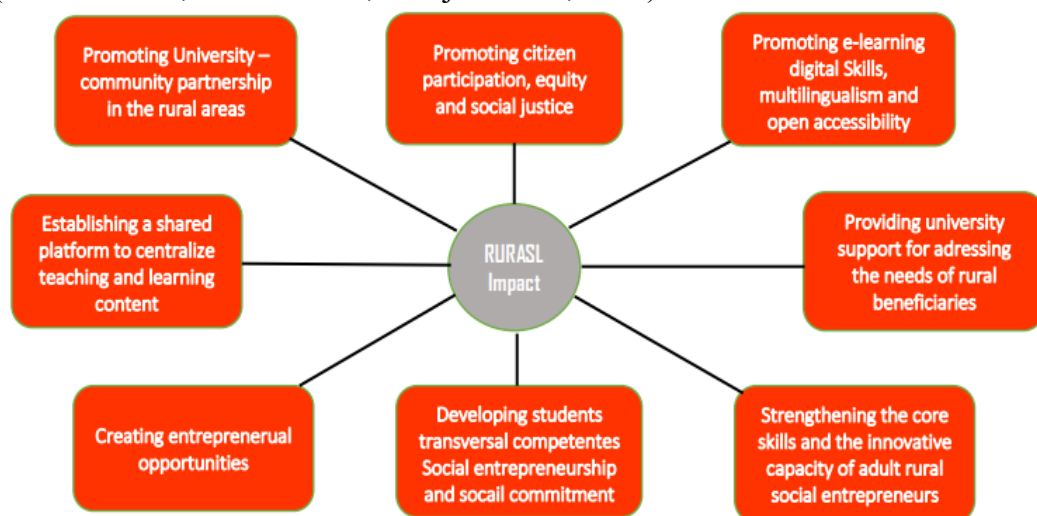
RURASL addresses the challenges identified in several EU strategy documents ('Social Inclusion', 'Rethinking Education Strategy', 'E-Skills Strategy', '2030 Digital Compass' (EU Commission, platform FUTURIUM, 2021) by bringing together higher education institutions and rural organizations to work together to develop the knowledge and skills needed to bring about change in rural communities, supporting the modernization of European higher education through a transnational curriculum based on an innovative approach and Open Educational Resources (OER).

Keys to successful digital transformation of human settlements

The following aspects of integrated digital transformation are identified as a result of the European best practices.

Human capital and digital skills

Infrastructure alone does not guarantee that everyone will benefit from digital transformation. In fact, digital skills are crucial. Limited access to and use of digital technologies in rural areas is accompanied by a lack of digital skills among different social groups (e.g., older people) and businesses. This includes basic digital skills and competencies that enable people to interact online and consume digital goods

and services, as well as advanced skills that enable the workforce to take advantage of technology to enhance productivity and economic growth.

Digital literacy and awareness of the opportunities that digitalization offers are key to the new business models, applications, and services needed to develop and promote social cohesion and economic prosperity in Europe. For everyone to participate in and benefit from the digital economy and to adapt quickly to new and unexpected occupations and skills needs, education and training systems need to focus more on developing general ICT skills, the skills of ICT professionals, and skills complementary to ICT, including basic skills, digital literacy, higher-order critical thinking skills, and social and emotional skills. Greater efforts are also needed to enhance the digital skills of adults to help them participate fully in the digital economy and society.

Target groups for improving digital skills in rural areas are: local initiative groups, businesses, and public administrations.

Digital public services. Digital public services have a significant impact on the quality of life and attractiveness of rural border areas in a cross-border context. They can lead to increased efficiency and access to adequate broadband services for rural entrepreneurs, which is crucial for economic and social development. The Measurement of Digital Public Services emphasizes the digitization of public services, focusing on spatial data infrastructure, e-government, and social infrastructure.

Innovative public-private partnerships systematize the digital transformation of businesses and localities and the renewal of business applications and e-public services. The use of Internet services explains the variety of activities that citizens already perform online. Such activities range from consumption of online content (videos, music, games, etc.) to modern communication activities, online shopping and banking, and a wide range of public services.

Digital infrastructure Ultrafast broadband infrastructure is a prerequisite for regions, businesses, and citizens to benefit from the digital transformation. The infrastructure aspect revolves around the development of superfast broadband infrastructure and its quality. Access to fast broadband services is a prerequisite for regional competitiveness, especially in rural areas.

To ensure future readiness and full coverage of superfast broadband services, several factors play a fundamental role.

These include:
- Tariff competition;
- Demand stimulation and consumption levels;
- Availability of government assistance and financial instruments;
- A decent legal and regulatory framework;
- Geographical and demographic characteristics;
- Availability of communication channels and upgradeable networks;
- Willingness to pay and affordability.

DSL, cable access, fibre-optic technology, radio broadcasting and new mobile standards have brought many technologies to the market that provide reliable broadband services.

However, it is important to choose the best technology for a particular region. In this context, many EU member states are seeking full coverage of fibre optics, which is seen as a promising technology.

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Integration of digital technology in business

Increasing the technological readiness of rural enterprises includes:

• Facilitating the digital transformation of SMEs in rural areas;

• Helping SMEs cope with information overload;

• Cybersecurity and defensive security systems that can be used to proactively detect attacks;

• Understanding and analyzing cyber threats;

• Design thinking as a problem-solving tool;

• Building an effective network of business stakeholders;

• Business networking activities;

• Development of support measures for rural digital entrepreneurial ecosystems;

• Rural digital hubs: ensuring ownership and participation;

• Public data platforms as drivers of economic development.

Based on the findings, a model CORA (EU Interreg North Sea Region project, 2023), Figure 4, was developed, including guiding measures, success stories, and selected training materials for the main target groups, namely local communities, authorities, and businesses, in three main dimensions: digital infrastructure, digital services, and digital skills.

Figure 4. CORA model (EU Interreg North Sea Region project, 2023)

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The CORA model aims to overcome the digital divide in rural areas, which is a common problem in Europe. In order to improve and empower rural areas to increase the use of digital services for better quality of life, work, and growth, a digital ecosystem must be created. It includes the main aspects of digital transformation, namely digital infrastructure, digital services, and digital skills and competences. CORA takes these factors into account and focuses on empowering rural areas for digital transformation. It aims to enable local authorities to bridge the digital divide, improve public service delivery, and create an environment that encourages digital innovation in rural areas.

The CORA model consists of three main steps: identifying common local problems, testing solutions to overcome problems, and optimizing and transferring knowledge. The aim is to first identify existing problems in the local context and provide appropriate solutions to overcome these problems. Conceptual solutions and approaches need to be tested and their impact analyzed. This experimental approach provides a new perspective on the barriers to digital transformation in rural areas. To this end, the process started with the development of a survey guide and our regional surveys to identify local digital baselines and demonstrate common transnational challenges among local and regional participating partners.

Systematising financial solutions

The infrastructural dimension of the digital transformation of human settlements revolves around the development of superfast broadband infrastructure and its quality. Access to fast broadband services is a prerequisite for regional competitiveness, especially in rural areas. To ensure future readiness and full coverage of superfast broadband services, several factors play a fundamental role. These include tariff competition, demand stimulation and consumption levels, availability of state aid and financial instruments, decent legal and regulatory frameworks, geographical and demographic characteristics, availability of channels and upgradable networks, and willingness to pay and affordability.

In 2017, the Commission launched the Connecting Europe Broadband Fund (CEBF) (Cube Infrastructure Managers, 2020) with the European Investment Bank to develop broadband network infrastructure in underserved areas of Europe. The fund combines private and public investment to support the financing of smaller, high-risk broadband projects. These projects help the European Commission meet connectivity targets through projects run by start-ups and small companies that deploy the most efficient technology available in underserved areas.

CEBF Investment Guidelines:

• The fund provides loss protection through its highly diversified investment strategy in promising greenfield infrastructure assets, in addition to the large junior equity provided by the European Commission and the European Strategic Investment Fund (EFSI);

• The fund invests by financing (mainly through minority equity positions and/or mezzanine/junior debt financing) investments in broadband access infrastructure and technically and economically viable greenfield projects located in

(grey) or (white) NGA (EU Commission State Aid 2009) zones, i.e., most often in underpopulated or rural areas;

• CEBF support complements other types of financing currently available on the market through public or private financial institutions, as well as existing EU financial instruments.

Private financing is usually associated with faster deployment. Generally, private equity or debt financing mechanisms can be tailored to meet the different needs of potential investors, e.g., strategic and institutional. The systemization of financing solutions is presented in Figure 5.

Figure 5. Systemisation of financial decisions (Gallegos, Doyle, Junko, Ariana, 2019)

| Private	Public	Community	Vendor	DFI
• Project bonds	• Equity capital	• Asset transfer (rights of way)	• Terms finance	• Investment project financing
• Direct loans	• Debt capital	• Community bonds	• Lease option finance	• Trust funds and grants
• Syndicated loans	• Subordinated loans	• Community finance	• Bank guaranteed loan	• Development policy financing
• Corporate bonds	• Minimum guarantees	• Subscriber equity	• Documentary credits	• Loans and equity capital to private sector
• Subordinated bonds	• Offtake agreements	• Subscriber finance		• Syndications
• Listed equity capital	• Tax increment financing			• Blending concessional finance
• Unlisted equity capital	• Infrastructure bonds			
• Corporate social responsibility (CSR) grants	• PPP project finance			

The involvement of public financing may entail additional constraints on profitability, with state aid conditions acting as some form of tariff regulation. Successful cases involving significant amounts of public finance and/or funding from development finance institutions tend to involve active private sector participation. The separation of funding and ownership between public and private enterprises needs to be careful to avoid contradictory incentives.

Living Labs and stakeholder networks. Economic barriers are crucial for land managers. The implementation of digital technologies and processes requires investment on the part of the land surveyor. As investment can vary depending on the type of intervention planned, it is certainly a decisive factor and, in many cases, a barrier to the adoption of more advanced methods. This becomes even more serious as the return on investment in some areas can be quite long, stretching over several years before the changeover pays off. This effect is particularly pronounced on small farms, where scalability is not optimally achieved. But return on investment is only one piece of the larger puzzle, which also includes cultural values and data

ownership. Access to digital infrastructure and data management will be fundamental issues that will influence digital innovation in land management practices.

DESIRA Living Lab (DESIRA Gateway EU FP8 project, 2023) creates user-centered open innovation ecosystems in the Virtual Research Environment (VRE) (Figure 6), based on a systematic approach to user co-creation, integrating research and innovation processes into real communities and environments.

**Figure 6. General view of the DESIRA VRE specification** (DESIRA Gateway EU FP8 project, 2023)
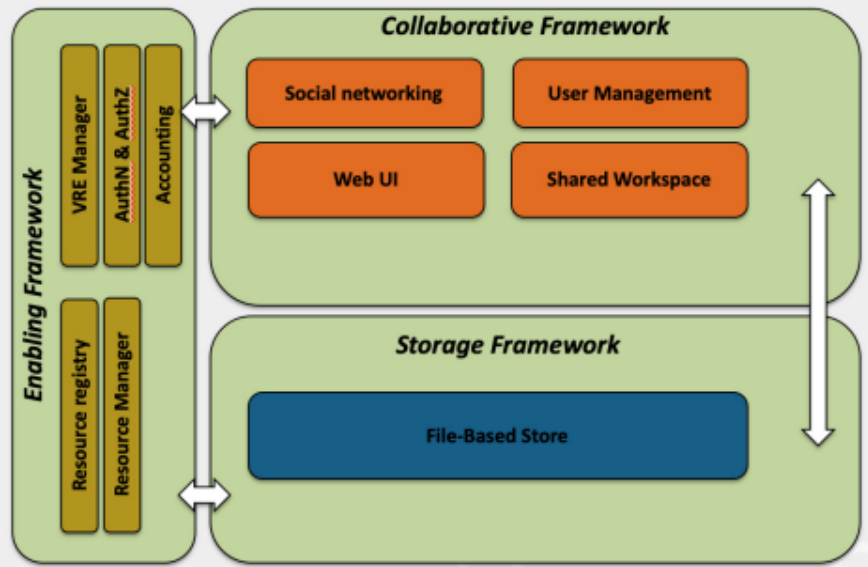
All approaches should recognize the right of the land manager to benefit and be compensated for the use of data generated by operations. However, data is becoming an increasingly complex issue as the amount of data that farmers may need or generate increases and the technology to manage it becomes more sophisticated. This leads to real concerns about the reliance on technology and privacy protection associated with data sharing.

Living Labs and networks (Saija, Quattrocchi & Ventura, 2023) have recently become major centers of debate about digitalization processes in rural areas. Their impact on land management practices and on the involvement of owners and managers in innovative practices has been recognized in Europe and worldwide. These new forms of transition management are seen as an acceleration of innovation. Living labs now have broad political support, including in the research and innovation policies promoted by the EC. The Living Lab approach is expected to support acceptable processes of digital transformation in entrepreneurship in rural areas. It should promote synergies between the economic, social, and environmental aspects of sustainability, as well as a fair distribution of costs, benefits, and risks among all actors in the supply chain. Living Labs can be not only a tool but also a process that challenges traditional land management practices and their

environmental and social externalities. The concept requires more sustainable models based on local conditions, as opposed to the dominant traditional agro-industrial system. The questions are whether, how, and to what extent existing living laboratory models can actually transition from dominant traditional practices to more sustainable systems, and whether they are inclusive.

An analysis of the potential of digital technologies to improve living conditions in 20 European regions was one of the goals of the DESIRA project. The results of the analyses show that each region or Living Lab has an existing socio-cyber-physical system (SCPS) (Kelly Rijswijk, Ellen Bulten, Laurens Klerkx 2020), Figure 7, which is explored and developed together with Living Lab participants by reflecting local needs and expectations.

Figure 7. The socio-cyber-physical system (Kelly Rijswijk, Ellen Bulten, Laurens Klerkx, 2020)
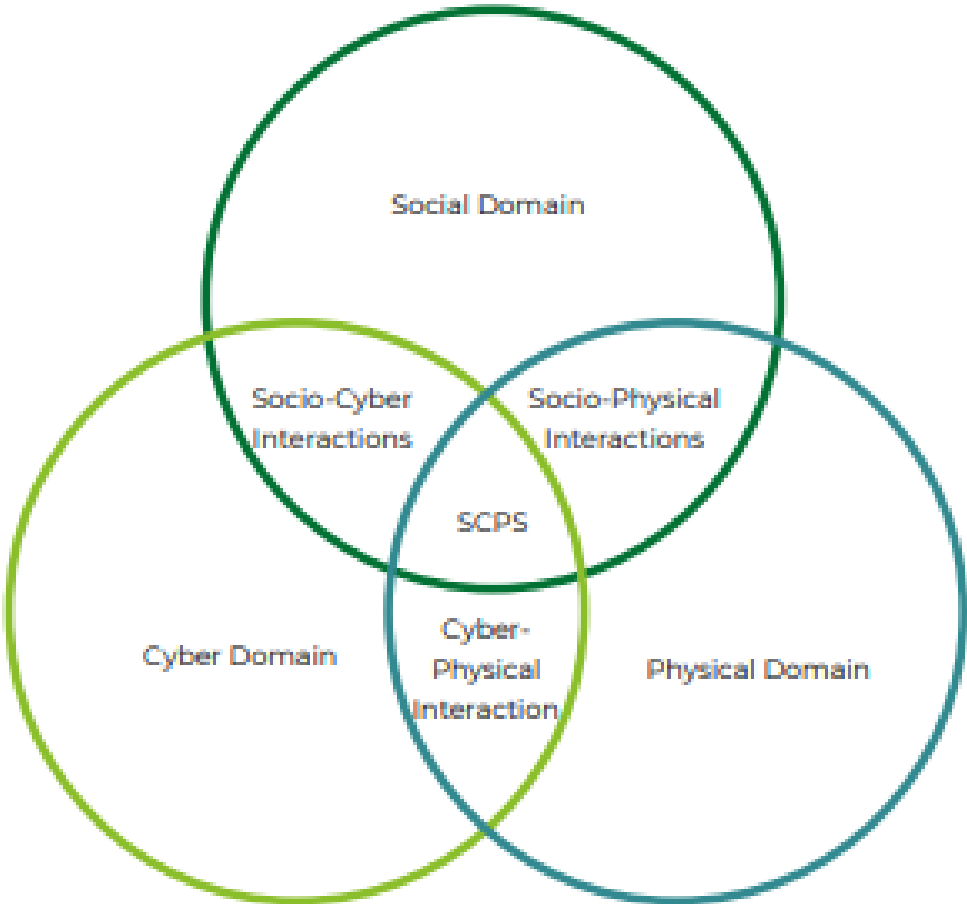
In addition, SCPS provides guidance on creating a local system, setting its boundaries, and helping Living Labs (Figure 9) analyze the current state of the system in terms of the results of the impact of digital transformation processes.

Figure 8. SCPS analysis process in Living Labs (Kelly Rijswijk, Ellen Bulten, 2020)
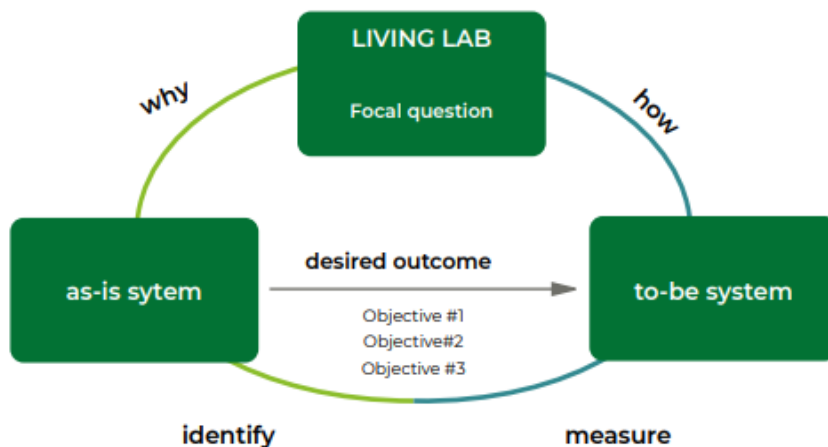
The SCPS status analysis identifies the desired outcomes of the system, sets targets to be achieved, and measures the distance to these targets. Living Labs then proceeds to analyze how the desired results can be achieved by incorporating digital changes into the current SCPS (future system).

Conclusions. The introduction of digital solutions in rural areas meets certain obstacles, among which:
- Difficulties in sharing the added value of digital services with consumers.
- Rural inhabitants often see digital services as an external imposition of methodologies, which will hinder the existing status quo in their remote communities.
- The lack of communication between technical and operational partners in European rural projects also makes communication difficult. Operational partners are not always informed about the technical features of the services deployed, which makes it difficult to share information with end-users and to add value to innovative projects.

These problems would be solved by:
- Creation of forums for smart community development in pilot districts and local initiative groups where local administrations and citizens can voice their concerns about the digital solutions of technical partners from HEIs.
- Involving civil society organizations and building the capacity of local public administrations to identify the needs of rural entrepreneurs and households to improve their digital entrepreneurial skills and competencies

- Planning for cyber defenses based on university infrastructure, possible expansion of information systems, networks, or processes in order to cope with the increased workload of distance learning, and the creation of new e-Science for Business services to accompany infrastructure and innovation projects in human settlements (increasing their productivity) while adding resources (usually hardware)

- Identification of the added value of using digital solutions and dividing them into target audiences: local administrations, technology providers, and citizens

- Creation of visual materials and infographics to help visualize the complex technical characteristics of solutions and services.

In order to effectively implement the National Programme European Village in the regions of the Republic of Moldova, best practices should be used, taking into account the effects of European and international impact on local community development, such as:

- Learning target groups will be able to access new Open Educational Resources (OER), Massive Open Online Courses (MOOCs) (JRC EU Commission, Inamorato dos Santos, Andreia; Punie,Yves, 2017), and other digital tools being developed by the JRC EU Commission that enable inter-regional and local collaborative networks.

- Regional universities should strengthen their relationships with local communities. The creation and operation of innovative infrastructure for collaborative research and innovation work within LivingLab with European partners requires public administrations, local initiative groups in rural areas, and serious knowledge and competence in the sectors of the digital economy.

REFERENCES

Babin, A., Tutunaru, S., Covalenco, I., & Babina, E. (2021, May 5-8). Smart Infrastructures for Rural Areas - Best Practices and Suggested Actions for Moldova. In: *Central and Eastern European eDem and eGov Days:* international scientific conference (6nd ed, pp. 127-137). Budapesta. Viena, Austria: Facultas Verlags- und Buchhandels. https://doi.org/10.24989/ocg.v341.9

Babin, A., Tutunaru, S., & Covalenco, I. (2021, October 15-16). Accelerating digital innovation within the Smart Village concept in the Republic of Moldova. In: *Economic growth in the conditions of globalization:* international scientific-practical conference (15nd ed, Vol. 2, pp. 285-291). Chisinau: INCE. https://ibn.idsi.md/ro/vizualizare_articol/156158

Babin, A., Covalenco, I., Tutunaru, S., & Babina, E. (2022, September 22-23). In: *CEEeGov '22: Proceedings of the Central and Eastern European eDem and eGov Days*: conference (p. 51), Budapest, Hungary. New York, United States: Association for Computing Machinery. https://doi.org/10.1145/3551504.3551517

Cube Infrastructure Managers. (2020). *Connecting Europe Broadband Fund (CEBF).* https://www.cebfund.eu/about

DESIRA Gateway EU FP8 project. (2023). *DESIRA Living Lab VREs* https://desira.d4science.org/explore

ERASMUS+RURASL. (2021). Project *Rural 3.0: Service Learning for the Rural Development.* https://erasmus-plus.ec.europa.eu/projects/search/details/599382-EPP-1-2018-1-PT-EPPKA2-KA

European Commission. (2009, September 17). *State aid: Commission adopts Guidelines for*

broadband networks - frequently asked questions. What is the relationship of the Guidelines with the Regulatory Framework and the NGA-Recommendation?. https://ec.europa.eu/commission/presscorner/detail/en/MEMO_09_396

European Commission. (2014). *Strategic Policy Forum on Digital Entrepreneurship.* https://single-market-economy.ec.europa.eu/industry/strategy/advanced-technologies/strategic-policy-forum-digital-entrepreneurship_en

European Commission. (2020). *Digital Education Action Plan (2021-2027).* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0624

European Commission. (2021). *2030 Digital Compass: Your Digital Decade.* Platform FUTURIUM. https://futurium.ec.europa.eu/en/digital-compass/pages/about

European Commission. (2022). *Cohesion Policy is delivered through specific funds.* Cohesion Open Data Platform. https://cohesiondata.ec.europa.eu/funds/21-27

European Commission. (2023, January 9). *First cooperation and monitoring cycle to reach EU 2030 Digital Decade targets kicks of.* https://ec.europa.eu/commission/presscorner/detail/en/ip_23_74

European Parliament and of the Council. (2022). *Establishing the Digital Decade Policy Programme 2030.* https://eur-lex.europa.eu/eli/dec/2022/2481/oj

.European Union. Interreg North Sea Region. (2023). *Connecting remote areas Model.* Project CORA. https://ruraldigital.eu/model/

European Union 4Digital Facility. (2023). *Moldova digital economy roadmap updated for 2023.* https://eufordigital.eu/moldova-digital-economy-roadmap-updated-for-2023/

Gallegos, D., Narimatsu, J., & Batori, O. A. (2019). *Business Models for Expanding Fiber - Optic Networks and Closing the Access Gaps:* Main Report, p. 57. International Bank for Reconstruction and Development / The World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/674601544534500678/main-report

GALSINMA Local Action Group. (2021). *RURASL: Exploitation Strategy Plan.* https://rural.ffzg.unizg.hr/wp-content/uploads/2021/02/EN_Exploitation-Plan-.pdf

Inamorato dos Santos, A., Punie, Y., Conole, G., Tannhäuser, A-C., Childs, M., Nkuyubwatsi, B., & Witthaus, G. (2017). *Validation of non-formal MOOC-based learning* (MOOCs). https://joint-research-centre.ec.europa.eu/what-open-education/mooc-massive-open-online-course_en

Initiative of the European Commission's DG Education and Culture in partnership with the OECD. (2017). *Preparing and Supporting Entrepreneurs.* https://www.heinnovate.eu/en

Institute of Entrepreneurship. (2021). *Development European Entrepreneurship: The EUropreneurship Concept.* https://ied.eu/about/europreneurship-network/#

Iacob, M., & Proietti, E. (2016). Guidelines for Teachers and Education Agencies. *Erasmus + DECODE Project: DEvelop COmpetences in Digital Era,* 51, 2016-1-IT02-KA201-024234. http://decode-net.eu/wp-content/uploads/2019/11/IO6_Report_Guidelines-for-Teachers-and-Education-Agencies.pdf

JRC EU Commission. (2022). *Learning and Skills for the Digital Era.* https://joint-research-centre.ec.europa.eu/scientific-activities-z/learning-and-skills-digital-era_en

JRC EU Commission, Science hub. (2022). *EntreComp: The entrepreneurship competence framework.* https://joint-research-centre.ec.europa.eu/entrecomp-entrepreneurship-competence-framework_en

Rijswijk, K., Bulten, E., Klerkx, L., den Dulk , L., Dessein, J., & Debruyne, L. (2020).

Briefing Concept of Socio-Cyber-Physical Systems (SCPSs). https://edepot.wur.nl/544950

Ministerul Infrastructurii și Dezvoltării Regionalale [Ministry of Infrastructure and Regional Development]. (2023). *Almost six months after the start of project implementation, the following progress has been made.* https://midr.gov.md/noutati/81-de-proiecte-din-cele-496-selectate-sunt-deja-realizate-in-cadrul-programului-national-satul-european

Rouby, A. (2021). *Flagship "Research and innovation for rural communities" DG Agriculture and Rural Development.* https://agriculture.ec.europa.eu/system/files/2021-10/presentation-flagship-randi-for-rural-communities-13102021_en_0.pdf

Saija, G., Quattrocchi, G., & Ventura, A-M. (2023). Acceptance of digital technologies in rural areas – Insights from SOILdarity. Chapter Future Prospects. https://desira2020.eu/2023/01/03/acceptance-digital-technologies-rural-areas-soildarity

Saraiva, L., Padrão, J., & Čalić, M. (2021). *Rural service-learning and social entrepreneurship eBook.* http://hub.rural.ffzg.hr/Home/Materials

Vuorikari, R., Kluzer, S., & Punie, Y. (2022). *DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes.* Publications Office of the European Union. Luxembourg. https://doi.org/10.2760/115376