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Is the Rural Population Caught in the Whirlwind of the Digital Divide?

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Abstract: Technology represents a benchmark ally for today's rural world and is a sine qua non-condition for achieving sustainable development. Indeed, today the arrival of digitization and information and communication tools makes life easier for the inhabitants of the rural world in general and for those who work in agriculture. However, not everyone has and knows how to use these technologies. There are very visible differences between the rural world and the urban one in the accessibility and use of technology, especially among vulnerable people (unemployed, elderly, women, etc.), causing a digital divide that reflects the great discrimination suffered by the rural world, full of stereotypes and very traditional role assignments. The objective of this study is to evaluate the differences in terms of access and use of technology. For this reason, the results of a survey carried out on the Spanish rural population have been analyzed with the structural equations tool "PLS-SEM". They show digital gaps, as well as a disturbance between the different gaps and the socioeconomic situation of users, which imposes the need to take immediate measures to reduce and fight against this type of inequality.

Keywords: sustainable development goals; agri-food security; equality; information and communication technologies; technology 4.0

1. Introduction

Today, Information and Communication Technologies (ICTs) have invaded all scenarios in the lives of human beings, from personal to professional [1]. The rural world has not been able to escape this boom in technology as it is closely related to agriculture, thanks to Artificial Intelligence (AI), which is the catalyst for the new revolution in the agricultural sector (agriculture 4.0) [2–4], called "AgriTech", which comprises the evolution of tractors with new functions such as the Global Positioning System (GPS), the appearance of autonomous robotics that today supports a large collection of agricultural data, the sensors that measure climatic factors: such as sunlight, wind speed, the degree of humidity, the drones that allow better remote control of crops, or identification of weeds, the smart irrigation systems the vertical farming, etc. [5–8]. This innovative method of vertical farming based on increased productivity, considering the limitations of agricultural plots, would make it possible to combat hunger (Achieve Sustainable Development Goal 2), poverty and fight against nutrition problems (Sustainable Development Goal 1, 3 and 12) and climate change (Sustainable Development Goal 13), achieving the sustainable development goals set by The United Nations Educational, Scientific and Cultural Organization

(UNESCO) for the year 2030, which represents a fundamental element of social, economic, and environmental progress [7,9,10]. These initiatives affect agriculture as a whole and rural development specifically, either in terms of saving time, increasing efficiency, or terms of added value that they provide to farmers, allowing consumers to find products fresh and healthy to face food security problems [2,11–13].

According to the World Resources Institute, to feed the population sustainably in 2030: it will be necessary to produce 56% more calories; devote an additional 593 million hectares to agriculture. Farmers will have to produce more with fewer available resources, preserving the environment to meet the needs of a world population that is estimated to reach 10 billion people in 2050. Hence the need to transform the sector and bet on new management methods by introducing new technologies [14].

However, many people and many farm workers do not have the luck or the means to adapt to these rapid changes and, consequently, do not have the access and the necessary skills to enjoy the contribution of this technology, especially in the rural world where the main actors of agriculture tend to be concentrated [15–17].

This phenomenon, called the "Digital Divide," is separated into three categories: first, the ICT access gap, which refers to the difficulty that people have in accessing this resource due to socioeconomic differences since digitization requires very costly investments and infrastructure for less developed areas such as rural areas. The second is the gap in the use of ICTs, which refers to the lack of digital skills that prevent the use of technology [18,19]. In this sense, and to give an example, the International Telecommunication Union (ITU) indicates that there are 40 countries in which more than half of its inhabitants do not know how to attach a file to an email [20]. The third is the gap in quality of use, which refers to digital skills to manage ICTs and make good use of them.

The objective of this work is to analyze the correlation that exists between the access, and the different levels of use of ICTs in the Spanish rural world, relating them to the socioeconomic factors that most limit the population in rural areas, such as gender, age and professional status, and that lead us to ask ourselves the following questions: Are there gaps in access and use of ICTs among rural populations? Is this gap different between women and men? Does this gap have more influence on agricultural activity? To do this, data collection has been carried out through a survey aimed at the rural population, and the data obtained has been analyzed through structural equation modeling.

2. Theoretical Framework and Development of Hypotheses

In a world increasingly faced with the vagaries of the weather, working with precision following irregular changes in the weather requires high-precision tools that help make decisions. With the accelerated development of digitalization, the agricultural sector has had to adapt to the technological revolution, finding itself in full mutation thanks to modernization and innovation, which provides exponential growth of agricultural, livestock and agri-food products [21].

These imposed changes have shown once again the importance of having and knowing how to use all kinds of technologies, starting with the simplest and reaching the handling of big data or the algorithms of agricultural machinery, which is admitting that many countries and many areas (especially rural) succeed in this transition [21].

However, the Technology of Information and Communication, similarly to all innovations, has been imposed so rapidly in the last decade that it has not allowed the actors involved in agricultural activity and those responsible for the development of rural areas to have the necessary time to adopt it and adapt to it, creating a digital divide between various categories of people, especially within the rural population, mainly affecting women, the elderly and people who are unemployed or employed in precarious positions who do not usually have daily contact with ICTs [22,23]. This digital divide has been defined as the inability of certain groups to access and use ICTs due to the socioeconomic differences that exist between population groups or between countries since not all people have the sufficient economic level to buy electronic devices or pay access to these digital tools [24].

Traditionally, the existing literature on the subject distinguishes a first digital divide, referring to access to new technologies [25–29], and a second digital divide resulting from the use made of these new technologies [30–32]. To these two categories, a third digital divide is added, which refers to the quality of use of these ICTs [33–35].

Castaño [36] and Castaño et al. [37] specify that the first digital gender gap appears with access to technology and is quantitative in nature. The second is the use that is made of it and marks the degree of effective incorporation into it (of greater scope and of a qualitative nature). The third circumscribed to the use of the most advanced ICT services (also of a qualitative nature and of great importance for the evolution of the previous two).

To this end, Ferro et al. [38] identify three main approaches to understanding the digital divide: the access digital divide, the multi-dimensional digital divide, and the multi-perspective digital divide. The first type (digital access divide) observes the digital divide as a simple separation between "those who have" and "those who do not have" with attention to access to computer equipment or the Internet. The second type (multi-dimensional digital divide) perceives this phenomenon through a complex group of endogenous and exogenous factors involving specific groups of the population, such as stereotypes and traditional mentality, the assignment of roles by gender, the training gap, geographic isolation, etc. The third type (multi-perspective digital divide) reveals that no social group uses technologies in an inherently different way from others but recognizes that ICTs and the Internet are used to satisfy very specific objectives, often linked to their histories and social locations.

If this digital gap is significant in rural areas, it shows even more segregation between the urban population and the rural population [39–42]. In fact, Sevilla and Márquez [43] point out that despite Spain being a leading country in connectivity, there is a significant coverage gap in intermediate and high-quality networks (over 30 Mbps and over 100 Mbps), which exceeds 30 points (according to the values established by the Digital Economy and Society Index of the European Commission) between both zones. This is reflected in the degree of adoption of Internet access through the fixed network.

Indeed, in Spain, the rural environment represents 84% of the total area of the country but only comprises 16% of the total population [44], which makes the territories quite unpopulated. This depopulation means that the towns are generally disconnected, lacking a good Internet connection or with limited access, while others do not have the necessary ICT tools to connect, or if they do, they do not know how to use it [45–48]. That negatively affects families in rural environments who suffer from this digital divide, making it difficult for them to telecommute, access online education, or perform administrative tasks online.

Along these lines, Jimenez [49] indicates that the Spanish rural environment shows a development differential with respect to the urban environment, especially in those areas where the phenomenon of depopulation is stronger. This situation motivated the enactment of Law 45/2007 [50] for the sustainable development of rural areas, laying the foundations and measures for coordinated public action and comprehensive planning of rural areas. This is due, according to the author, to several factors, among them the depopulation and masculinization of the environment, the job insecurity suffered by this population, and the traditional mentality that limits the autonomy of women and their empowerment, due to the double shift that they must combine in this environment.

On the other hand, the Spanish General Union of Workers (UGT) [51] points out that the factors responsible for the differences in terms of ICT access and use between different population groups are summarized in low income, gender, advanced age, sparsely populated habitat, or low levels of training, which influences the integration of people in the information society.

Also, recognition and self-realization at work must be considered an essential element for access to ICTs, since, on many occasions, the assessment of work within the company entails greater responsibility and the use of more technology [51,52]. Starting from this context and considering the different factors that can affect digital divides, the following hypotheses have been considered in this study:

Hypothesis 1 (H_1). *The socioeconomic situation of rural users affects their access to ICT tools (First digital divide).*

This hypothesis has been nuanced by Korup and Sydlik [53], who associated the digital divide with the social context in which the ICT user finds himself and specified that this is linked to human capital (level, type of studies and job), the family context (income and family structure), and the social context (function of gender, age, cultural background, and place of residence).

Also, Mossberger et al. [54] and Helsper [55] point out that access to such technology is unequally distributed among individuals with different demographic characteristics, such as age, gender, socioeconomic level, ethnicity, and geographic location.

In fact, in our first hypothesis, three determining elements of the socioeconomic situation are considered, which are "age", "job position" and "well-being in their job position" since these variables determine whether users have been in direct contact with technology or if they have been in a situation of technological marginalization.

Several authors have commented on the close link that exists between the access and use of ICTs and the age of their users, including Tsai et al. [56] and Lee et al. [57] that indicate that age represents one of the main factors the digital divide, placing older people in the worst situations of access and use of ICTs. In this sense, Hernández [58] indicates that while 80% of young Spaniards between 16 and 24 years old have basic digital skills, only 35% of people between 55 and 74 years old have them.

Also, there is a very close link between the job position a person occupies and their degree of adoption of technologies [59–61]. In fact, being in continuous contact with technological tools and faced with the need to adapt to their daily use, in general, employees suffer less of a digital divide than unemployed people who do not have this opportunity to use ICTs frequently [61]. The unemployed are not the only ones who suffer from this digital divide; this is valid for operator positions in which ICTs are not usually used or little technology is used, given that in certain positions, the workers do not usually enjoy this training, and it is the which is why the well-being [62,63]. The importance perceived by the employee in the company is also considered. In this sense, the Infojobs report [64] indicates that 66% of the active population affirms that digital transformation and robotization have modified their job position and digital skills.

In addition to the above, UGT Communications [65] points out that the groups that suffer the most from technological inequalities in Spain are the unemployed and the inhabitants of the smallest population centers. The organization justifies it by the infrequent use that the unemployed make of ICT tools and the Internet and indicates that their digital skills are 15 percentage points lower than those used by employed people.

All this shows us that the socioeconomic conditions of users affect access to ICTs and their use and vice versa [66]. This is closely related to the economic means that the user has and that allow him to acquire ICT tools. This socioeconomic situation generally differs between urban and rural areas, where populations are isolated and have fewer job opportunities [67]. Esparza Chamba [66] indicates that the socioeconomic conditions in which ICTs are implemented can trigger new gaps in social inequality or widen existing ones. In addition, Ramírez and Sepulveda [68] and Gutierrez-Provecho et al. [69] assure that the digital divide is conditioned by the economic resources of its users. Therefore, the higher their job position, the more likely they are to have technological tools.

This hypothesis is closely related to the use of ICTs, since by having access to them, the skills of use can be developed, and this is what we are going to analyze in the following hypothesis.

Hypothesis 2 (H_2). *The access to technological tools (First digital divide) affects the achievement of basic abilities to use ICTs (Second digital divide).*

This hypothesis consists of determining if having access to ICTs, and basic skills of its use are automatically acquired or if they are two dissociable elements; in this study, two technological tools are mainly considered, which are the "laptop" and the "printer". The Internet element has not been considered in this case because it is a tool that does not always depend on the socioeconomic situation of the person and even more so in rural areas, since sometimes, even if the person is old enough to use the Internet or that they have a job that allows it because it is a necessary resource, there remains an element that depends on the coverage that does not always reach these areas [48,70,71]. Along these lines, Van Djik [72] indicates that the digital divide does not refer only to access to ICTs, but also to use since two people can have the same access to ICTs but not the same skills nor the same strategy in using them.

Chong [73] points out in this regard that when the digital divide is discussed as a problem of access to technology, it is forgotten that it is also necessary to use technology efficiently. Indeed, the use of technology inherently requires the development of skills that allow users to understand the processes by which information is sought and reached, ranging from turning on devices and connecting them to the Internet to the understanding of processes [74].

This led us to differentiate the use according to the different skills that a person may have of ICTs, considering first in this hypothesis the basic skills of turning on and off the computer, saving or modifying files, surfing the Internet, and writing a text email, and then to other more developed skills in the following hypotheses [75,76].

According to Ghobadi [77], the concept of "use" refers to the differential use of ICT applications daily. This could include both actual use of ICT and 'active versus passive use (Ghobadi [77] describes the active users of TICs as the ones who have a creative use of these tools, such as publishing a personal website, creating a weblog, posting a contribution on an online bulletin board, and newsgroup community; Contrary to the passive user, who does not usually have regular use of these technologies. This kind of use is largely linked to demographic characteristics of users and technical connections (e.g., social class, education, age, gender and ethnicity, the effectiveness of the connection, and the motivation to use ICT, material access, and having appropriate skills).). According to the author, the use is largely related to the demographic characteristics of the users, such as social class, age, gender, etc.

In this sense, Area [78] defines digital literacy for basic use in three dimensions; the first is instrumental and consists of having the skills to use hardware and software, such as "turning the computer on and off" or "use the Microsoft package", the second is cognitive and is summarized in the information search and analysis capabilities, such as "Internet surfing and looking for information", and the third is socio-communicational and deals with the abilities to express themselves and communicate through technology, such as "sending and receiving emails".

Other authors, such as Czerniewicz [79], indicate that there is a very strong correlation between the availability of ICTs and their use due to the frequency of access to them, but indicates that the high use of ICTs does not necessarily mean that there is a varied use of these ICTs. Moreover, this is what we are going to try to confirm in the following hypothesis:

Hypothesis 3 (H_3). *Access to technological tools affects the achievement of advanced skills in the use of ICTs (Second digital divide).*

In this hypothesis, the most advanced skills in the use of ICTs are considered, among them "computer configuration and hardware problem solving", "installation of a computer system", and "configuration of a computer program" [80,81]. The objective is whether the fact of making available to a user of a certain age and a certain job the necessary technological tools would allow him to have these advanced skills that define the second digital divide or if two people with different socioeconomic statuses but with exactly the same access, take very different advantage of this technology, as pointed out by the Organization for Economic Co-operation and Development (OECD) [82] and Pedró [83].

Jimenez et al. [84] categorize digital skills related to managing programs, installing devices, or using programming languages as more advanced and technical related to the management of specialized terminology (for example, plugins, cookies, etc.). In this sense, the Spanish Statistics National Institute (INE) [85] indicates that people who manage this task do not reach 40% of Internet users who have advanced digital skills (41.2% of men and 38.4% of women).

Calderón [86] identifies two types of competencies: the basic ones that include operational skills (management of technological devices and performance of basic tasks) and office automation skills (use of office automation software), mainly word processors and presentation programs, and advanced skills, linked to more complicated tasks, such as programming. Consequently, we formulate the following research hypothesis:

Hypothesis 4 (H_4). *Access to technological tools affects the achievement of operational/administrative skills in the use of ICTs (Second digital divide).*

This hypothesis is based on the existing correlation between access to ICT tools and the skills necessary to process or carry out daily tasks that are required in such a digitized world [87,88]. In this sense, the gap in the use of ICTs is defined as the lack of digital skills due to the lack of contact with ICTs or the lack of personal or professional training, which leaves a good part of the population outside the margin of certain services such as making medical appointments or carrying out administrative or financial procedures that improve the quality of life of the people who use them [24].

Also, Del Castillo [89] points out that the digital gap between active workers and unemployed people goes further and explores the data of the procedures with the Public Administrations through the Internet since, according to the INE [90], the unemployed have suffered more problems in carrying out these procedures than active workers. This has been justified by the lack of skills and knowledge since, according to this source, 83.3% of students have advanced ICT skills, compared to 50.5% of the employed and 32.2% of the unemployed.

Not accessing technology can prevent social insertion since it conditions the administrative management of many procedures (City Hall, Treasury, Social Security, hospitals, police, banks, etc.) and limits access to the facilities it offers the world of technology today, as is the case with online shopping [91–95]. Therefore, the two skills that have been evaluated at this point have been "management of an administrative file" and "management of a banking operation". To complete this work, the relationship of the first digital divide with the third is considered in the following hypothesis:

Hypothesis 5 (H_5). *Access to technological tools affects the achievement of professional skills in the use of ICTs (Third digital divide).*

In this hypothesis, a more professional aspect of the use of ICTs is considered, which is considered more specific to an activity or a task and requires specific training, as is the case of the skills of agricultural activity, and in this situation, two tasks have been selected for being the ones that use ICTs the most today: "remote control of crops" and "management of a geographic information system" [96–98].

The idea is to analyze whether, by having access to ICTs, farmers are more likely to develop their abilities to control the parameters of temperature, humidity, irrigation, and fertilization of crops remotely through the computer, which could facilitate the laborious work that is usually done in the field [99,100].

ICTs are focusing on this activity to create new functionalities that allow increasing, through better management, efficiency, and sustainability in the use of natural resources [98,101,102]. In recent years, agricultural yields have been increasing due to an increase in both the quantity and quality of marketed products [103–108].

Research aimed at reducing the agricultural digital divide also indicates that having access to ICT tools helps farmers in their daily work, but different strategies must be considered in the design of ICT tools so that they can use them correctly [109]. This strategy must be applied in the same way in the achievement of the different skills of use since the different use levels are related to each other, as we see in hypothesis 6:

Hypothesis 6 (H_6). *The basic ICT use skills are related to the other levels of useful skills.*

Hypothesis 6 considers the relationship between basic skills and other ICT use skills. It is about defining whether the degrees of advanced technological skills affect the degree of basic technological skills or not [110,111]. Indeed, developing increasingly high technological skills could improve the use made of technology in professional and personal life. For example, the fact of having to use technologies related to bank procedures or purchases over the Internet pushes citizens to learn basic skills since they would have to contact the bank by email to fix a problem or use an Excel form to find out the calculations for their accounts. The same happens with administrative procedures that sometimes require a more developed use of technology, as is the case of installing the digital signature on the computer, for example [69,112,113]. In the same way, the tasks of managing a geographic information system can be related to other basic tasks, such as surfing the Internet and searching for information [76,114]. In fact, Moeller et al. [115] indicate that learning ICTs allows greater inclusion in society since it is not only a powerful resource for learning but also an increasingly relevant tool for life.

Also, several authors, among them Van Deursen and Van Djik [116] and Hidalgo et al. [23], define the relationship between the different digital divides and indicate that people with more resources would obtain greater benefits from technology. This is due, according to them, to the high levels of resources and skills that allow the generation of higher levels of digital capital, which in turn favors an instrumental use of ICTs aimed at further increasing social, personal, economic, and political capital [117–122]. This theory is aligned with the hypothesis that access to technology plays the role of a moderating variable within the model that will be presented in the next section. Helsper [123] supports this assumption and indicates that higher levels of digital resources would correspond to a greater probability of avoiding potential adverse effects that may arise from the use of ICTs. In summary, Van Deursen et al. [118] indicate that different levels of resources correspond to different levels of skills that, in turn, generate different levels of involvement in technological activities and different levels of benefit from ICTs.

On the other hand, to check whether gender affects the different gaps, this variable that defines hypothesis 7 is analyzed:

Hypothesis 7 (H_7). *The gender variable affects the digital divide.*

If the previous bibliographic review has shown many inequalities that impede rural development, gender inequalities in this environment are even worse for women, who face a triple challenge: digital access, rurality, and gender. The digital divide depends on various sociodemographic characteristics, such as gender, which prevent women from enjoying the opportunities and benefits of digital transformation in the same way as men [124–129]. This is because women spend most of their time in unpaid activities and less in formal work, which means that they do not have the adequate financial capacity to access technological tools and are not faced with their daily use [105,130,131].

In this sense, Herrero [132] confirms that the digital gap between women and men that exists in society is more evident in rural areas since the use of these technologies is directly related to employment, which reduces the possibility of women due to the prioritization of their domestic activities, in which ICTs are not an indispensable resource. Indeed, in agriculture, women normally play a secondary role [133] in what could be called "the exploitation of the agrarian family". According to the Mundubat-CERES [134], only 32% of farm owners are women, although this percentage is gradually increasing.

These hypotheses lead us to the qualitative-quantitative study of analysis of the structural equations that are defined below in the methodology section.

3. Materials and Methods

To carry out this work and respond to the hypotheses raised, the qualitative and quantitative documentary method was used in two phases, which consisted of first analyzing the literature and the theoretical part related to the object of the study to acquire some basic knowledge and become familiar with the different concepts of the digital divide. To do this, articles, books, and publications related to digitization in rural and agricultural areas and generational and gender gaps have been reviewed. Secondly, the information and statistics related to the digital divide in Spain have been analyzed and compared.

For the study, as a primary source, outstanding data from the Spanish National Institute of Statistics (INE) were used, together with other statistical sources such as the Food and Agriculture Organization (FAO), the International Telecommunication Union (ITU), the World Bank and the Word Economic Forum. In addition, information was collected from different secondary sources for the consultation of scientific articles available in Internet databases and other works cited in the bibliography.

Once the data has been collected, the hypotheses related to the different gender gaps and the socioeconomic situation of the users have been defined. These hypotheses have constituted a basis that allowed us to carry out our second phase, which consisted of preparing a survey aimed at the population of the rural world to analyze the influence that the variables had between them. The questions have been prepared considering the socioeconomic factors that can create the digital gender gap in terms of access and use of ICTs.

Once the questionnaire has been configured in accordance with the requirements of the selected methodology, which consists of ensuring that it is reliable and capable of measuring without error the weight of the relationship between the variables and appropriate to the sample and the context, it was validated by experts from different areas related to this topic (Gender, agriculture, ICTs, sustainability and economic) and by the Ethics Commission of the University, this process was followed by a hybrid form. On the one hand, the surveys were carried out using in person in different Spanish rural areas, which required the displacement of the authors to different Spanish rural areas, and on the other hand, it was sent by email and disseminated through social networks. For this reason, different Spanish rural organizations, associations, and chambers of commerce have been contacted, which have kindly offered to send it to the contacts they had in their databases, share it on their web pages and social networks, and even do it in person during their events. This massive dissemination was intended to extend the survey in all Spanish communities and reach the target sample "Rural population" regardless of their socioeconomic status or economic activity; and the decision to do it in person was also motivated by the need to reach the elderly, people who live in isolated or unconnected areas, and people who do not have or do not know how to use technology in the same way as people who have access to ICTs and who can consult it remotely.

This survey, composed of 27 questions, was conducted in the period between 1 April 2022 and 25 July 2022, during which period 408 responses were obtained using the google form for the digital survey and the printed survey for the presential one, including 137 responses from men and 271 responses from women. This represents a sample greater than the minimum number of responses required (384) for the sample to be considered reliable and representative according to the "Sample Size Calculator" (www.surveysystem.com) (accessed on 6 April 2022).

The questionnaire was divided into 3 sections. The first section consisted of reflecting on the socioeconomic situation of the sample, considering the elements previously analyzed after reading the literature, such as gender, age, geographical area, and job position. The questions about the demographic and socioeconomic situation have been all closed.

The second section consisted of determining the gaps in terms of access and the questions related to these dichotomous variables and offered two options, Yes or No.

The last section, related to the use of ICTS, was made up of questions about the frequency of use of these tools, where the following options were proposed: daily, weekly, monthly, annually, and never.

The survey was sent and presented to the rural inhabitants regardless of their income level, gender, age, educational level, or job position. The only filter element that was considered was residing in a rural area. The objective was to obtain a wide and varied opinion of the rural population for maximum representativeness of the data. During the completion of this survey, the anonymity of the participants has been ensured, and the responses have been collected in accordance with the provisions of Article 40 of Law 3/2018 on data protection.

To analyze the data, the Structural Equations Model has been used through the PLS-SEM version 4 software. The selection of this tool is since it is the most appropriate to test the proposed theoretical model because it supports the simultaneous estimation of multiple relationships between the constructs [135–137]. In addition, the PLS-SEM allows the simultaneous evaluation of the reliability and validity of the measures of the theoretical constructs since it is designed mainly for causal-predictive analyses [138–143].

The constructs and items used in this study appear in Table 1 and have been determined after reviewing the literature.

Table 1. Constructs and scale ítems.

Construct/Indicator	Code	Scale Items	Source
	SSE		
Age	EEDAD	Age of rural people	[34–45]
Job	EPTRAB	Professional activity	
Importance at work	ETRABIMPL	You feel essential at work	
	AHI		
Access to technological tool 2	EDISHTEC2	Laptop availability	[34–45]
Access to technological tool 6	EDISHTEC6	Printer availability	
	UTN1		
Use of technology 1	EFRECMAN1	Turn on, turn off the computer	[46–51,72–78]
Use of technology 2	EFRECMAN2	Use the Ms Office suite	
Use of technology 3	EFRECMAN3	Save and modify files	
Use of technology 4	EFRECMAN4	Navigate in Internet	
Use of technology 5	EFRECMAN5	Write an e-mail	
	UTN2		
Use of technology 7	EFRECMAN7	Install a computer system	[52–56,72–78]
Use of technology 8	EFRECMAN8	Set up the computer	
Use of technology 17	EFRECMAN17	Set up a computer program	
	UTN3		
Use of technology 10	EFRECMAN10	Manage an administrative file	[17,54,58–63,72–78]
Use of technology 11	EFRECMAN11	Manage a banking operation	
	UTN4		
Use of technology 13	EFRECMAN13	Control a crop remotely	[48,64–78]
Use of technology 14	EFRECMAN14	Manage a geographic I.S.	

Nomenclature of Latent Variables (LV): SSE: Socioeconomic situation; AHI: Access to computer tools; UTN1: Basic technology use; UTN2: Advanced technology use; UTN3: Administrative/Operational technology use; UTN4: Professional technology use. Source: Own elaboration.

4. Results

To respond to the hypotheses raised above, and after collecting, cleaning, and coding the data, the different analyzes have been carried out, beginning by reflecting the socioeconomic composition of the selected sample, and separating the information by gender (Table 2).

Table 2. Sample Distribution.

	Male		Female		Total Sample	
	N	%	N	%	N	%
Age						
Between 18–25	10	7.30	11	4.06	21	5.15
Between 25–40	44	32.12	85	31.37	129	31.62
Between 40–55	60	43.76	105	38.75	165	40.44
Between 55–65	20	14.60	44	16.24	64	15.69
Over 65	3	2.19	26	9.59	29	7.10
Personal and family situation						
Married	73	53.28	138	50.92	211	51.71
Divorced	7	5.11	22	8.12	29	7.11
Single	55	40.15	103	38.01	158	38.73
Widower	2	1.46	8	2.95	10	2.45
Number of dependent family members						
None	66	48.18	125	46.13	191	46.81
Between 1–3	62	45.25	140	51.66	202	49.51
4 or more	9	6.57	6	2.21	15	3.68
Educational level						
Primary studies (School, college)	7	5.11	22	8.12	29	7.11
Secondary studies (Institute)	12	8.76	19	7.01	31	7.60
1st cycle vocational training	12	8.76	15	5.54	27	6.62
2nd cycle vocational training	21	15.33	36	13.28	57	13.97
Higher studies (University)	82	59.85	167	61.62	249	61.03
Training and specialization courses	2	1.46	8	2.95	10	2.45
No studies	1	0.73	4	1.48	5	1.23
Employment situation						
Salaried	77	56.20	157	57.93	234	57.35
Owner	33	24.09	46	16.97	79	19.36
Retired	2	1.46	23	8.49	25	6.13
Unpaid work outside the home	3	2.19	38	14.02	41	10.05
Unemployed	22	16.06	7	2.58	29	7.11
Total sample	137		271		408	

Source: Own elaboration.

Table 2 shows that the sample is very varied. In terms of age, the one that stands out is the one between 25–40 (Between 32.12% for men and 31.37% for women), and the one that predominates is the 40–55 years old (43.76% for men and 38.75% for women). Regarding the family situation, the married one stands out (53.28% for men and 50.92% for women). It is observed that in terms of dependents, in the case of men, the situation of not having dependents predominates, while in the case of women, 51.66% have responsibility for between 1 and 3 dependents. As far as educational levels are concerned, university studies stand out the most (59.85% for men and 61.62% for women). On the other hand, the employment situation shows that, in both cases, salaried workers prevail (56.20% for men and 57.93% for women).

To relate the variables to each other according to the hypotheses raised, we expose the structural model in a schematic way in the following figure (See Figure 1).

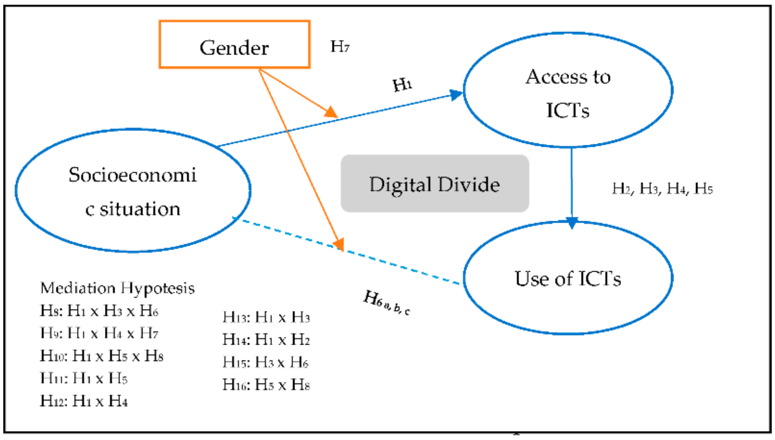

Figure 1. Research Model. **Source:** Own elaboration.

The analyzed data is reflected in Table 3, which represents the set of latent variables (LV which is reflected in the first column, with the different indicators that make it up. In addition, in Appendix A (Table A1), you can consult the table of the Covariances. Where:

- μ: average of the indicator with its values Min: minimum value reached by the indicator and Max: maximum value reached by the indicator; SD: standard deviation; SL: Standardized loadings.
- Convergent validity and reliability of latent variables are defined by: AVE: Average variance extracted; AC: Cronbach's Alpha; and CR: Composite reliability.

Table 3. Descriptive statistics of the model.

		μ	min	máx	SD	SL	Q^2	AVE	CA	CR
LV	EGEN	1.34	0	1	0.47					
SSE								0.56	0.58	0.78
	EEDAD	2.88	1	5	0.97	0.54				
	EPTRAB	3.75	1	8	2.45	0.84				
	ETRABIMPL	1.73	1	3	0.92	0.82				
AHI							0.11	0.65	0.47	0.79
	EDISHTEC2	1.15	1	2	0.36	0.86	0.12			
	EDISHTEC6	1.34	1	2	0.47	0.76	0.09			
UTN1							0.16	0.62	0.84	0.89
	EFRECMAN1	1.74	1	5	1.43	0.82	0.17			
	EFRECMAN2	2.06	1	5	1.56	0.84	0.16			
	EFRECMAN3	1.90	1	5	1.46	0.86	0.17			
	EFRECMAN4	1.40	1	5	1.10	0.62	0.15			
	EFRECMAN5	2.04	1	5	1.62	0.76	0.12			
UTN2							0.01	0.63	0.70	0.83
	EFRECMAN7	3.10	1	5	1.20	0.85	0.02			
	EFRECMAN8	3.25	1	5	1.21	0.84	0.02			
	EFRECMAN17	3.30	1	5	1.17	0.68	0.01			
UTN3							0.04	0.67	0.53	0.80
	EFRECMAN10	2.87	1	5	1.48	0.91	0.06			
	EFRECMAN11	3.25	1	5	1.64	0.71	0.02			
UTN4							0.002	0.68	0.52	0.81
	EFRECMAN13	3.74	1	5	0.86	0.81	0.002			
	EFRECMAN14	3.44	1	5	1.20	0.83	0.002			

Source: Own elaboration.

To determine the predictive capacity of the model, the Q^2 values obtained from the Stone-Geisser test have been included in the table applying blindfolding of both the constructs (VL) and the validated indicators, and all of them are positive [144].

Table 3 shows that of the three indicators that make up the socioeconomic situation construct (SSE), the variable with the most weight is "The job (EPTRAB)" and "The importance at work (ETRABIMPL). In terms of access to computer tools (AHI), the one with the most weight is "The laptop availability (EDISHTEC 2)". On the other hand, in the basic technology use (UTN1) it is observed that the one that has more weight is "Turn on, turn off the computer (EFRECMAN 1), "Use the Microsoft Office package (EFRECMAN2)" and "Save and modify files (EFRECMAN3)". In the advanced technology use (UTN2), "Install a computer system and configure the computer (EFRECMAN 7)" and "Solve hardware problems (EFRECMAN 8)" predominate in this construct. While in terms of administrative/operational technology use (UTN3), it is "Manage a computer administrative file (EFRECMAN 10)" the one that has more weight. As far as professional technology use is concerned (UTN4), "Managing a geographic information system (EFRECMAN 14)" is the most important, although the difference is very low with Controlling a crop remotely (EFRECMAN 13). This is reflected in Figure 2 below:

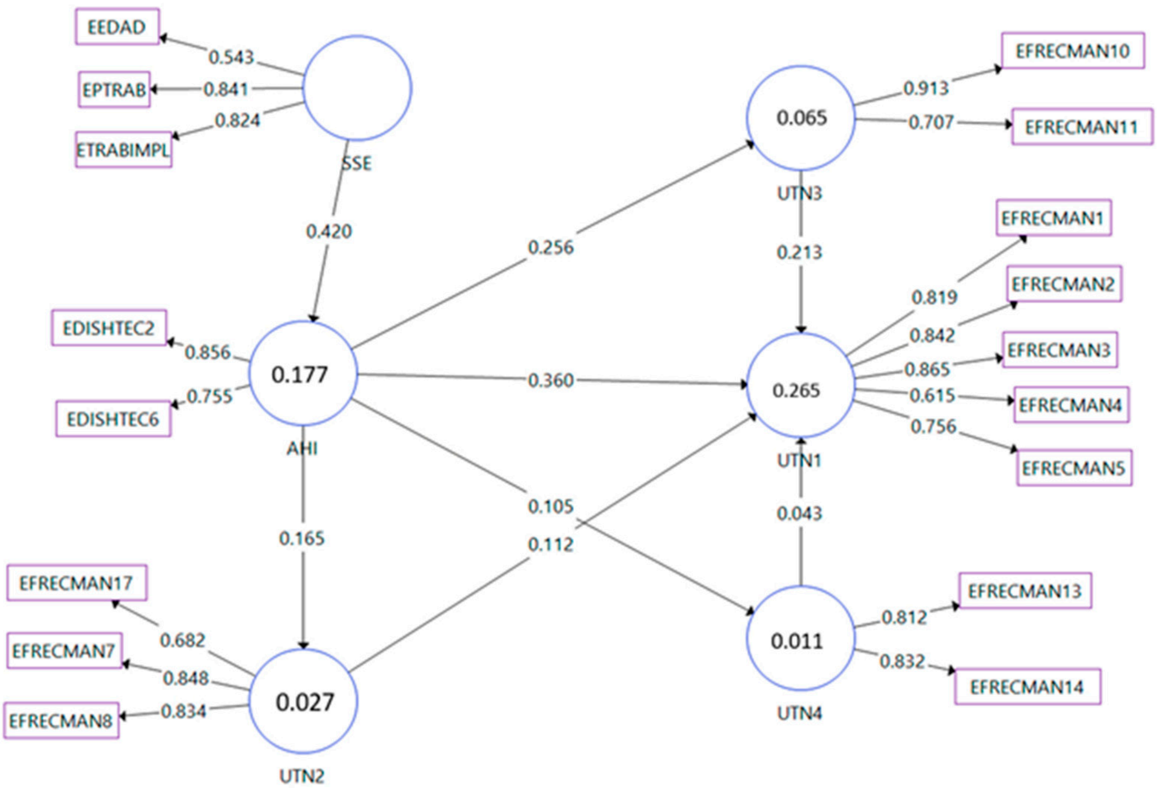

Figure 2. Structural model. Source: Own elaboration.

Graph 2 shows that the economic situation construct shows a great impact on access to ICTs. This, in turn has quite an effect on the first level of use of ICTs (UTN1) and secondarily on the second level of use (UTN2). Regarding the incidence of access to technologies on the third level of use (UTN3) and the fourth level of use (UTN4), it is less than in the two previous uses.

On the other hand, the graph highlights that, among the different uses of technologies, the one that has the greatest influence is the third level of use (UTN3) over the first level of use (UTN1).

To detail the degree of significance of all the constructs of the latent variables, the descriptive statistics are presented below in Table 4:

Table 4. Convergent validity and reliability.

		β	t	Io95%	hi95%	VIF	f^2
H_1	SSE → AHI	0.42	8.08 ***	0.33	0.50	1.00	0.21
H_2	AHI → UTN1	0.36	7.31 ***	0.28	0.44	1.08	0.17
H_3	AHI → UTN2	0.17	3.50 ***	0.08	0.23	1.00	0.03
H_4	AHI → UTN3	0.26	6.29 ***	0.19	0.32	1.00	0.07
H_5	AHI → UTN4	0.11	2.35 ***	0.02	0.17	1.00	0.01
H_{6a}	UTN2 → UTN1	0.11	2.57 ***	0.04	0.18	1.18	0.01
H_{6b}	UTN3 → UTN1	0.21	5.02 ***	0.14	0.28	1.17	0.05
H_{6c}	UTN4 → UTN1	0.04	0.98	−0.03	0.11	1.07	0.002

Note: β: Path coefficients; t = (β/SD); *p*-value: degree of significance *** $p < 0.01$; lo95% low confidence interval; hi95% high confidence interval: f^2: f squared. R^2: UTN1(B):0.265; UTN2(C): 0.027; UTN3 (D): 0.065; UTN4 (E): 0.011; AHI (F): 0.177. Estimated model fit: SRMR: 0.104; d_ULS:1.664; d_G: 0.367; Chi square: 896.868; NFI:0.570. Source: Own elaboration.

In Table 4, it is observed that all the paths have a high degree of significance except the fourth level of use (UTN4)-> the first level of use (UTN1) path, which is also reflected in the collinearity, where there is no interference between the constructs when acquiring a value below of 3, which validates the model. Regarding f^2, the Socioeconomic Situation (SSE) → Access to computer tools (AHI), and Access to computer tools (AHI) → the first level of use (UTN1) constructs contributes to a better fit of each path.

Also, it has been verified that the values of loads of the different indicators are greater in their own latent variable than in the rest.

Next, in Table 5, a discriminant validation table of the internal model is presented, where the values of the Fornell-Larcker test are shown, which consists in verifying that the correlations between latent variables are smaller than the square root of the Average Variance Extracted (AVE). It has been completed with the HeteroTrait-MonoTrait ratio test (HTMT) to show that the latent variables are sufficiently different from each other and do not measure the same concept twice [145].

Table 5. Discriminant validity.

		A	B	C	D	E	F
A	SSE	**0.81**	*0.80*	*0.69*	*0.29*	*0.48*	*0.21*
B	UTN1	0.42	**0.75**	*0.47*	*0.38*	*0.39*	*0.28*
C	UTN2	0.44	0.33	**0.78**	*0.32*	*0.50*	*0.19*
D	UTN3	0.17	0.24	0.25	**0.79**	*0.50*	*0.42*
E	UTN4	0.26	0.22	0.34	0.32	**0.82**	*0.16*
F	AHI	0.11	0.15	0.13	0.24	0.09	**0.82**

Source: Own elaboration.

The following Table 6 presents the results of mediation, which occurs when a third variable or construct intervenes between two related constructs.

Table 6. Mediation (Regardless of gender).

	Specific Indirect Effects	μ	SD	t	lo95%	hi95%
H_8	SSE → AHI → UTN2 → UTN1	0.01	0.004	1.88 ***	0.002	0.02
H_9	SSE → AHI → UTN3 →UTN1	0.02	0.01	3.42 ***	0.01	0.04
H_{10}	SSE → AHI → UTN4→ UTN1	0.002	0.002	0.86	−0.001	0.01
H_{11}	SSE → AHI → UTN4	0.05	0.02	2.10 ***	0.01	0.08
H_{12}	SSE → AHI → UTN3	0.11	0.02	4.42 ***	0.07	0.15
H_{13}	SSE → AHI → UTN2	0.07	0.02	2.88 ***	0.03	0.11
H_{14}	SSE → AHI → UTN1	0.16	0.03	4.08 ***	0.10	0.21
H_{15}	AHI → UTN2 → UTN1	0.02	0.01	2.12 ***	0.01	0.04
H_{16}	AHI → UTN4 → UTN1	0.004	0.01	0.90	−0.002	0.01

Note: *p*-value: degree of significance *** $p < 0.01$. Source: Own elaboration.

Table 6 shows that there is a mediation of the Socioeconomic Situation (SSE) to the first level of use (UTN1) through Access to Computer Tools (AHI) and the second level of use (UTN2). The same happens with the hypothesis: H_9, H_{11}, H_{12}, H_{13}, H_{14} and H_{15}. As for H_{10} and H_{16}, this mediation is not significant.

To determine whether gender, due to its dichotomous nature, presents a significant difference between the groups made up of the female gender and the male gender, the moderation study reflected in Table 7 has been carried out, which is also shown has added the difference in behavior between the rural population in general, and the population that is dedicated to agricultural activity [145,146].

Table 7. Moderation Statistics.

	Women		**Men**		**Permutation Mean Differences (W–M)**			
Path	β_W		β_M		$\beta_{(W-M)}$	**IC [5–95%]**	β	**IC [5–95%]**
	Rural	Agrarian	Rural	Agrarian	Rural		Agrarian	
SSE → AHI	0.50	0.32	0.22	(−0.00)	−0.007 ***	[−0.18–0.18]	0.006	[−0.44–0.47]
AHI → UTN1	0.48	0.31	0.21	0.05	−0.007 ***	[−0.18–0.17]	0.002	[−0.36–0.35]
AHI → UTN2	0.28	0.14	(−0.21)	(−0.29)	−0.002	[−0.17–0.17]	0.002 **	[−0.41–0.40]
AHI → UTN3	0.33	0.28	0.05	(−0.08)	−0.000 ***	[−0.14–0.15]	0.003 **	[−0.31–0.34]
AHI → UTN4	0.15	0.18	(−0.01)	0.02	−0.005 **	[−0.15–0.15]	−0.003	[−0.46–0.46]
UTN2 → UTN1	0.004	0.06	0.29	0.41	−0.001 ***	[−0.16–0.16]	0.004 **	[−0.27–0.29]
UTN3 → UTN1	0.19	0.18	0.24	0.17	0.002	[−0.15–0.15]	0.001	[−0.27–0.28]
UTN4 → UTN1	0.04	0.12	0.07	0.16	−0.003	[−0.16–0.16]	−0.002	[−0.30–0.31]
N	271	61	137	55	*** $p < 0.001$	** $p < 0.05$	* $p < 0.1$	
	μ(W–M)		*p*-value		σ		*p*-value	
MICON Analysis	Rural	Agrarian	Rural	Agrarian	Rural	Agrarian	Rural	Agrarian
SSE	0.349	0.012	0.001	0.513	0.004	0.007		0.375
AHI	0.100	−0.189	0.178	0.166	0.012	0.010	0.032	0.462
UTN1	0.042	−0.358	0.354	0.028	0.008	0.009	0.332	0.080
UTN2	0.321	0.324	0.001	0.044	0.005	0.002	0.160	0.344
UTN3	−0.009	−0.094	0.458	0.313	0.004	0.003	0.378	0.447
UTN4	0.094	0.051	0.187	0.410	0.009	0.005	0.080	0.415

Note: *p*-value: degree of significance *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

The results of Table 7 show a degree of significance in the difference in means between women and men in the rural world compared to the agrarian world. This appears in Socioeconomic Situation (SSE) → Access to computer tools (AHI), Access to computer tools (AHI) → Basic technology use (UTN1), Access to computer tools (AHI) → Administrative/operational technology use (UTN3), and Advanced technology use (UTN2) → Basic technology use (UTN1), all four in favor of men in the rural world. The different questions in the agrarian world in which they appear with a positive sign, although with a lower degree of significance: Access to computer tools (AHI) → Advanced technology use (UTN2), Access to computer tools (AHI) → Administrative/operational technology use (UTN3), Advanced technology use (UTN2) → Basic technology use (UTN1) in favor of women.

To determine the effect of moderation, the calculation of the measurement invariance of composite models (MICOM) has been applied in Table 7, which completes the study of moderation with the results of this analysis that reflect that there is a partial measurement invariance in the world rural and a complete measure invariance in the agricultural sector.

5. Discussion

The results obtained support the first six hypotheses (H_1: The socioeconomic situation of rural users affects the access to ICT tools, H_2: The access to technological tools affects the achievement of basic abilities to use ICTs, H_3: The access to technological tools affects the achievement of advanced skills in the use of ICTs, H_4: The access to technological tools affects the achievement of operational/administrative skills in the use of ICTs, H_5: The access to technological tools affects the achievement of professional skills in the use of ICTs, H_{6a}: the Advanced technology use affects the Basic technology use, H_{6b}: The Administrative technology use affects the basic technology use), except H_{6c} (The professional technology use affects the basic technology use), as it does not have a degree of significance. This is explained by the absence of a link between the professional skills specific to an agricultural activity with the other basic, advanced, or administrative skills. Also, it has been observed how the socioeconomic situation affects the first digital gap and, consequently, the second and third. This indicates that age, job position and the fact of feeling essential in their work represent important elements in situations of digital divides since not all generations have the same access to and use of ICTs. In this sense, it can be affirmed that many of the so-called digital natives (Digital native refers to young people exposed to Communication and Information Technologies since their birth according to Salas Delgado [147]) [148] are familiar with technology, but in addition to accessing it, it is necessary that they have digital literacy, since, as Pérez-Rodríguez and Delgado [149] put it, "having information does not automatically produce knowledge", since "transforming information into knowledge requires reasoning skills to organize, relate, analyze, synthesize and make inferences" and deductions of different levels of complexity; in short, understand it and integrate it into previous knowledge schemes".

Serrano and Martínez [150] and Moreno Gálvez [151] point out in this sense that the digital divide is not only related to exclusively technological aspects but also, therefore, a reflection of a combination of socioeconomic factors.

On the other hand, it has been seen how access to ICTs has affected the different degrees of use. This is explained, as indicated in the theoretical part, by the ease of learning that is achieved once the tool is made available. In this sense, Ndou [152] states that there is a positive correlation between access to ICTs and their use in rural areas.

Regarding the relationship between the different types of use, it has been observed that advanced technology use (UTN2) and administrative/operational technology use (UTN3) have a significant incidence on basic technology use (UTN1), which is not the case with the professional technology use (UTN4). This is because they are tasks closely related to the basic management of ICTs. Without knowing how to turn the computer on and off, you cannot, for example, install a computer program or manage a purchase or an administrative procedure.

Regarding the gender issue, it has been observed that this variable has a direct effect on the digital divide, sometimes in favor of men and other times in favor of women, depending on whether we are referring to the rural world or to agricultural activity, which confirms hypothesis H_7. Indeed, the results have shown that the differences in means have a significant impact on the hypothesis: H_1, H_2, H_4 and H_5 and with less significance on the hypothesis H_6. At the same time, they go in favor of women in the agricultural sector in the hypothesis: H_3, H_4, and H_6. This is justified by the greater involvement of women in activities in the agricultural sector, including rural tourism activities, which require a high level of involvement and the fact that, in other activities, women do not have this contact with the ICTs, due to the traditional mentality of rural areas, which conditions them to assume more family responsibilities, as indicated in Table 2. In reality, women continue to be the most affected by disproportionately assuming unpaid care, a burden that has increased due to the closure of schools, preventive isolation in homes, and the need for emotional support from other family members in the face of the uncertainty caused by the pandemic [153], an element also observed in Table 2, where 14.02% of women indicate working in unpaid activity, compared to only 2.19% of men. Sometimes, it is due to stereotypes that make women unwilling to use ICTs, which causes a reaction of rejection and a phobia towards technology. Indeed, different investigations show that men have more positive attitudes toward computers and more stereotyped attitudes regarding who can use them [154]. Additionally, women experience more computer-related anxiety than men and generally have lower levels of achievement around information technology [155]. Although the gender gap in physical access shows a decreasing trend [156], men use ICTs more than women due to higher prior exposure to technology and work-related requirements [157].

On the other hand, it is important to point out that the economic autonomy of rural women could influence their access and use of ICTs since economic resources greatly influence the acquisition of these tools and the training that can be done to manage them [158]. In this sense, the report of the Digital Economy and Society index indicates that only 37% of adults receive training on a regular basis, which generates a lack of basic digital skills [159].

In short, it has been seen that the digital divide in the rural world is due to a host of injustices of different categories, all of which are related, in one way or another, to a lack of training. In this regard, Bennett [160] indicates that, in rural areas, they have not received a formal education, and it is likely that they will not use a computer in their entire lives. This lack of use has a strong impact on the economic, social, health and community reality of the countryside because access to ICTs is, above all, the central tool for promoting personal, collective, and productive development.

6. Conclusions

According to Estefanía [161], living conditions have improved in the last century more than in the rest of human history. However, it is the period of history in which inequalities of all kinds are highest: economic, gender, educational, labor, generational, technological, digital, etc.

Indeed, the results of this work have shown that there are differences in the access and use of ICTs in rural Spain. This is due to several socioeconomic factors such as age, job position and the responsibility that each person has in their job.

On the other hand, it has been observed in this study that the gender variable affects the different digital gaps since men and women do not have the same abilities to use ICTs.

One of the consequences of these digital divides is the isolation of the rural population, which prevents them from enjoying the same training and employment opportunities as the urban population, in addition to the disadvantages in the telecommunications infrastructure that they suffer due to the distance from the main cities and the low population density.

This situation highlights how essential it is to have a public intervention to close the digital gaps in the rural world [162], especially among women and men, as well as the elderly and young people, since these gaps represent a real impediment to the rural environment to develop in the same way as the urban world, and this despite the natural resources it enjoys. In this sense, Otero et al. [163] argue that equalizing the access and use of ICTs would allow the improvement of food security and contribution to the achievement of a competitive, inclusive, and sustainable agriculture, which leads to food self-sufficiency among all the inhabitants of this environment. For this reason, it is essential to value the benefit that all the inhabitants of the rural world (even the elderly) can have from technological training.

Regarding the gender aspect, it is important to design and implement effective and useful public policies for the empowerment of women living in rural areas and the development of their digital potential, as well as their involvement in decision-making [163–167].

On the other hand, it is necessary to highlight the need to eliminate stereotypes and gender roles in the rural world, either in terms of education or employment, and to make visible the role of women in this environment [168].

This work has some limitations since it focuses only on the rural world. This leads us to consider the idea of continuing to investigate the digital gender gap between the urban and rural worlds as a future perspective, to see the existence of the gap between both areas. The intergenerational digital divide could also be analyzed in more detail, comparing the differences between both media, and examining their economic resources.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Correlation of the observed variables.

		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
A	EEDAD	1.000																
B	EPTRAB	0.117	1.000															
C	EDISHTEC2	0.334	0.248	1.000														
D	EDISHTEC6	0.126	0.303	0.308	1.000													
E	EFRECMAN1	0.205	0.233	0.345	0.263	1.000												
F	EFRECMAN2	0.209	0.189	0.292	0.210	0.645	1.000											
G	EFRECMAN3	0.234	0.193	0.299	0.247	0.651	0.756	1.000										
H	EFRECMAN4	0.300	0.152	0.342	0.307	0.374	0.312	0.362	1.000									
I	EFRECMAN5	0.093	0.222	0.177	0.265	0.500	0.545	0.577	0.380	1.000								
J	EFRECMAN7	0.180	0.155	0.204	0.012	0.152	0.204	0.218	0.078	0.109	1.000							
K	EFRECMAN8	0.219	0.060	0.166	0.064	0.136	0.166	0.187	0.198	0.159	0.568	1.000						
L	EFRECMAN10	0.113	0.175	0.232	0.176	0.252	0.279	0.300	0.203	0.293	0.266	0.265	1.000					
M	EFRECMAN11	0.043	0.130	0.134	0.091	0.134	0.198	0.122	0.114	0.222	0.151	0.173	0.357	1.000				
N	EFRECMAN13	0.208	0.069	0.056	0.069	0.081	0.059	0.095	0.099	0.095	0.118	0.126	0.082	0.051	1.000			
O	EFRECMAN14	0.141	0.035	0.093	0.060	0.101	0.124	0.063	0.060	0.040	0.123	0.135	0.066	0.032	0.352	1.000		
P	EFRECMAN17	0.199	0.067	0.155	-0.036	0.164	0.197	0.209	0.052	0.042	0.409	0.332	0.173	0.148	0.266	0.211	1.000	
Q	ETRABIMPL	0.119	0.703	0.223	0.260	0.183	0.171	0.167	0.088	0.160	0.152	0.101	0.145	0.175	0.076	0.018	0.123	1.000

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