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Article

Diagnostic study of digital skills based on the DigComp 2.2 framework in a union of cooperatives in the state of Puebla, México

Estudio diagnóstico de competencias digitales basado en el marco DigComp 2.2 en una unión de cooperativas del estado de Puebla, México

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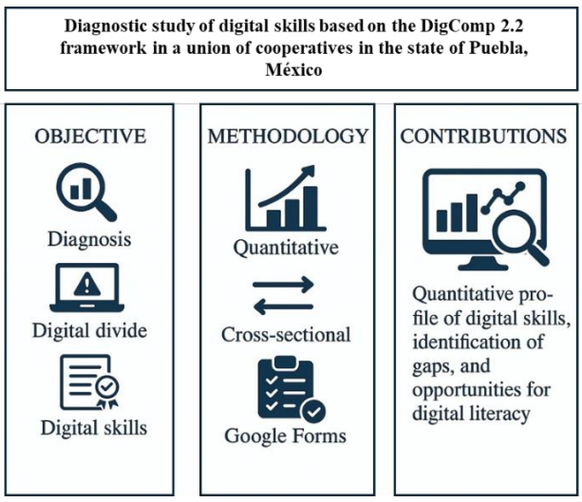
Abstract

The digital divide poses a central challenge to inclusion and development in the Social and Solidarity Economy (SSE), particularly impacting social cooperatives by limiting their access, innovation, and participation in the digital environment. Structural factors such as educational inequality, lack of infrastructure, and a lack of digital skills perpetuate this problem, especially in Mexico and Latin America. In response, this study diagnoses the level of digital skills in a cooperative union in Puebla, Mexico, using the DigComp 2.2 framework. The objective is to identify gaps in these skills to inform strategies that promote technological adoption, productivity, and greater integration into the digital ecosystem. The results provide a quantitative basis for designing and implementing targeted actions to reduce the digital divide in the cooperative sector, facilitating its sustainable development.



Digital skills, digital literacy, cooperatives, DigComp 2.2

Resumen

Las brechas digitales constituyen un reto central para la inclusión y el desarrollo en la Economía Social y Solidaria (ESS), impactando especialmente a cooperativas sociales al limitar su acceso, innovación y participación en el entorno digital. Factores estructurales como la desigualdad educativa, la falta de infraestructura y la carencia de competencias digitales perpetúan este problema, sobre todo en México y Latinoamérica. Frente a ello, el presente estudio diagnostica el nivel de competencias digitales en una unión de cooperativas en Puebla, México, empleando el marco DigComp 2.2. El objetivo es identificar las brechas en estas competencias para fundamentar estrategias que impulsen la apropiación tecnológica, la productividad y una mayor integración al ecosistema digital. Los resultados brindan una base cuantitativa para diseñar e implementar acciones focalizadas que permitan reducir la brecha digital en el sector cooperativo, facilitando su desarrollo sostenible.

Competencias digitales, alfabetización digital, cooperativas, DigComp 2.2

Area: Advocacy and attention to national problems

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Introduction

Digital divides, understood as lack of internet access, limited affordability of services, and lack of digital skills, pose a significant challenge to equitable development and social inclusion. These gaps represent an obstacle to social and economic progress, as they lead to the marginalisation of large sectors of the population and a loss of productivity, efficiency and competitiveness in businesses, regions and nations (Koike, 2024). The groups most affected are rural communities, people living in poverty, and workers in the social and solidarity economy (SSE), who are left behind in an increasingly digitised and competitive environment (Morales, 2020; Sánchez-Zárate, 2025).

In these organisations, digital divides pose a critical threat, as they hinder their inclusion in the digital ecosystem and limit both their capacity for innovation and the fulfilment of their community values and objectives. The persistence of these gaps contributes to deepening inequality and weakens the transformative impact of the SSE on poverty reduction and improving quality of life, by hindering access to health services, education, decent employment and citizen participation (Olarte, 2017).

For digital transformation to take place in cooperatives linked to the SSE, it is necessary to develop digital skills and comprehensive, contextualised and critical training processes that enable both technical and social barriers to be overcome, thereby generating real digital inclusion (Camalle et al., 2025). This implies not only access to technology, but also its appropriation and effective use (Espinoza et al., 2023).

Digital literacy involves the skills necessary to participate autonomously and critically in the digital society and benefit from the opportunities it offers. It also involves the ability to obtain, manage, integrate, communicate, evaluate and create information using digital technologies to access employment, decent work and entrepreneurship (UNESCO, 2018, as cited in Dalio et al., 2023). To ensure universal accessibility to digital tools and services, the development of digital skills must be guided by universal design principles that promote equity and usability (Karelis et al., 2025).

Various reference frameworks have been developed to classify digital competencies and facilitate the identification of skill requirements for both citizens and economic sectors. Among these, the European Digital Competence Framework for Citizens (DigComp 2.2) stands out. This framework provides assessment criteria and application examples for the design of policies and training programmes tailored to specific needs (Vuorikari et al., 2022).

This paper presents the results of the application of a diagnostic tool based on the DigComp 2.2 framework to a union of cooperatives in the state of Puebla, Mexico. The main objective was to identify gaps in the digital competence domain of its members, in order to inform the formulation of digital literacy strategies.

The relevance of this study lies in obtaining statistical data that will allow for a comparative measurement between the before and after of this intervention, as well as enabling future evaluation of whether its members have successfully appropriated technology to increase productivity and their participation in the digital ecosystem.

This article is structured in four sections: contextualisation of the problem; theoretical and conceptual framework; methodology applied; presentation of results and critical discussion; and, finally, conclusions with recommendations for future research.

1. Contextualisation of the problem

The causes of the digital divide are complex and structural, ranging from educational and socio-economic inequality, lack of infrastructure, lack of knowledge of inclusive technological models and solutions, to lack of funding and institutional support (Dalio et al., 2023).

In recent years, the development of digital skills has become an essential component of social, educational and labour inclusion, as well as for the fulfilment of the Sustainable Development Goals (SDGs). In this context, the study conducted by Koike (2024) presents a detailed overview of the level of digital skills in Mexico, according to the definitions and criteria established by the International Telecommunication Union (ITU).

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The study classifies digital skills into three main categories: basic skills, standard skills, and advanced skills. These categories are determined on the basis of specific activities ranging from the basic use of digital tools to computer programming.

At the national level, the results for 2022 show that 38.2% of the population had no digital skills, 31.3% had basic skills, 24.6% had standard skills and only 6.4% had advanced skills. This picture reflects a situation that must be addressed, as between 40 and 45 million people lack digital skills, limiting their participation in increasingly technology-mediated environments.

The study also identifies significant regional disparities. The state of Chiapas had the highest percentage of the population without digital skills (55.7%), while Mexico City had the lowest (24.6%). These gaps are accentuated in isolated and marginalised rural areas, where lack of connectivity, low affordability of services and limited availability of technological equipment hinder the development of such skills. In addition, states such as Guanajuato, Michoacán, Nayarit, Puebla, Tabasco, Veracruz and Zacatecas have high percentages of the population without digital skills.

In the particular case of the state of Puebla, the study reports that 40.6% of the population lacks digital skills, 27.1% has basic skills, 21.5% has standard skills, and only 6.3% has advanced skills.

On the other hand, the analysis of the Digital Development Index (DDI) -which considers the infrastructure dimensions of Information and Communication Technologies (ICT), ICT adoption, affordability, ICT use in economic activities, and internet use – shows that Mexico City obtained the highest value (2.52), while Chiapas achieved the lowest (-3.36). In this indicator, Puebla recorded a value of -0.41, below the national average.

Taken together, these results reveal a wide digital and technological appropriation gap in Mexico, particularly in the most vulnerable sectors and in regions with less infrastructure. This situation represents a challenge for digital inclusion and for the equitable use of ICT towards sustainable development and the reduction of social inequalities.

2. Theoretical context

2.1 Social and solidarity economy

The social and solidarity economy (SSE) refers to a group of organisations (cooperatives, mutual societies, associations, social enterprises) that prioritise the satisfaction of social needs and collective well-being over profit, promoting equity, inclusion and sustainability. Countries such as France, Spain and Brazil have promoted the digital transformation of the SSE, facilitating its access to markets and strengthening its resilience to crises such as the one suffered in the COVID-19 pandemic (Villalba-Eguiluz & Arcos-Alonso, 2025; Gallego-Bono & Tapia-Baranda, 2021). The central purpose of the SSE is to create an economic system that promotes social justice, reduces socio-economic gaps and encourages community participation in economic and social development. It also seeks to integrate social and ecological aspects into productive and consumption activities (Saiz-Álvarez and Palma-Ruiz, 2019).

Among the main challenges to driving the digital transformation of the SSE are limitations in resources and training, especially in rural areas and indigenous communities. Digitalisation can facilitate social inclusion, improve management and expand the scope of solidarity projects, but it requires specific policies, institutional strengthening and technological capabilities in communities to take advantage of these tools (Sotomayor et al., 2021, Solaz et al., 2025).

2.2 The European Digital Competence Framework for Citizens (DigComp 2.2)

The European Digital Competence Framework for Citizens (DigComp 2.2) is a key reference for digital literacy in Europe and internationally, providing a structured framework for assessing and developing citizens' digital competences in a context of accelerated digital transformation.

This framework addresses five main areas (Vuorikari et al., 2022):

1. **Information and digital literacy:** the ability to identify, locate, retrieve, store, organise and analyse digital information, as well as to assess its relevance and reliability.

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2. **Online communication and collaboration:** the ability to communicate, collaborate, interact and participate in virtual networks and teams, using appropriate means, tones and behaviours.

3. **Digital content creation:** the ability to create, configure, expand and edit digital content, understanding the principles and rules that govern it.

4. **Network security:** ability to protect devices, people, personal data, content and the digital environment, using technologies in a safe and sustainable manner.

5. **Problem solving:** ability to identify and solve technical problems, as well as to explore new ways of leveraging digital technologies.

DigComp 2.2 stands out for its cross-cutting approach, its constant updating in line with new technologies and its applicability to different citizen profiles, not only to educational or work contexts. Its flexible and technologically neutral structure allows for adaptation to different contexts and needs, avoiding rapid obsolescence and facilitating international comparison (Bartolomé et al., 2022).

The use of a framework such as DigComp is essential to ensure consistency, comparability and quality in the assessment and development of digital competences, as it allows for the identification of gaps, the design of relevant training interventions and the certification of competences in a transparent and recognised manner. Furthermore, it facilitates adaptation to technological and social changes, promoting inclusion and active digital citizenship (Barboutidis & Stiakakis, 2023; Van Audenhove et al., 2024).

Several studies have documented the application of DigComp in digital literacy processes, demonstrating its usefulness (Bartolomé et al., 2022; Chaw and Tang, 2023; Laguado et al., 2024; Nguyen et al., 2024; Spyropoulou et al., 2024), and supporting them by providing clear criteria, international comparability, and guidance for the design of training programmes.

3. Methodology

This study is characterised as quantitative, cross-sectional and descriptive, aimed at diagnosing the level of digital competences among members of a union of cooperatives within the Social and Solidarity Economy. The instrument used was a structured survey with a total of 50 questions. The first part collected sociodemographic data (gender, age, educational level, economic activity). The rest addressed digital competences classified according to the DigComp 2.2 framework (Vuorikari et al., 2022).

To measure achievement levels, Likert scales were used, adapted according to the nature of each competence. Thus, in some sections, five levels were used (always, often, sometimes, rarely, never), while in others, three-option scales were used, such as (totally, partially, I do not use them), (totally, partially, I do not know) or similar. This strategy is based on the flexibility recommended in the literature for collecting self-reports in diagnostic studies on digital competences (Laguado, et al., 2025).

The survey was validated through a pilot test with 15 people outside the target population, allowing areas for improvement in the wording of the questions to be identified before the final application. The sample consisted of 63 people selected randomly and voluntarily from among the 80 active members of the cooperative union, corresponding to a 78.7% participation rate.

All participants gave their informed consent, guaranteeing anonymity and ethical protection of data, in accordance with guidelines for social and educational research (Hernández et al., 2014). The information was collected electronically using Google Forms, and the results were compiled in a spreadsheet for subsequent descriptive analysis in accordance with the recommended procedures for studies of this type (Laguado et al., 2025).

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4. Results

The results of the diagnosis carried out to assess the level of digital competences among the members of a union of cooperatives within the SSE are presented below. The presentation of the data is organised in a first section with the analysis of the sociodemographic profile of the participants, followed by the five areas of the DigComp 2.2 framework.

Finally, their perception of the impact of technology on the growth of their businesses is included. The results are visualised using descriptive graphs that identify levels of proficiency and areas requiring improvement, thus facilitating a clear and useful interpretation for strategic decision-making.

Figure 1 shows the count and percentage of participants by age range. It can be seen that the age range with the highest percentage is between 36 and 45 years old.

Figure 2 shows the age distribution of respondents grouped by gender. The graph shows a clear predominance of females in all age groups surveyed.

The age group with the highest female participation is 36 to 45 years old, followed by 46 to 55 and 26 to 35 years old. Male representation is significantly lower in all ranges, and the category "Prefer not to say" appears only in the 36 to 45 age group, with a single case.

Box 1

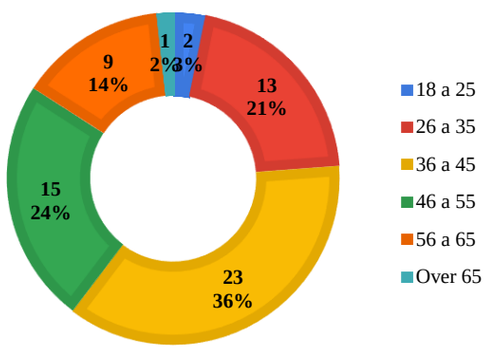

Figure 1

Count and percentage of the age range of respondents

Own Elaboration.

Box 2

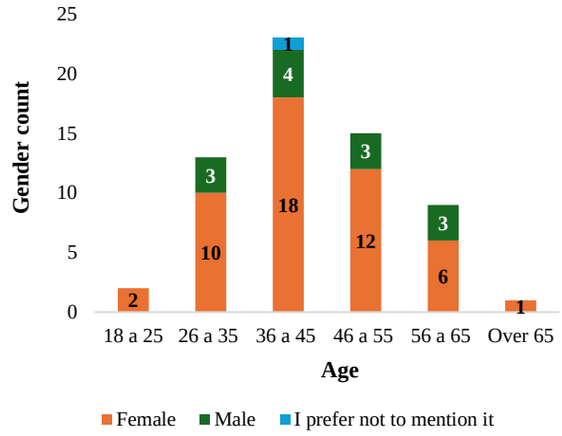

Figure 2

Age distribution of respondents grouped by age and gender

Own Elaboration

Figure 3 shows the age and gender breakdown grouped by level of education. It can be seen that most of the members have a university degree, totalling 29 in all, with women predominating. Among those surveyed, only one person has no academic qualifications and is female.

Figure 4 shows that the predominant economic activity carried out by respondents is the manufacture and sale of products.

Figure 4 shows that the predominant economic activity among respondents is "Manufacturing and selling products" with 23 responses (37%), followed by "Producers" with 21 responses (33%). The activity with the fewest responses was "Intermediary," representing 8%.

Box 3

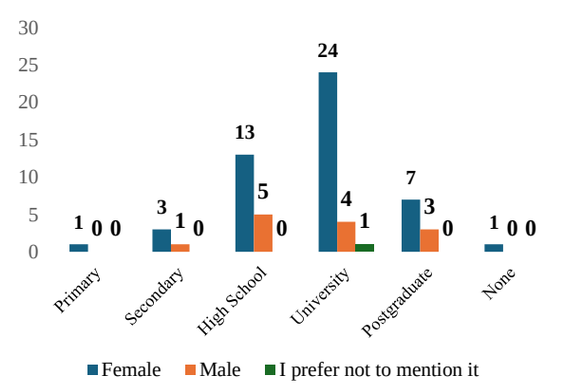

Figure 3

Data grouped by educational attainment and gender

Own Elaboration

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Box 4

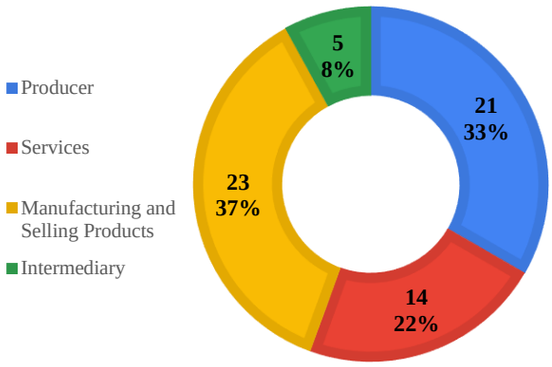

Figure 4
Economic activity of respondents.
Own Elaboration

Figures 5 to 7 show the responses to the eight questions focused on diagnosing the first category of the DigComp 2.2 framework (Information and Data Search).

Figure 5 shows the results of the responses to question 1: "How often do you use web browsers such as Google Chrome, Mozilla Firefox or Safari to find information related to your business?"

It can be observed that 66.6% of respondents mention using browsers daily and frequently, and only one of the respondents (1.58%) mentions not using them.

Figure 6 summarises the responses to questions 2 to 7.

– *Question 2.* "Knows how to improve search results by using advanced search features (e.g., specifying the exact phrase)."

– *Question 3.* "Knows how to use advanced search operators (such as AND, OR, NOT) to improve search results."

– *Question 4.* "You know how to find the author or source of information to verify the credibility of information you have previously found."

– *Question 5.* "You are able to download a document from the web, save it to a specific location, and rename it."

– *Question 6.* "Knows how to download databases from data repositories and use that information to generate statistics that support decision-making for their business."

– *Question 7.* "Knows how to collect data through digital surveys to learn more about the market or competition in order to compile statistics and establish action plans."

Box 5

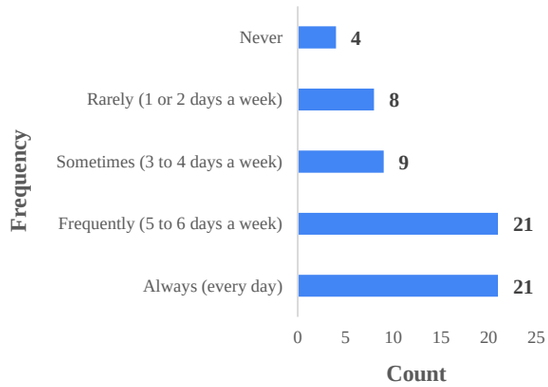

Figure 5
Answers to question 1
Own Elaboration.

Box 6

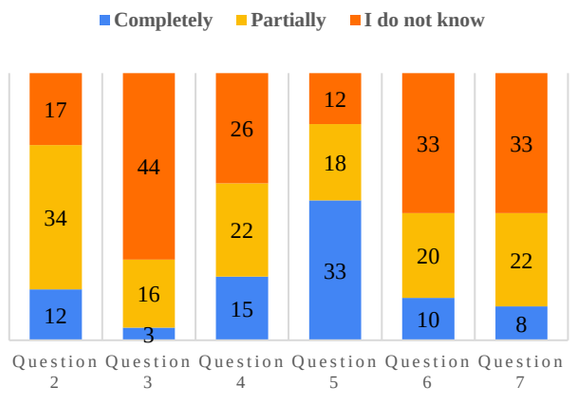

Figure 6
Answers To Questions 2 To 7
Own Elaboration.

It can be seen that for *Questions 2 and 3*, the percentages for the option 'Completely' are low (19% and 5%, respectively), while 'I don't know' reaches up to 44% in *Question 3*. This indicates that a significant proportion of the group is not proficient in the use of Boolean operators or advanced search engine tools, which limits their efficiency in locating relevant information.

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Regarding *Question 4*, 23.8% responded ‘Totally’ and 34.9% ‘Partially,’ indicating an average level of competence in assessing the credibility of the information found. This result is relevant, as source verification is key to combating misinformation and making informed decisions.

The responses to *Question 5*, related to downloading and managing documents, show the highest percentage of ‘Totally’ responses (52.4%), suggesting that this skill is more established in the group. This may reflect a practical familiarity with everyday digital tasks, although not necessarily with critical or analytical skills.

The responses to *Questions 6 and 7*, which address the use of databases and digital surveys to generate statistics, show the highest percentages of ‘I don't know’ (52.4% in both). This reveals a significant lack of analytical skills applied to the professional or business context, which limits the group's ability to use strategic information in decision-making.

Figure 7 shows the results for *Question 8*. “Do you use the artificial intelligence tools of browsers such as Google, Edge, or Firefox to find more comprehensive answers to your questions?”

Box 7

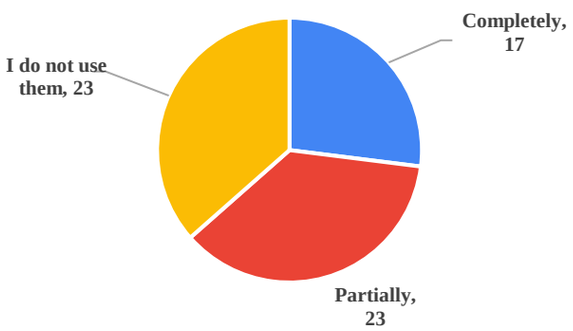

Figure 7
Answers to question 8
Own Elaboration

It is observed that only 17 of the respondents (27%) mention using them, which indicates that there is a significant proportion that does not yet take advantage of the benefits of Artificial Intelligence tools integrated into search engines.

The results of the respondents' answers to the eight questions focused on the second category of the DigComp 2.2 framework (Communication and Collaboration) are shown in Figures 8 to 11.

Figure 8 shows the responses to *Question 9*: “Do you use social media to stay in touch with other people and expand your network of potential customers?” It is observed that 23 people, representing 36.5% of those surveyed, contact potential customers daily, indicating an understanding of the advantages that social networks offer to strengthen their market share.

Box 8

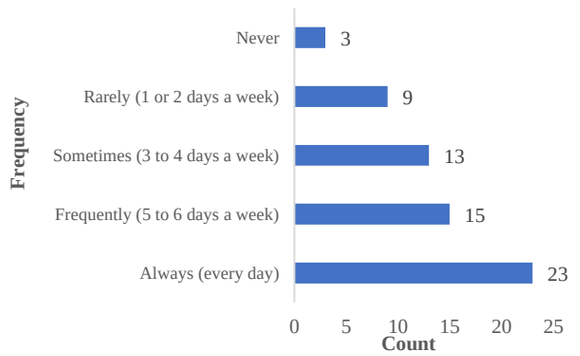

Figure 8
Answers to question 9
Own Elaboration.

Figure 9 shows the results of the responses to *Question 10*: “The social networks you use are (you may choose more than one).” It can be seen that the most widely used is WhatsApp, as only one of the respondents mentioned that they do not use it. The least used is Snapchat.

Box 9

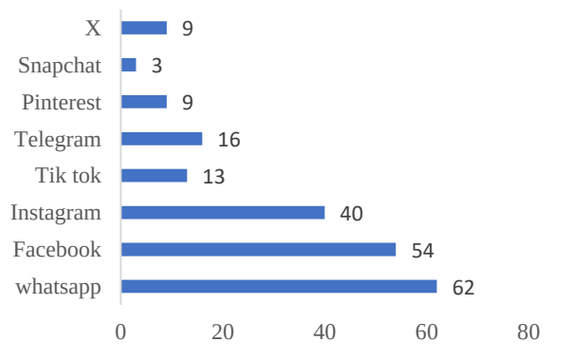

Figure 9
Answers to question 10
Own Elaboration

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Figure 10 summarises the results of the responses to *Question 11*. "Do you use email to send information to other people about your business or to expand your sales network?" It can be seen that 39.7% of respondents rarely use it and only 6.3% say they always use it.

Box 10

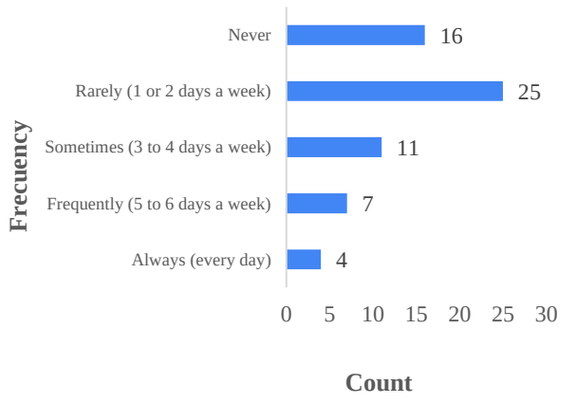

Figure 10
Answers to question 11
Own Elaboration

Figure 11 summarises the results for questions 12 to 16.

- *Question 12.* "You know how to use videoconferencing platforms to participate as an attendee in various professional or personal events."
- *Question 13.* "You know how to use videoconferencing platforms to moderate, record, or present information to a group of people with whom you can promote your product."
- *Question 14.* "You know how to protect your privacy and personal data when communicating with others through social media."
- *Question 15.* "Knows how to direct files that arrive in their email to spam to stop receiving unwanted messages."
- *Question 16.* "Knows how to use platforms to create blogs, wikis, or personal pages to generate collaboration on research or discussion of specific topics that can highlight the benefits of their products or services."

It can be seen that the results for *Question 12* show a balance between the responses 'Totally' (26) and "Partially" (29), with only 8 people who 'Do not know' this skill.

This indicates that the majority of the group has experience as participants in virtual events, which represents a consolidated competence in basic digital environments.

With regard to *Question 13*, although 27 people answered 'Partially,' only 16 answered 'Completely,' and 20 indicated 'I don't know.' This suggests that the group has difficulty playing active roles as moderators or presenters, which limits their digital leadership and professional promotion capabilities.

Responses to *Question 14* reveal that 31 people 'Don't know' how to protect their privacy on social media, compared to only 10 who 'Totally' do. This finding is concerning, as privacy management is essential for digital security and online risk prevention.

With regard to *Question 15*, although 28 people answered 'Partially,' a significant proportion (23) 'Do not know' how to redirect emails to spam. This indicates the need to develop intermediate competence in the use of email tools.

Question 16 received the highest number of "Don't know" responses (43), which shows a low level of familiarity with blogs, wikis, or personal pages as means of collaboration and dissemination. This lack of knowledge limits the group's potential to participate in digital communities, generate collaborative content, and position their products or ideas in virtual environments.

Box 11

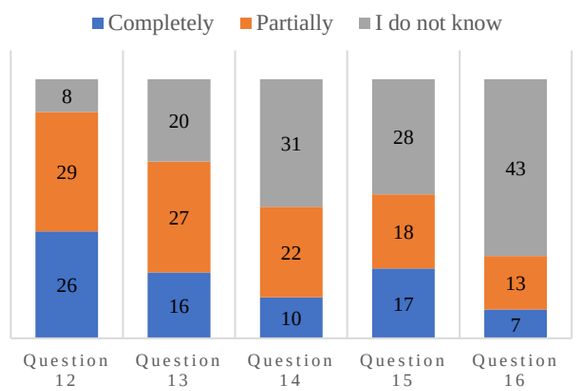

Figure 11
Answers to questions 12 to 16
Own Elaboration

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The results of the respondents' answers to the nine questions focused on the third category of the DigComp 2.2 framework (Digital Content Creation) are shown in Figures 12 and 13.

Figure 12 shows the responses to questions 17 to 21.

– *Question 17*. "Knows how to use office software (e.g. Word) to generate digital documents with images, information tables, graphs or audio."

– *Question 18*. "Knows how to use a spreadsheet (e.g. Excel) to keep track of purchases, sales, suppliers, profits and losses, among other things."

– *Question 19*. "Knows how to use tools that implement artificial intelligence to create presentations, audio files or graphics that can be sent to customers."

– *Question 20*. "You know how to use your mobile phone to create digital content such as audio or video."

– *Question 21*. "You know how to create infographics and posters that combine information, statistics and images using software available on your computer to advertise your products or services."

Box 12

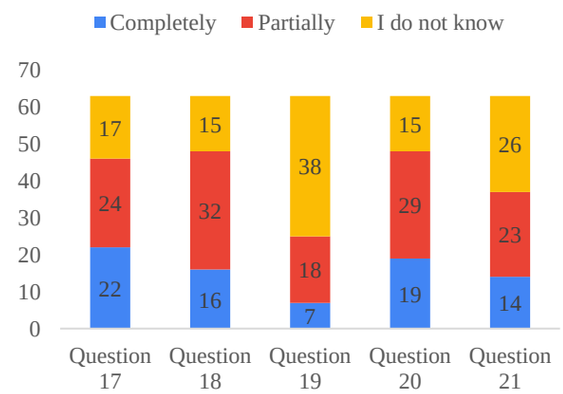

Figure 12
Answers to questions 17 to 21.
Own Elaboration

The results of *Questions 17 and 18* show a balanced distribution between 'Totally' and "Partially" responses, with low percentages for 'I don't know.' This indicates that most of the group has the operational skills to generate documents and manage financial information using Word and Excel, which represents a solid foundation in functional digital skills.

The results of *Question 19* show the highest number of 'Don't know' responses (38), with only 7 people responding 'Totally'. This result highlights a significant gap in the use of emerging technologies for content creation, which limits the use of innovative solutions in productive contexts.

As for the results of *Question 20*, 19 people responded 'Totally' and 29 'Partially,' suggesting a growing familiarity with the use of mobile phones as a digital production tool.

The results of *Question 21* show a considerable proportion of 'I don't know' responses (26), indicating that many participants are not proficient in the use of software to create infographics or advertising posters. This shortcoming may affect the group's ability to effectively communicate their ideas, products, or services visually.

Figure 13 summarises the responses to questions 22 to 25.

– *Question 22*. "You know how to edit videos to make them shorter or longer or to improve their quality."

– *Question 23*. "You know how to edit audio files to make them shorter or longer or to improve their quality."

– *Question 24*. "Knows that digital content, goods and services may be protected by intellectual property rights (e.g. trademarks, copyright, designs, patents) and understands the implications."

– *Question 25*. "Knows that when generating digital content and taking information, images, audio or video from other sources, they must always give the appropriate credit to avoid plagiarism."

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Box 13

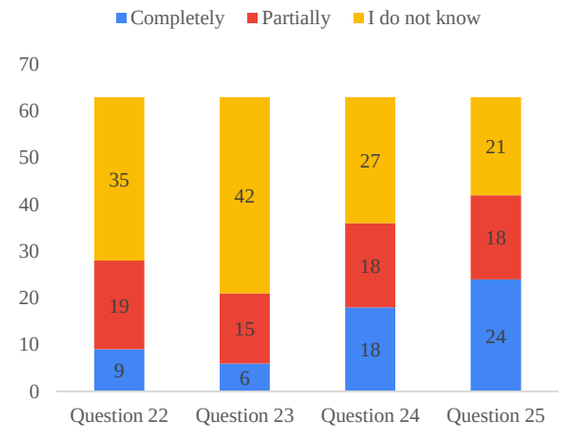

Figure 13
Answers to questions 22 to 25.
Own Elaboration

The responses to *Questions 22 and 23* indicate a low level of familiarity with audiovisual editing tools, which limits the group's ability to improve the quality of their digital content and adapt it to different formats or audiences.

In *Question 24*, although 18 people answered "Totally," 27 indicated "I don't know." This result suggests that a significant portion of the group is unclear about the legal implications of copyright, trademarks, or patents in the digital environment, which represents a risk in the ethical management of content. However, in contrast, in the responses to *Question 25*, 24 people answered "Totally" and only 21 answered "I don't know." This reflects greater awareness of the need to credit the sources used, which is a positive indicator in terms of digital responsibility and information ethics.

The results of the respondents' answers to the 10 questions focused on the fourth category of the DigComp 2.2 framework (Network Safety) are shown in Figures 14 and 15.

Figure 14 shows the answers to questions 26 to 30.

– *Question 26.* "You know how to install antivirus software on your computer."

– *Question 27.* "You know how to install antivirus software on your mobile phone."

– *Question 28.* "You know that you should create passwords that include numbers, letters, and special characters to prevent them from being easily hacked."

– *Question 29.* "You know how to configure your computer to enable the firewall."

– *Question 30.* "When installing a new application on your mobile phone, you check the messages it displays to see what data it is granting access to and, based on that, you decide whether or not to install it."

Box 14

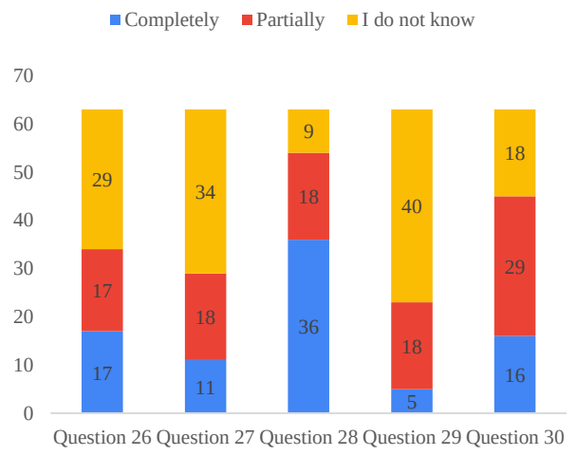

Figure 14
Answers to questions 26 to 30
Own Elaboration

The results of the responses to *Questions 26 and 27* regarding the installation of antivirus software on computers and mobile phones, respectively, show that only 17 and 11 people responded 'Absolutely,' while 29 and 34 indicated 'I don't know.' This highlights a gap in basic knowledge of malware protection, especially on mobile devices, which poses a risk to the integrity of personal and professional information.

The results of the responses to *Question 28* suggest partial awareness of the importance of digital credential security, but also an area for improvement towards more conscious and preventive practices.

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As for the responses to *Question 29*, related to firewall enablement, 40 people indicated that they were 'Unfamiliar' with this feature, while only 5 responded 'Totally'. This reflects a significant lack of proactive configuration of perimeter defence measures on computer equipment.

In *Question 30*, 46% belong to the Partially category, suggesting that although respondents take security aspects into account when installing software on their mobile devices, they can still improve their practices in this regard.

Figure 15 summarises the responses to questions 31 to 35.

Box 15

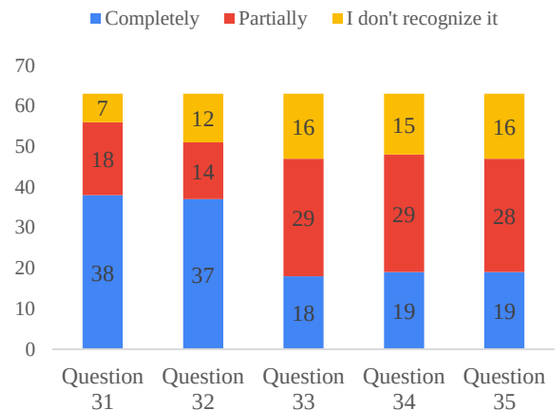

Figure 15
Answers to questions 31 to 35.
Own Elaboration

– *Question 31.* "Consider the importance of only providing biometric data (such as your fingerprint or facial recognition) to institutions that need to confirm your identity, and not to any application that requests it."

– *Question 32.* "Consider the importance of not connecting to public Wi-Fi networks to carry out financial transactions or online banking."

– *Question 33.* "Know how to identify suspicious emails that attempt to obtain sensitive information (e.g., personal data, bank details) or that ask you to click on a link that could download malicious software or take you to fake websites."

– *Question 34.* "You are able to identify a fraudulent event through a message or phone call, so you do not provide any information that could affect your assets, personal data or family."

– *Question 35.* "Identifies the energy-saving advantages of the devices and services you use, for example, by changing the quality settings of video streaming services, using Wi-Fi instead of mobile data when at home, closing applications, optimising email attachments."

With regard to *Questions 31 and 32*, the responses indicate that the group has a solid understanding of the risks of sharing biometric data and conducting transactions on public networks, reflecting a preventive attitude towards digital threats.

The results for *Questions 33 and 34* suggest that, although there is a certain level of awareness about fraudulent emails and calls, there is still room for improvement in accurately identifying threats and making secure decisions. The responses to *Question 35* show that the group is beginning to recognise the importance of optimising the use of technological resources, although this is not yet established as a common practice.

Finally, the results of the respondents' answers to the 10 questions focused on the fifth category of the DigComp 2.2 framework (Problem solving) are shown in Figures 16 and 17.

Figure 16 shows the responses to questions 36 to 39.

– *Question 36.* "Knows how to identify and solve a camera and/or microphone problem in an online meeting."

– *Question 37.* "Knows how to find solutions on the Internet when faced with a technical problem.

– *Question 38.* "Knows how and when to use machine translation solutions (e.g., Google Translate) and simultaneous interpretation applications (e.g., iTranslate) to gain a rough understanding of a document or conversation."

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– *Question 39.* "Knows how to use digital technologies to help turn their idea into action (e.g., mastering video making to start a channel for sharing recipes)."

Box 16

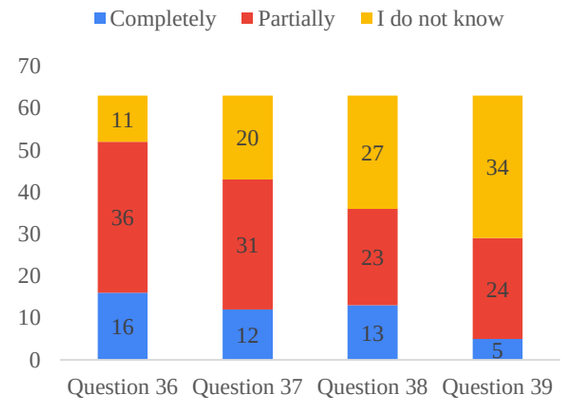

Figure 16
Answers to questions 36 to 39
Own Elaboration

The results of *Question 36* suggest an opportunity for improvement in the technical autonomy of respondents during online collaborative environments, as the majority of the group has a basic understanding of how to resolve camera or microphone issues in virtual meetings, but has not yet fully mastered these skills.

The results of *Question 37* show signs of a positive trend towards self-management of problems through internet searches, but the level of mastery is still limited, which could affect the efficiency of digital incident resolution.

The results of *Question 38* show that a significant proportion of the group does not use or is unaware of the potential of tools such as Google Translate or iTranslate, which could limit access to multilingual information and participation in global digital environments.

Regarding *Question 39*, the results show evidence of a lack of digital entrepreneurship skills and strategic use of platforms to turn ideas into concrete projects, such as content channels or personal initiatives.

The results for the responses to *Question 40*: "You are able to reflect on your level of knowledge, make plans and take steps to improve it in order to boost your business," are shown in Figure 17.

This graph shows that 42.9% of participants answered 'Partially,' indicating that a relative majority recognise the importance of reflecting on their knowledge and are in the process of taking steps to improve. This is a group that could benefit from training support strategies.

Box 17

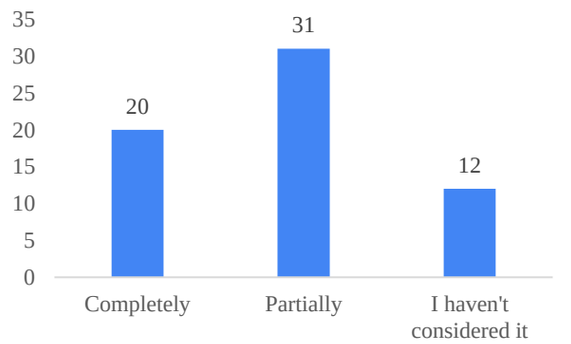

Figure 17
Answers to questions 40
Own Elaboration

The responses to questions 41 to 45 are summarised in Figure 18.

– *Question 41.* "You know how to access educational and skills certification platforms, or standards applicable to goods and services, among others."

– *Question 42.* "You are willing to continue learning, training and keeping yourself informed in order to find ways to grow your business."

– *Question 43.* "You are aware that digital tools can be used to help identify your own learning interests and set personal goals in life."

– *Question 44.* "You take the initiative to ask to be taught how to use an application (e.g. how to book a doctor's appointment online) rather than delegating the task to someone else."

– *Question 45.* "You are willing to help others improve their digital skills, building on their strengths and mitigating their weaknesses."

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Box 18

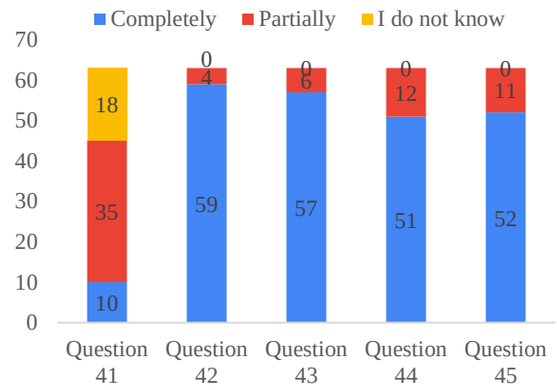

Figure 18
Answers to questions 41 to 45.
Own Elaboration

The responses to *Question 41* indicate that a relative majority recognise the value of online platforms for skills certification and regulatory updates, although there is still a group that requires guidance to access these resources. With regard to *Questions 42 and 43*, the results show a deep-rooted culture of continuing education, self-assessment and personal goal setting using digital tools.

With regard to the responses to *Question 44*, the results highlight the group's autonomy and self-management in the acquisition of practical digital skills.

Finally, the responses to *Question 45* reflect a high sense of responsibility and community, in line with the objective of the ESS.

Conclusions

The joint analysis of the sociodemographic data (Figures 1 to 4) and the results by areas of digital competence (Questions 2 to 45) allows us to establish a detailed profile of the social group evaluated, as well as to identify strengths, gaps and opportunities for improvement within the framework of the DigComp 2.2 model.

The predominance of the 36-45 age group (Figure 1), together with the high representation of women in all age ranges (Figure 2), configures a profile of participants in the active productive stage, with the potential to apply digital competences in work and commercial contexts.

This profile is reinforced by the predominant educational level (Figure 3), where 29 people have university education, which correlates positively with the results obtained in areas such as:

– *Digital communication and collaboration:* Functional proficiency was observed in the use of videoconferencing as assistants (Question 12) and intermediate proficiency in advanced functions such as moderation or recording (Question 13), which is consistent with the educational level and economic activity of the group.

– *Digital content creation:* Basic office automation skills (Questions 17 and 18) are well established, while the use of artificial intelligence tools (Question 19) and collaborative platforms (Question 16) shows gaps, suggesting a need for specialised training to take advantage of emerging technologies.

However, despite the level of education, weaknesses were identified in critical areas such as:

– Installation of antivirus software and firewall configuration (Questions 26 to 29), where responses indicating lack of knowledge predominate, especially on mobile devices.

– Protection of personal data and privacy (Questions 14 and 30), with intermediate results that require reinforcement in secure practices.

– Digital sustainability (Question 35), where there is evidence of an emerging awareness of energy saving, but it is not yet consolidated as a common practice.

These gaps are significant considering that the predominant economic activity is the manufacture and sale of products (Figure 4), which involves the constant use of digital devices and the need to protect sensitive information.

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The results of questions 40 to 45 show a highly favourable attitude towards autonomous learning, continuous improvement and collaboration:

– 59% are willing to continue training to boost their business (Question 42).

– More than 50% take the initiative to learn new applications (Question 44) and help others improve their digital skills (Question 45).

– Although access to educational platforms still has room for improvement (Question 41), the commitment to personal and community development is evident.

This set of findings suggests that the evaluated group has a solid foundation for progressing toward higher levels of digital competence, provided that contextualized, differentiated training strategies focused on real-world applicability to their economic activities are implemented, as suggested by Koike (2024) and Laguado et al. (2025).

Currently, ICT-related companies, as well as those in the communications sector, are leading the digitization process. This dynamic represents a significant opportunity for other sectors to increase their competitiveness and efficiency by incorporating advanced digital technologies, as is the case for organizations belonging to the social and solidarity economy (SSE) (Rodríguez-Pedró, 2025). In this sense, as a future line of work, the design of a differentiated digital literacy campaign is proposed, based on a holistic and systemic approach (Mohamad et al., 2025, which provides participants in later phases with the necessary skills to adopt technologies and apply them in processes aimed at their digital transformation (Montaudon-Tomas et al., 2020, Rodríguez-Pedró, 2025).

Conflict of interest

The authors declare no conflict of interest. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Author contribution

Alonso-Calpeño, Mariela Juana: Contributed the idea for the project, was responsible for contacting the cooperative union and establishing the link for the development of the project. She also determined the framework on which the diagnosis would be carried out, collaborated in the design and application of the data collection and analysis instrument, and contributed to the writing of the article.

Pérez-Jiménez, Carlos: Collaborated in liaising with the cooperative union. Designed the data collection instrument under the selected competency framework, collaborated in conducting the pilot test, and collaborated in administering the survey and analysing the data. He also collaborated in writing and reviewing the article.

Availability of data and materials

Data on this type of study are unavailable or very scarce. That is why this diagnostic study had to be conducted.

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