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Analysis of the digital gender gap among undergraduate students in business administration and management degree programs.

Análisis de la brecha digital de género del alumnado universitario del grado de administración y dirección de empresas.

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RESUMEN: Esta investigación tiene como objetivo general determinar el nivel de competencia digital del alumnado del Grado de Administración y Dirección de Empresas (ADE) de la Universidad de Extremadura (España) e identificar si existe o no, una brecha digital de género. La investigación se ha basado en la aplicación del Cuestionario de Competencias Digitales en Educación Superior (CDES) organizado en base a 5 dimensiones (Alfabetización tecnológica, Acceso y uso de la información, Comunicación y colaboración, Ciudadanía digital y Creatividad e Innovación), estructurado fundamentalmente en base a preguntas de una escala tipo Likert. Para alcanzar el objetivo del estudio se ha seleccionado una muestra de 371 alumnos y alumnas de la Facultad de Ciencias Económicas y Empresariales de la Universidad de Extremadura y los datos recogidos en el cuestionario han sido analizados con el programa informático SPSS. Los resultados obtenidos muestran que, el 73% del alumnado posee un nivel alto de competencia digital, distribuidos en un 72,6% de hombres y un 73,5% de mujeres, no encontrando diferencias significativas según el análisis estadístico realizado, por lo que se puede concluir que no se ha encontrado brecha digital de género en nuestro universo de análisis.

PALABRAS CLAVE: Competencias digitales, educación superior, Administración y Dirección de Empresas, brecha digital de género

JEL Codes: A22, I21, I23

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ABSTRACT: The general objective of this research is to determine the level of digital competence of undergraduate students of the Bachelor's Degree in Business Administration and Management (ADE) at the University of Extremadura (Spain) and to identify whether there is a digital gender gap. The research was based on the application of the Digital Competences in Higher Education Questionnaire (CDES) on the basis of five dimensions (Technological Literacy, Access and Use of Information, Communication and Collaboration, Digital Citizenship and Creativity and Innovation), structured mainly on Likert-type scale questions. To achieve the objective of this study, a sample of 371 students from the Faculty of Economics and Business Studies of the University of Extremadura was selected and the data collected in the questionnaire were analysed using SPSS software. The results obtained show that 73% of the students have a high level of digital competence, distributed in 72.6% of men and 73.5% of women, finding no significant differences according to the statistical analysis carried out, so it can be concluded that no digital gender gap has been found in our universe of analysis.

KEYWORDS: Digital skills, higher education, Business Administration and Management, digital gender gap

1. INTRODUCTION

Currently, the abundant availability of information with the use of information and communication technologies (ICT) poses the challenge of selecting that information. ICTs have developed significantly since the first decade of the 21st century, giving rise to the so-called Knowledge Society. We are facing the fourth industrial revolution, a phenomenon that brings with it many opportunities for the development of science, innovation and knowledge. For Perasso (2016) this revolution is marked by the convergence of digital, physical and biological technologies; although it is true that at the moment it is not possible to determine to what extent people's lifestyles will be modified, smart factories and the exploitation of Big Data are already replacing workers in certain areas, and modifying the way in which goods and services are acquired or provided. According to Aguilar (2020), the term Industry 4.0 originated in Germany in 2011 at the Hannover-Messe trade fair to designate the set of technologies and production processes that are beginning to design the future industry.

As today's world is digitally interconnected, end-to-end digitisation of production stages will lead to autonomous facilities and self-managing production lines, taking the product value chain to a new level of organisation and control. This will be possible through the integration and interaction of research, design, production, logistics and service provision. For this reason, it is necessary for Business Administration and Management Sciences (BAM) to manage large-scale production, but with low volume stocks, as the products will have to be personalised based on the particular needs of each individual.

According to Fernández (2017), Industry 4.0 attempts to provide a positive response to the problems of energy saving and management of natural and human resources with the application of ICT tools. To this end, an organised system of communication networks is used for instantaneous and permanent exchange of information. This makes it necessary to train future graduates in ADE so that management is more effective, in correspondence with the availabilities and needs of each element of the system, allowing improvements and gains in productivity, as well as in the economy of resources. Thus, according to Davenport (2014) it is necessary that the training of human capital within companies be extolled and increased as an added value. Consequently, the impact of ICT must have an integrative impact on the training centres of graduates in Business Administration and Management from a transdisciplinary perspective. For Moeuf et al. (2020), human talent must be trained with competences in new technologies, to

be able to perform effectively in an interconnected, automated and intelligent production system, which offers value to products and services. For Conde & Ocaña (2017), it is necessary for students to go out into the labour market prepared for new jobs and continuously train workers to adapt to new technologies.

In universities, the pandemic of COVID-19 (Adedoyin & Soykan, 2020) has forced their incursion into ICT and Industry 4.0 in order to develop teaching with virtual tools, given the conditions of compulsory confinement, which has been a challenge for teachers, students and all administrative and service staff. Authors such as Coronel et al., (2020) support the idea that COVID-19 has facilitated the introduction of ICT in educational processes, according to which, teachers were not technologically prepared, given that they use ICT sporadically to teach classes. However, Acuña Ortigoza & Sánchez Acuña (2020)) revealed pressing technological limitations, but above all, limitations in teaching competence in these technologies, which are necessary for sustainable and quality teaching. According to Espinoza Mina & Gallegos Barzola (2020), universities must offer their future graduates training in new technologies, to develop competences such as creativity, critical thinking, teamwork and problem solving, within the teaching of knowledge specific to each degree, using ICT tools as support.

In Bozna (2017), we can read that the challenge for universities is to train people with the necessary competences to face the challenges of postmodernity, which are evident in all human activities, one of them being education, which for Guzmán Acuña (2008), is a social process that depends on the context and the vision of all the elements involved in it, such as teachers, students and institutions; in addition, he indicates that it is currently modified by new socialisation and communication schemes. Consequently, according to Falco (2017), ICT is a transforming agent of society and is used to generate knowledge. According to the European Union (2007) digital competence involves confident and critical use of ICT for work, leisure and communication. Furthermore, digital competence is underpinned by competences such as the use of computers to obtain, evaluate, store, produce, present and exchange information. To assess these competences, in 2012, Professor Duque Oliva (Oliva & Pinzón, 2012) indicated that to assess ICT competences in absolute terms without taking into account the perception of students and to measure them without him, would be to continue in a state of myopia.

For this reason, and in order to assess ICT skills, it is necessary to measure the positions of men and women in our study object of students from a gender perspective, and to identify, where appropriate, whether or not there is a gender gap, which makes it necessary to design and implement positive actions to mitigate the gap and mitigate or eliminate possible obstacles to the professional development of students of the Bachelor's Degree in Business Administration and Management. The digital gender gap is defined as the difference between the percentage of men and the percentage of women using ICT indicators expressed in percentage points (Secretaría de Estado de Economía y Apoyo a la Empresa, n.d.).

According to a study by the National Observatory of Technology and Society, the digital gap in Internet access between women and men has been reduced in Spain over the last decade, reaching parity in 2018. However, there are still differences in the activities carried out online, with the gap being greater in software and problem-solving skills. Thus, this study highlights the higher relative prevalence of online activities related to care and health among women and in economics, commerce and information among men. Even so, the gap in basic digital skills is three percentage points to the disadvantage of women (Empresarial Redes, n.d.).

In an extensive study on the gender perspective for the use of ICT Ibáñez et al. (2020) concluded that studies on the second digital gender gap confirm the differences in the level of digital skills between men and women, as well as the different uses of technologies, which are maintained throughout the different stages of life and are related to the gender position of people in our society. This study has been carried out in the STEM field (Science, Technologies, Engineering and Mathematics). Our study is restricted to ADE students, given the implications for the professional future of graduates, as well as for the development and efficiency of Industry 4.0. As indicated by Gargallo et al., (2010) ICT tools should be incorporated into higher education teaching to encourage a positive attitude towards them and ensure the acquisition of digital skills on equal terms between men and women.

2. OBJECTIVES

The general objective of this research is to determine the level of digital competence of students in the Degree in Business Administration and Management by gender and to identify the existence of a digital gender gap. The specific objectives arising from the general objective are to determine the level of digital competence in Technological Literacy, in Access to and Use of Information, in Communication and Collaboration, in Digital Citizenship and in Creativity and Innovation.

3. METHODOLOGY

This research is based on the use of a validated questionnaire on Digital Competences (Mengual-Andrés et al., 2016) called the Cuestionario de Competencias Digitales en Educación Superior (CDES). This questionnaire was developed by the EDUTIC (Education and Information and Communication Technologies) Research Group at the University of Alicante. This questionnaire has served as a basis for the development of many others that have evolved from it, such as the study by Gutiérrez-Santiuste et al. (2023), who also developed a validated questionnaire for Assessing Digital Communication Skills in Higher Education. It was also used by Pozú-Franco et al. (2020), for the Assessment of Digital Competences in university teachers. Similarly, Parmigiani et al., (2022) used it as a base questionnaire for the development of a questionnaire for the assessment of global competence within teacher training programmes. Also noteworthy is the questionnaire used by Fan & Wang (2022), which has been applied to university students in China. Finally, mention should be made of Suárez-Guerrero et al. (2020), who have also used this questionnaire to assess 9469 Peruvian higher education students. In short, this questionnaire allows for statistical analysis of measurable and numerically quantifiable data, given that the focus of this study is quantitative.

3.1. Sample

The data for this research were collected from 371 students of the Faculty of Economics and Business Studies of the University of Extremadura (UEx). According to information on its website[1], this faculty has approximately 2,800 students. It offers three degrees: Business Administration and Management (ADE); Economics and Labour Relations. It also offers three double degrees: ADE-Law; ADE-Economics and a double degree in ADE-Labour Relations and Human Resources. In addition, several Master's degrees are taught, but this study has been carried out with undergraduate students. A simple random sample was used to collect information (Ochoa, 2019), for which the research team went to the

[1] https://www.unex.es/conoce-la-uex/centros/eco

faculty's classrooms during school hours. The choice of classrooms and timetables was made after an exhaustive study of the compatibility of participants' timetables.

Table 1. Sample description

Variable	Categories	n	Percentage
Gender	Male	190	51.21%
	Female	181	48.79%
Age	19 years old	69	18.60%
	20 years old	66	17.79%
	21 years old	95	25.61%
	22 years old	48	12.94%
	23 years old	24	6.47%
	24 years old	17	4.58%
	25 years old	14	3.77%
	26 years old	25	6.74%
	more than 26 y.o.	7	1.90%
	n.a.	6	1.60%

According to Cortés (2014), for a population of 2,800 individuals, at a confidence level of 95% and with a margin of error of 5%, a representative sample of 339 individuals would be obtained, and the necessary sample size has therefore been reached in our study. Table 1 shows the basic socio-demographic data of the sample in terms of gender and age of the students.

3.2 Instruments

The instrument used for the study was the CDES questionnaire (Mengual-Andrés et al., 2016), which consists of 48 items or questions. All of them are evaluated or scored on a Likert-type scale with values from 1 to 5, with a value of 1 being "not at all important" and 5 being "very important". The 48 questions are organised into five dimensions or factors:

- Technological Literacy: Students demonstrate adequate understanding of ICT concepts, systems and functioning. Eleven questions are used to assess competence.
- Information access and use: Students apply digital tools to obtain, evaluate and use information. This dimension is made up of 8 questions.
- Communication and collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. This dimension contains 8 questions.
- Digital citizenship: Students understand the human, cultural and social issues related to ICT and practice legal and ethical behaviours. There are 8 questions on this dimension.
- Creativity and Innovation: Students demonstrate creative thinking, constructive knowledge and develop innovative products and processes using ICT. This dimension has 13 questions.

3.3 Procedure and codification

The CDES questionnaire was adapted to Google Forms (Palomares Chust, 2015), and some of the teachers who teach in the different courses were contacted to reconcile

schedules and avoid repetition of students in the responses to the questionnaires. All data were collected in the same Google database and exported to Excel as a preliminary step to the complete study, which was carried out using the Statistical Package for the Social Sciences (SPSS) software version 27.0.

The coding of the 5 dimensions of the CDES questionnaire was carried out according to the number of questions that make up each dimension, and their quantity, which determined the values to be used to calculate the values for each dimension. Thus, for example, for the dimension Access to and Use of Information (Dimen_AUI), first the sum of the 8 questions that make up this dimension is totalled and then the value is calculated with the scales of 8, 16, 24, 32 and 40 that give rise to the values chosen by the students of 'Not at all important', 'Important', 'More or less important', 'Important' and 'Very important'. The rest of the dimensions are coded as "Dimen_AT" for the dimension "Technological Literacy", "Dimen_CC" for the dimension "Communication and Collaboration", "Dimen_CD" for the dimension "Digital Citizenship" and "Dimen_CI" for the dimension "Creativity and Innovation".

3.4 Internal consistence of scales

Given that the CDES questionnaire used in the study is a validated instrument (Mengual-Andrés et al., 2016), we proceeded to analyse the internal consistency of the scores of the measurement instrument and determine its reliability. To this end, the students' responses were combined by adding their values and obtaining a total score for the instrument. To group the questions into categories, it was previously demonstrated that there is internal consistency between these questions, therefore, it is correct to add up the results of the questions to define it as a total score. Thus, it has been possible to know that the scores of the sample are reliable from the point of view of the internal consistency of their answers and the existence of homogeneity between the questions that make up a dimension (Guix, 2005). Cronbach's alpha was used to assess the extent to which the reliability of the test would improve (or worsen) if a certain item or question was excluded. To do so, we followed George & Mallery (2019) in terms of recommendations for evaluating Cronbach's alpha coefficients according to the result obtained, where 0.9 to 0.95 is excellent, greater than 0.8 would be good, greater than 0.7 is acceptable, greater than 0.5 is poor, and less than 0.5 is unacceptable. In our case, applying the full Cronbach's alpha to the 48 questions of the CDES questionnaire corresponding to the five Dimensions the value is 0.957. Therefore, it has "excellent" internal consistency. And according to Sánchez Meca & López Pina (2008) it can be said that "the reliability of the scale scores in the sample is 0.957". McDonald's Omega has also been calculated and the same result has been obtained.

3.5 Categorising General Digital Competence

In order to be able to assess the digital competence of the students for each of the dimensions, the variable "General Digital Competence" has been categorised, which is determined by the five dimensions of the questionnaire. In any case, for the 5 dimensions and also for the final variable "General Digital Competence" they have been categorised in the values of: "Not competent", "Elementary", "Basic", "Advanced" and "Expert". Therefore, in our study, the range of valid values for each category was determined based on the number of questions in a category. 4

4. RESULTS

Once the data collected from the CDES questionnaire were coded, the results were analysed. First, an overall analysis of the results was carried out, followed by a detailed

analysis of each of the dimensions, in order to analyse the independence, or otherwise, of the gender of the student's digital competence.

4.1 Overall analysis

Firstly, a descriptive statistical analysis of all the variables measured in this research was carried out based on the application of the validated CDES questionnaire by Mengual-Andrés et al. (2016).

With the aim of carrying out an analysis from a gender perspective of the level of digital competence, this study is based on the compilation of data disaggregated by sex, which allows us, in each of the dimensions, to determine whether to apply the Student's t-test (parametric test) or the Mann-Whitney U-test (non-parametric test) to compare the two independent samples. In all cases, statistical analysis was performed to determine whether parametric or non-parametric tests were applied. For this purpose, we determined the values of normality, randomness and homoscedasticity. The normality test was performed using Kolmogorov-Smirnov test because the sample size was larger than 50.

For the variables measuring whether students have a personal computer and Internet at home, a large majority indicated that they do have a computer (98.4%) and all indicated that they do have Internet at home.

Regarding the variable measuring the number of hours of computer use per week, only 4.3% indicated that they used the computer for less than one hour per week. The rest of the usage ranges are more or less balanced, with 32.9% saying they use it more than one hour and less than five hours a week; 31.0% say they use it between 5 and 20 hours a week; and finally, 31.8% say they use it more than 20 hours a week. In the analysis of the data disaggregated by sex, the Mann-Whitney U test was used, given that a non-parametric test had to be applied, since the null hypothesis was rejected in the normality test, and therefore the sample did not follow a normal distribution. The result of the Mann-Whitney U test has a significance value of 0.077, so we can conclude that there are no significant differences by gender in the number of hours per week that students use the computer.

As for the use of computers in the development of the subjects in class, 94.1% indicated that they did use it, while in absolute values 22 of the 371 students indicated that they did not use it (5.9%).

Question A5 is a question with 4 multiple-choice answers. The results showed that 14.9% of the students considered that they had not received any training, only 3.5% of them had received training in software specific to their area of studies, while the vast majority (68.8%) had received training in office automation. Finally, 46.1% indicated that they had knowledge of Basic Computer Science.

Question A7 assessed the respondent's level of ICT training according to the place or source of learning. The results, with values ranging from 1 for "little" to 5 for "a lot", are listed in Table 2. The responses of 57.7% of the respondents (little training in specific training courses) stand out; at the same time, 38.3% said that they had a very high level of ICT skills based on self-training. The statistical study of the questions showed that self-training had an average score of 3.63. The average score for training at the university was 3.31. Evaluation of the training received in secondary education had an average of 3.08. Finally, the training received in primary education drops to 2.25 and on the basis of specific courses only 2. Therefore, the last two types of training origins are below the "normal" value, that is, the vast majority of them are in the "very low" or "low" range.

Table 2. Distribution of ICT training received by the students.

	1	2	3	4	5	Missing
A7-1.VG.Self training	10.5%	12.7%	18.9%	19.7%	38.3%	0%
A7-2.VG.School	28.0%	31.3%	30.2%	7.5%	2.7%	0.3%
A7-3.VG.SecondEduc.	8.4%	19.9%	34.2%	30.2%	7.0%	0.3%
A7-4.VG.University	10.5%	12.7%	29.4%	28.0%	18.3%	1.1%
A7-5.VG.Other training	57.7%	7.0%	9.4%	11.6%	8.4%	5.9%

In carrying out the study with data disaggregated by sex for question A7, both in the parametric tests with Student's t-test and with the Mann-Whitney U test, the training received at university is different for male and female students according to the significance value (0.015). In the rest of the cases, the null hypothesis (there are no significant differences according to sex) must be accepted, as the value is greater than 0.05. The statistical results of the means and standard deviations are shown in Table 3, where it can be seen that the mean education for females is 3.16 compared to 3.47 for males.

Table 3. Source of ICT training received by students, by gender.

	Gender	N	M	SD	St error
A7-1.VG.Self training	Male	190	3.73	1.263	.092
	Female	181	3.51	1.478	.110
A7-2.VG.School	Male	189	2.17	1.053	.077
	Female	181	2.34	1.008	.075
A7-3.VG. SecondEduc.	Male	189	2.97	1.137	.083
	Female	181	3.18	.957	.071
A7-4.VG.University	Male	187	3.47	1.165	.085
	Female	180	3.16	1.254	.093
A7-5.VG.Other training	Male	174	2.01	1.400	.106
	Female	175	1.99	1.440	.109

Question A8 assessed the years of computer use. Almost half of the students (49.06%) indicated that they had been using the computer for between 5 and 10 years and 32.61% for more than 15 years, that is, 81.67% had been using computer for more than 5 years. In this question, A8, when testing for significant differences according to gender, the results show that the Mann-Whitney U has a significance value of 0.038. Thus, it is necessary to reject the null hypothesis that there is a significant difference according to sex. The differences can be seen in the 5 -10 years age group, where there were more females (55.2%) than males (43.2%), while in the 10 -15 years age group, the percentage of males (37.9%) was higher than that of females (27.1%). It is also worth noting that in both cases, those who had been using it for less than 5 years were in the minority (6.8% of men and 7.2% of women).

Question A9, on how the use of computers and technology contributes to the improvement of quality as a future professional of the students of the ADE degrees of the University of Extremadura, was distributed as follows: 62.1% of them indicate that they totally agree; if they are added to the 26.1% who indicate that they agree, they constitute a total of 87.6%. The above value is a large majority of them, leaving only 5.9% for neutral values, 2.7% disagreeing and 3.8% as "strongly disagree". For this variable it is necessary to apply non-parametric tests because normality requirement of the variable is not met when applying the Kolmogorov-Smirnov test. Therefore, it is necessary to apply the Mann-Whitney U test. In this case, the significance value is 0.05, which is at the limit for accepting or rejecting the null hypothesis. According to the SPSS programme, this has to be accepted, therefore, there is no significant difference between men and women for this variable. Student's t-test was also applied for the two independent samples, given

that some authors have stated that this test is sufficiently robust to determine whether two independent samples are statistically equal, therefore, the null hypothesis indicating that there is no statistically significant difference between men and women for the study variable must be accepted.

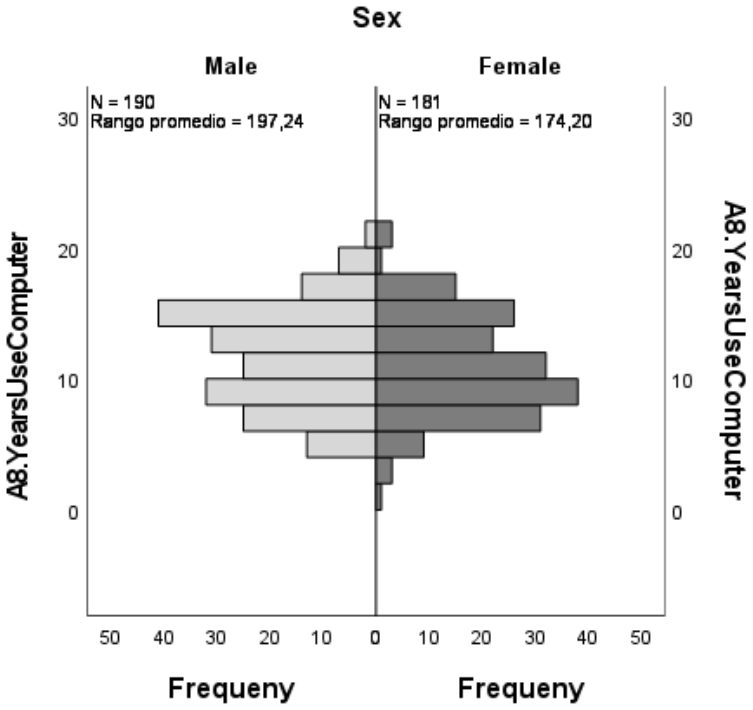

Figure 1. Man-Whitney U test for "Number of years of computer use" by gender.

Finally, to close this section of global analysis, students' assessment of the degree to which their teachers have mastered the use of ICT (variable: A10TeachersUse) in the area of Financial Economics and Accounting is shown in Figure 2. When applying the normality tests (Kolmogorov-Smirnov), this variable is not normal and the Mann-Whitney U test has to be applied, which indicates that there are statistically significant differences by sex for the variable A10TeachersUse, as the null hypothesis is rejected as it has a significance of 0.008. Thus, it can be observed that men value ICT training more positively than women. The average score on the scale of 1 to 10 was 7 for men and 6 for women. The most differentiated values between men and women were in value 7, with 20.5% of students choosing it, compared to 15.5% of female students, and value 8, with 27.9% of male vs. 21.5% of female students selecting it.

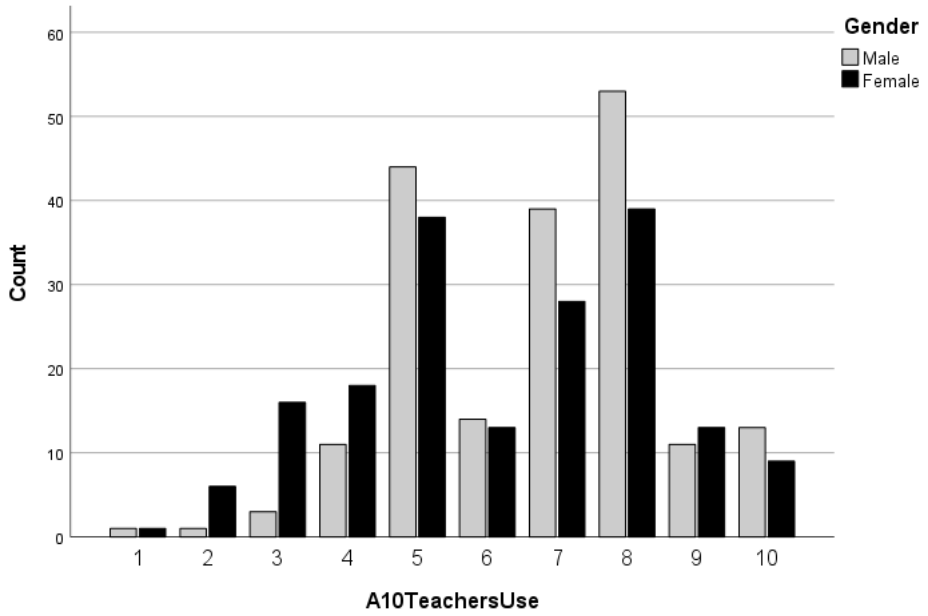

Figure 2. Distribution of responses on the degree of ICT use or management that students think the teaching staff should have according to gender.

4.2 Analysis by dimensions

The five dimensions that give rise to the final assessment of the Digital Competence of students in the Bachelor's Degree in Business Administration and Management are made up of different questions that are analysed and presented in this section. All the questions were evaluated on a Likert scale with the following values: 1-not at all important; 2-not very important; 3-more or less important; 4-important and 5-very important. The coding in SPSS was explained in the previous section on "Data coding". In any case, for each dimension, coding was performed on the basis of dimensions with the 5 values of 'not competent', 'elementary', 'basic', 'advanced' and 'expert'. Table 4 shows a summary of the level of digital competence broken down by gender for each dimension.

For all dimensions, the Kolmogorov-Smirnov test concluded that they did not follow a normal distribution; consequently, it was not necessary to perform the cluster test or analyse homoscedasticity. Therefore, the Mann-Whitney U test was applied in all cases.

Table 3. Level of Digital Competence; Category by Gender.

		Not competent	Elementry	Basic	Avanced	Expert
Digital Comp. AT	Male	0,0%	0,3%	10,5%	60,0%	29,5%
	Female	0,0%	1,1%	9,9%	47,5%	41,4%
Digital Comp. AUI	Male	0,0%	0,5%	10,0%	43,2%	46,3%
	Female	0,0%	1,7%	8,8%	40,3%	49,2%
Digital Comp. CC	Male	0,0%	1,6%	15,8%	50,5%	32,1%
	Female	0,0%	1,7%	13,8%	44,8%	39,8%
Digital Comp. CD	Male	0,0%	0,0%	12,6%	38,9%	48,4%
	Female	0,0%	0,0%	9,9%	41,4%	48,6%
Digital Comp. CD	Male	0,0%	0,0%	11,1%	37,9%	51,1%
	Female	0,0%	0,6%	9,9%	33,1%	56,4%
General Digital Comp.	Male	0,0%	0,0%	6,8%	46.3%	46.8%
	Female	0,0%	0,6%	6.1%	43.6%	50,3%

For the Technological Literacy dimension, the Mann-Whitney U test concludes that the null hypothesis is to be maintained with a degree of significance of 0.057; consequently, there is no statistically significant difference between the levels of males and females. Table 4 shows that the highest values for both men and women were at the Advanced level with 60% for men and 47.5% for women. However, at the Expert level, the percentage of women (41.4%) was higher than that of men (29.5%). However, the mean of this dimension (see Table 5) in the students' responses was 3.80. Of the 11 items in this dimension, the most highly rated items were: "Manage computer resources using different operating systems" (M=4.35); "Use office automation tools for information processing" (M=4.04) and "Develop online conversations using synchronous communication tools via the Web" (M=3.99). The least valued were: "Mastering digital image, audio and video processing tools" (3.32); "Creating databases using specific software to organise and manage information" (M=3.48) and "Effectively using e-learning/b-learning platforms for online training and collaboration" (M=3.59).

In the dimension of Access to and use of information, the null hypothesis that there is no statistically significant difference according to the Mann-Whitney U test with a value of 0.652 must also be accepted. According to Table 4 the highest values for both men and women are at the Expert level with 46.3% for men and a higher value for women, namely 49.2%. However, for the Advanced level the percentage of women (40.3%) was lower than that of men (43.2%). According to Table 5, the average for this dimension was 3.9, with the following items being the most highly rated: "Plan information searches for problem solving" (M=4.09) and "Synthesise selected information by organising it appropriately for the construction and assimilation of new knowledge" (M=4.05). The least valued were: "Returning the solution to a problem to the community in terms of digital information resources" (M=3.84) and "Designing a research project on the basis of a problem to be solved, identifying the most appropriate ICT resources" (M=3.91).

The Communication and Collaboration dimension also has no statistically significant difference between men and women, given that the degree of significance of the Mann-Whitney U is 0.169. Table 4 shows that the highest values for both men and women were at an Advanced level with 50.5% for men and 44.8% for women. However, at the Expert level, the percentage of women (39.8%) was higher than that of men (32.1%). The average score on this dimension was 3.82. The highest rated items were: "Effectively communicate information and ideas to multiple audiences, using a variety of media, formats and platforms" (M=4.04) and "Interact with experts or others using social networks and ICT-based communication channels" (M=3.96). The least valued were: "Sharing experiences on social networks" (M=3.28) and "Sharing digital environments and media for collaboration and publishing electronic resources with peers" (M=3.82).

Table 4. Global descriptive values of the instrument dimensions, category by gender

	Total (N= 371)		Male (N=190)		Female (N=181)	
	M	SD	M	SD	M	SD
Dimen_AT	3,8008	0,6285	3,7694	0,6025	3,8338	0,6547
Dimen_AUI	3,9889	0,6459	3,9750	0,6255	4,0035	0,6681
Dimen_CC	3,8322	0,6815	3,8033	0,6623	3,8626	0,7016
Dimen_CD	3,9858	0,6685	3,9816	0,6618	3,9903	0,6773
Dimen_CI	4,0379	0,6857	4,0312	0,6754	4,0450	0,6982

Regarding the Digital Citizenship dimension, it should first be noted that there was no statistically significant difference between men and women, as the degree of significance of the Mann-Whitney U is 0.774. Table 4 shows that the levels of "Not competent" and "Elementary" had a result of 0 percentage for both men and women. The "Expert" level shows a higher percentage and almost equal positions for men and women, with 48.4% and 48.6% respectively. The "Advanced" level presented very similar values, 38.9% for men and 42.4% for women. The average for the Digital Citizenship

dimension is 3.98, with the best rated items being "Promote the safe, legal and responsible use of information and ICT" (M=4.19) and "Show a positive attitude towards the use of ICT, supporting collaboration, learning and productivity" (M=4.14). On the other hand, the lowest ratings were: "Exercise leadership for digital citizenship" (M=3.67) and "Understand digital etiquette (netiquette) by developing responsible social interactions related to information and ICT use" (M=3.73).

For the fifth dimension, Creativity and Innovation, the students' responses also indicate that there is no difference according to gender, as the degree of significance of the Mann-Whitney U is 0.359. As shown in Table 4 the highest values for both males and females were at the Expert level with 51.1% for males and 56.4% for females. However, for the Advanced level, the percentage of women (33.1%) was lower than that of men (37.9%). This dimension has 13 items with an average score of 4.03. The three most highly rated items are: "Integrate digital tools and resources to promote learning capacity and creativity" (M=4.26); "Develop experiences that stimulate creative and innovative thinking" (M=4.14) and "Tend towards professional effectiveness and self-renewal by incorporating ICT in their work context" (M=4.14). The lowest rated are: "Participate in professional knowledge communities using ICT" (M=3.82); "Recognise the conditions and contexts that require the use of ICT" (M=3.88) and "Develop initiatives with an entrepreneurial spirit in the use of ICT" (M=3.89).

Finally, the calculated variable "Level of General Digital Competence" summarises the Digital Competence of ADE students in the levels of "Not Competent", "Elementary", "Basic", "Advanced" and "Expert", based on the 5 dimensions assessed. This variable also does not follow a normal distribution and consequently, it is also necessary to apply the Mann-Whitney U test to accept or reject the null hypothesis, and the result is 0.5 as the significance value. Consequently, based on the results, the null hypothesis must be accepted, which indicates that there is no significant difference between the two samples (males and females). In Table 4 it can be seen that the highest values for both males and females were at the Expert level with 46.8% for males and 50.3% for females. However, for the Advanced level the percentage of women (43.6%) was lower than that of men (46.8%).

5. CONCLUSIONS

Based on the results, it can be concluded that the instrument used in this research (the validated CDES questionnaire) is reliable and correctly measures the objective pursued in the study. The internal consistency of the questions was found to be "excellent" according to George & Mallery (2019).

In all cases, it was determined whether parametric or non-parametric tests could be applied to each variable. In the vast majority of cases, non-parametric tests had to be applied, specifically the Mann-Whitney U test, which determined, based on the null hypothesis, whether he variable under consideration depended on the sex of the students.

Based on the results, it was found that all the students had a personal computer, the vast majority had Internet access at home, and a large majority (94.1%) used the computer in their university classes. In all cases, there were no significant differences according to gender.

There was also no gender difference in the number of hours of computer use per week, with more than 30% using the computer for more than 20 hours per week. For the variable training received in computer use, no gender differences were found, and a majority (51.6%) said that they had received training in office software.

A significant difference was found in the degree of ICT training in terms of the origin of the training received when this was at university, the average degree of training (from 1=slightly to 5=very much) was 3.47 for men and 3.16 for women. There were no differences in the rest of the educational backgrounds. It also stands out that 57.7% indicated that they had not received specific training courses for the ADE degree programme.

The results of the study showed a significant difference in the number of years of computer use according to gender. Thus, the majority of men had been using computers for more than 10 years (37.9% compared to 27.1% of women). Consequently, in the 5 -10 years age group, the percentage of women (55.2%) was higher than that of men (43.2%). However, in the question that assesses whether computers and technology contribute to improving the quality of the ADE professional, the results showed that there are no differences according to gender. On the other hand, 87.6% agree that they contribute, which is encouraging for the professional development of these future graduates.

In the last question regarding the characterisation questions of the questionnaire, which assesses whether the degree teachers use and integrate ICT in teaching (A10), the results showed a significant difference between men and women, as men value ICT training more positively than women with the average for male students being 7, while the average for female students is 6.

Finally, with regard to the dimensions that make up digital competences, all of them are independent according to gender, both in the calculation for the dimensions and in the calculation for general digital competence. In all cases the Advanced and Expert levels stand out, while the Basic level is approximately 10% overall. In light of the results, the elementary level is purely testimonial in most dimensions with a range from 0 to a maximum of 1.7%, that is, never more than 2%. Finally, the level of "not competent" was 0% in all cases.

The general digital competence of ADE students is calculated based on the results of the five dimensions of the questionnaire, and as it has been shown that they are not conditioned by gender, we can conclude that the complete values for ADE students are 6.5% at the Basic level, 45% at the Advanced level and up to 48.5% at the Expert level. With these data on ICT competence level, future graduates will be able to reach a high professional level, which is the objective that every university institution, and consequently its teachers, should pursue.

In short, the objective has been achieved, which was to determine the level of digital competence of ADE students according to gender, and it is concluded that there is no gender digital gap for the sample under study. It is the intention of this research team to continue collecting this data in future years to compare the evolution of the digital competences of ADE students.

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