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PAPER

Digital Competencies in Higher Education Students: Analysis of Attitude, Knowledge, and Use of ICT

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ABSTRACT

In the contemporary era, the convergence between education and digital technology demands an ongoing revision of pedagogical strategies, focusing on placing the student as the protagonist of the learning process. This study aimed to analyse the digital competencies of students from the Higher Technological Institute of Spain (ISTE) in Ecuador, considering their attitude, knowledge, and use of information and communication technologies (ICT), as well as how sociodemographic variables affect this context. Using a non-experimental, descriptive, cross-sectional research design with a correlational approach to variables, the ACUTIC questionnaire was applied to a sample of 156 ISTE students. The data was analysed with R Commander 4.3.1, first performing a descriptive analysis exploring trends in variables such as age and gender. Furthermore, the use of parametric and non-parametric tests depends on the data distribution. The results confirmed that there are no gender differences in attitude, knowledge, or use of these technologies (p-value > 0.05). While age does not correlate with ICT use ($p = 0.1661$) or attitude ($p = 0.1173$), it does relate to knowledge of them ($p = 0.0182$) and to the possession of computers and smartphones ($p < 0.001$ and $p = 0.0059$, respectively). There is a robust correlation between ICT knowledge and use (p-value < 2.2e-16). Geographical location corresponds with stable internet access ($p = 0.0000$) and computer ownership ($p = 0.0028$). In conclusion, the digital competencies of ISTE students in Ecuador are influenced by multiple sociodemographic factors and represent a crucial aspect of adapting to the changes and demands of education.

KEYWORDS

digital learning, education, statistical analysis, student attitudes, technologies

1 INTRODUCTION

1.1 Postmodern context and educational evolution

At present, society is immersed in what is known as the postmodern era, which poses the need to reconfigure educational excellence with new methodological

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paradigms that place the student as an active agent [1]. Similarly, digital technologies have had a significant impact on the work dynamics of educators and the knowledge acquisition process of students in educational settings [2], [3]. This phenomenon has opened new opportunities for the evolution and improvement of educational methods [4]. In this way, the integration of information and communication technologies (ICT) has a notable influence on learning, social interaction dynamics, and the management of cognitive knowledge itself [1]. Consequently, the steady progression of ICT incorporation in the educational field is taking on relevant importance in the planning of educational reforms [5, 6].

In this context, the integration of ICT facilitates aspects related to optimising individual work, promoting student autonomy, simplifying the execution of group and collaborative tasks, offering flexibility in adapting assessment methods, and fostering bidirectional interaction between teachers and students [7, 8]. However, along these same lines of research, Liu et al. [9] note that the issue of ICT adoption by educators has been a topic of discussion for an extended period, and despite being familiar with and having greater confidence in it, its use remains limited. Meanwhile, Gizaw and Tessema [5] assert that, despite its promising potential, the integration of ICT in education is in its early stages and is hindered by issues like a lack of technological familiarity among users and the costs associated with acquisition and maintenance. Therefore, an increase in teachers' attitudes towards ICT adoption will result in improving the quality of the educational environment [10, 11].

1.2 Adoption of ICT in higher education

The inclusion of ICT in the realm of higher education has been holistically implemented throughout the curriculum, and this dynamic is equally applicable to formative research procedures in both face-to-face and virtual academic programmes [12, 13]. In the same vein, the application of technologies in higher education shows limitations. According to the UNIVERSITIC report in Spain [14], it is noteworthy that only 28% of universities have a recurring plan for the assignment and management of ICT-specialised personnel. In contrast, the remaining 72% of institutions lack this specific planning. Even though educators understand the significance of incorporating ICT into teaching, its use is predominantly restricted and limited [9]. Given the disparity between students' personal use of technological resources and university guidelines for sustainable digital technology in learning, it is vital to investigate digital literacy competence and the use of technology to enhance student engagement [15, 16].

With the goal of expanding teaching and education opportunities, especially in the realm of didactic resources for distance instruction, ICT is utilized [17]. These maintain an active educational approach, allowing educators to adapt teaching methods and adjust to a constantly evolving global environment. Along the same research lines, Ngenzi et al. [18] indicate that one of the discerned behaviours in the numerical analysis of their study was the conviction that technology is a beneficial tool for learning among students. On another note, attitude emerges as the most influential component of behavioural intention [19].

It is essential to recognise that today's youth, who were born and raised in the digital era, require a pedagogical approach that empowers them to use technology effectively and appropriately in their academic training [20, 21]. At the same time, students familiar with communication forms on social platforms such as WhatsApp, Facebook, or Twitter expect to see these modalities replicated in the academic context [22]. Now, didactic procedures with ICT generate more interest than traditional

methods [23]. However, students are not enthusiastic about the educational use of social networks due to their lack of prior academic experience with these platforms [24, 25]. In the context of research in Argentine universities, it is evident that students use ICT in their daily activities, although their use in academic activities is limited [26].

1.3 Perceptions and attitudes towards ICT

Yen Chun et al. [27] revealed in their research that students positively value the effectiveness of ICT tools focused on collaboration and social media as effective resources for their education. Consequently, it is feasible to assert that while teachers maintain a favourable disposition towards technology, students, whether they have disabilities or not, can acquire knowledge quickly and effectively [28, 29]. Thus, the widespread adoption and growing commitment of teachers to ICT have elevated the excellence of instruction and training provided in the educational realm, proving particularly evident and significant for students [30]. The progression of digitization and computer technologies, especially telecommunications, is leading to the formation of an educational and informative environment [31, 32].

Additional research suggests that higher education students who place greater importance on ICT tend to use them more intensively for their learning process [33, 34]. Similarly, at the university level, students display a favourable disposition towards technological incorporation in education. Consequently, there's a preference for ICT among those over 25 years old [35, 36]. However, the implementation and use of these technologies are influenced by gender and age variables. Romero et al. [35] findings reveal that men tend to consider themselves more skilled in the educational use of ICT compared to women, particularly in areas related to information management and the creation of individual learning environments.

The findings from Cabezas et al. [36] research indicate that self-assessment of ICT knowledge is negatively perceived, while there is a positive connotation regarding the handling of devices, tools, and services, demonstrating a positive attitude towards technology. Concurrently, this notion is shared by Romero et al. [35], where they mention that students particularly value their ability to operate digital devices. The results of Aburto's [24] research showed considerable and notable aptitudes in handling word processors, such as Word or others, at 35%; skills in managing spreadsheets (Excel or others) at 33%; and proficiency in using email (Outlook or others) at 33%. Thus, it's noted that these figures do not fall into the low category, leading to the inference that students possess fundamental and basic competencies in information and communication technologies.

1.4 Research description

The primary purpose of this study was to conduct an analysis of the digital competencies exhibited by students belonging to the Higher Education System of a Technological Institute in Ecuador. The analysis covered aspects related to attitude, knowledge, and use of ICT to determine the influence of certain sociodemographic variables (age, gender, geographical location, etc.) in the educational environment. The methodology used was quantitative with a cross-sectional-correlational descriptive approach, using the ACUTIC questionnaire [37] as a tool to gather information on the study variables.

This study primarily contributes to the literature in education by discussing students' digital competencies in the educational process. Although ICT tools facilitate teaching, few studies have investigated attitudes, knowledge, and use of them in technological institute education. The results obtained have the potential to guide educators in making decisions about how and when to implement ICT tools, as well as in the appropriate selection of them for future uses.

2 METHODOLOGY

The methodological strategy is developed as non-experimental research with a descriptive and cross-sectional design, using a questionnaire to obtain quantitative data [38]. These methodologies are widely used in education and the social sciences, aiming to characterise, understand interactions, and examine the variables in question. In turn, a correlational research approach was considered, focusing on understanding how the various dependent and independent variables relate [39]. The study's objective was to analyse the digital competencies of students from the Higher Education System of the Instituto Superior Tecnológico España (ISTE) in Ecuador, considering attitude, knowledge, and use of ICT, and to evaluate how sociodemographic variables influence this educational context.

2.1 Sample

The target population encompassed fifth- and sixth-level students from ISTE located in the city of Ambato-Ecuador, covering the majors of Business Administration, Finance, Strategic Digital Marketing Management, and Information Systems and Cybersecurity. Simple, non-probabilistic convenience sampling was used.

The minimum sample size was determined using Slovin's formula (n = N/(1 + N e^2)), where n represents the total participants, N is the entire population, and e corresponds to the margin of error (0.05). Considering that ISTE, based on the inclusion criteria of the participants, has 258 enrolled students, 156 of them were needed to constitute the appropriate sample size.

2.2 Instrument

This study used an instrument to carry out data collection. Firstly, a general questionnaire was employed, in which data related to demographic, socioeconomic, and institutional aspects were gathered anonymously. Through this record sheet, the profile of the sample was configured, including aspects such as age, gender, geographical location, internet access, and device ownership.

Furthermore, the ACUTIC questionnaire [37] was applied, aiming to understand the attitudes, training, knowledge, and use that higher education students have regarding ICT. This questionnaire, developed at the University of Murcia, Spain, covered three subgroups comprising a total of 31 items. Its reliability and validity were verified in the Spanish population, showing solid statistical properties with a global Cronbach's alpha coefficient of 0.891 [40]. To grade the responses, a five-level Likert scale was used for each subgroup. For attitude, it was graded from "strongly disagree" (1) to "strongly agree" (5), for knowledge from "none" (1) to "very high" (5), and for ICT use from "never" (1) to "always" (5).

2.3 Data collection

Data collection was carried out using an online questionnaire on the Google Forms platform during the period from February to May 2023. The methodology involved data acquisition among students from the Higher Education Institute in the city of Ambato. The study adheres to all the ethical requirements established by the Helsinki Declaration and adapted to this study [12]. All participants received appropriate information about the study's objectives and provided their informed consent to participate in the project.

To safeguard the confidentiality and privacy of the study subjects, the questionnaire was structured in a way that did not involve collecting personal information from respondents that could be used by researchers for their identification.

2.4 Data analysis

The collected data were subjected to analysis using the R Commander 4.3.1 software to conduct a statistical evaluation using two differentiated approaches. Firstly, a descriptive analysis was carried out, covering an initial exploration of the data with the purpose of detecting trends related to variables such as age, gender, geographical location, internet access, and device ownership. Frequencies, contingency tables, and central tendency measures (mean) were included.

To explore the relationships between variables, we began by confirming their normality using the Lilliefors test. Once this condition was established, we identified variables that followed a normal and non-normal distribution, leading to the implementation of parametric (Welch's t-test, Pearson) and non-parametric (Mann-Whitney, Spearman, Chi-squared) based on the characteristics of the sample and the data on normality.

Correlation analyses were conducted to study the relationships between various combinations of variables. Using the Spearman correlation method, the associations between attitude and age, attitude and knowledge, attitude and use, knowledge and age, and age and use were explored. On the other hand, the Pearson correlation was used to investigate the relationship between knowledge and use. These findings were visualised using scatter plots, which graphically represent the correlations to provide a visual understanding of the trends and relationships between the studied variables.

3 RESULTS

The sociodemographic data of the selected sample show a higher presence of women at 62.2%, while men account for 37.8%. The ages of these participants range from 19 to 58 years, with an average age of 36 years. This is evident because, being a higher technological institute, people enter to study at an older age compared to a traditional university. Some of the factors mentioned by the students include seeking professional reorientation, schedule flexibility, a shorter duration of some technical programmes, specific labour market demands that value specialised technical skills, and more flexible admission policies.

The geographical location of the participants is distributed between rural and urban, with 70.5% and 29.5%, respectively. Meanwhile, 90.4% state they have access to a fixed internet network and possess devices such as computers (86.5%), smartphones (68.6%), tablets (15.4%), among others (0.6%).

Table 1 displays a comparison between categorical variables and their relationship with various technological variables. It is observed that there is a strong

association between geographical location and access to a stable internet network (p-value 0.0000). This could indicate that, depending on whether one is in a rural or urban area, the likelihood of having stable internet access varies significantly. Similarly, geographical location influences computer ownership and therefore its use in the learning process, being significantly different between areas (p-value 0.0028). On the other hand, no relevant differences were found concerning the ownership of tablets or smartphones based on geographical location.

Regarding differences based on gender, there is a significant relationship concerning the use of computers (p-value 0.0144). This suggests that men and women might have different usage patterns for this device. However, there are no significant differences in the use of tablets or smartphones based on gender.

Table 1. Relationship between geographical location and gender with access to technologies and the Internet

Variable	Group	Location/ Gender	Yes %	No %	p-Value	Expected Yes	Expected No
Geographical Location	Internet Access	Rural	76.10	23.90	0.0000***	41.57	4.42
		Urban	96.40	3.60		99.42	10.57
	Computer	Rural	73.90	26.10	0.0028**	39.80	6.19
		Urban	91.80	8.20		95.19	14.80
	Tablet	Rural	15.20	84.80	0.9701	7.07	38.92
		Urban	15.50	84.50		16.92	93.07
	Smartphone	Rural	63.00	37.00	0.3345	31.55	14.44
		Urban	70.90	29.10		75.44	34.55
Gender	Computer	Male	78.00	22.00	0.0144*	51.05	7.94
		Female	91.80	8.20		83.94	13.05
	Tablet	Male	20.30	79.70	0.1810	9.07	49.92
		Female	12.40	87.60		14.92	82.07
	Smartphone	Male	66.10	33.90	0.6016	40.46	18.53
		Female	70.10	29.90		66.53	30.46

Notes: The significance of the differences is assessed using chi-squared tests. A smaller p-value indicates strong evidence against the hypothesis of independence between the compared categories.
Source: R. Commander 4.3.1.

3.1 Normality test

Table 2 summarises the normality tests using the Lilliefors test for various combinations of variables and subgroups. The objective of these tests is to determine if the data in question comes from a normal distribution. A p-value greater than the significance level (typically 0.05) suggests that the null hypothesis can be rejected and that the data do not significantly deviate from a normal distribution. On the other hand, a p-value less than the significance level indicates that the data probably do not come from a normal distribution. For example, the age of those with a computer does not significantly deviate from normality (p = 0.1310), while the age of those without a tablet does (p = 0.0581). It is important to consider the adjusted p-value, which considers multiple tests and adjusts significance to avoid false positives.

Table 2. Normality tests for variables and groups

Variable	Group	D	p-Value	Adjusted p-Value
Age		0.0816	0.0140	
	Computer (Yes)	0.0745	0.0655	0.1310
	Computer (No)	0.0939	0.9152	0.9152
	Tablet (Yes)	0.1053	0.7021	0.7021
	Tablet (No)	0.0828	0.0290	0.0580
	Smartphone (Yes)	0.0739	0.1649	0.1649
	Smartphone (No)	0.1267	0.0518	0.1036
Attitude		0.2731	< 2.2e-16	
	Male	0.2674	1.959e-11	1.9585e-11
	Female	0.2783	< 2.2e-16	< 2.22e-16
	Rural	0.2565	0.0000	0.0000
	Urban	0.2535	< 2.2e-16	< 2.22e-16
	Computer (Yes)	0.2729	< 2.2e-16	< 2.22e-16
	Computer (No)	0.2626	0.0005	0.0005
Knowledge		0.0683	0.0719	
	Male	0.1201	0.0335	0.0671
	Female	0.0687	0.3133	0.3132
	Rural	0.0957	0.3621	0.3621
	Urban	0.0918	0.0233	0.0466
	Computer (Yes)	0.0551	0.4001	0.4001
	Computer (No)	0.1714	0.1098	0.2196
Use		0.0647	0.1133	
	Male	0.0800	0.4556	0.4556
	Female	0.0893	0.0538	0.1076
	Rural	0.1309	0.0464	0.0927
	Urban	0.0596	0.4376	0.4375
	Computer (Yes)	0.0670	0.1443	0.2885
	Computer (No)	0.1457	0.2892	0.2892

Note: The D statistic represents the maximum difference between the observed cumulative distribution and the one expected under the normality hypothesis.
Source: R. Commander 4.3.1.

3.2 Comparative analysis

In the comparative analysis of various variables with their respective demographic and technological groups, several notable findings are observed in Table 3. Methodologically, Welch t-tests and Mann-Whitney tests were conducted to compare mean or rank mean differences between groups for various variables. In terms of content, it's evident that age differs significantly between those who own a computer and those who don't ($p < 0.001$), with those owning a computer being on average older (37.04 years). However, not all variables showed significant differences

between groups, such as age in relation to owning a tablet or smartphone. Attitude, knowledge, and use related to gender, geographical location, and computer ownership mostly did not show significant differences between groups, except for age in relation to owning a smartphone (p = 0.0059).

Table 3. Comparison of attitude, knowledge and use in relation to technologies by different demographic factors

Variable	Group	Type of Test	t/w Value	p-Value	Mean/Median
Age	Computer (Yes)	Welch t	–5.9232	< 0.001***	37.04
	Computer (No)				28.90
	Tablet (Yes)		–0.0327	0.9741	36.04
	Tablet (No)				35.98
	Smartphone (Yes)		2.8378	0.0059**	34.52
	Smartphone (No)				39.23
Attitude	Male	Mann-Whitney	U = 3298.5	0.1029	
	Female				
	Rural		U = 2347.5	0.4695	
	Urban				
	Computer (Yes)		U = 1107.5	0.1003	
	Computer (No)				
Knowledge	Male	Mann-Whitney	U = 2996.5	0.6227	
	Female				
	Rural	Welch t	0.8493	0.3975	39.76
	Urban				38.60
	Computer (Yes)		0.40124	0.6911	38.84
	Computer (No)				39.57
Use	Male	Welch t	1.1573	0.2494	40.93
	Female				39.23
	Rural		1.3926	0.1671	41.35
	Urban				39.26
	Computer (Yes)		–0.78469	0.4393	40.08
	Computer (No)				38.52

Note: t-tests and Mann-Whitney tests indicate the statistical significance of observed differences.
Source: R. Commander 4.3.1.

3.3 Correlation analysis

Using Spearman's correlation method (data with a non-normal distribution), it was found that the relationship between attitude and age yielded a Rho value of 0.1267 with a p-value of 0.1173, indicating a weak and non-significant correlation. The correlation between attitude and knowledge was –0.0138 with a p-value of 0.8634, suggesting a near-zero and non-significant correlation. Attitude and Use showed a Rho of 0.1188 with a p-value of 0.1394, also indicating a weak and non-significant correlation. However, when evaluating the relationship between knowledge and age, a Rho

of –0.1900 with a p-value of 0.0182 was obtained, denoting a negative correlation (i.e., as one variable increases, the other variable tends to decrease, and vice versa) being significant. Age and Use presented a Rho of –0.1121 with a p-value of 0.1661, denoting another weak and non-significant correlation. Finally, using Pearson's correlation method (normally distributed data) for Knowledge and Use, a high correlation value of 0.8282 was obtained with an extremely significant p-value of <2.2e-16, indicating a strong positive relationship between these two variables (refer to Table 4).

Table 4. Spearman and Pearson correlations

Variables	Correlation Method	Rho Value (or Cor)	p-Value
Attitude-Age	Spearman	0.1267	0.1173
Attitude-Knowledge	Spearman	–0.0138	0.8634
Attitude-Use	Spearman	0.1188	0.1394
Knowledge-Age	Spearman	–0.1900	0.0182*
Age-Use	Spearman	–0.1121	0.1661
Knowledge-Use	Pearson	0.8282	<2.2e-16***

Note: The rho (or Cor) value represents the degree and direction of the relationship between the two variables; a value close to 1 or –1 indicates a strong positive or negative relationship, respectively, while a value close to 0 suggests a weak relationship.
Source: R. Commander 4.3.1.

Figure 1 represents the relationship between age and knowledge, showing a main concentration of data at ages 25 to 45 and knowledge levels between 30 and 50. Although the dots are distributed throughout the graph, no clear linear trend is identified, indicating a direct correlation between age and knowledge level. Furthermore, for each age range, a wide variability in knowledge levels is observed, with no obvious signs of outliers.

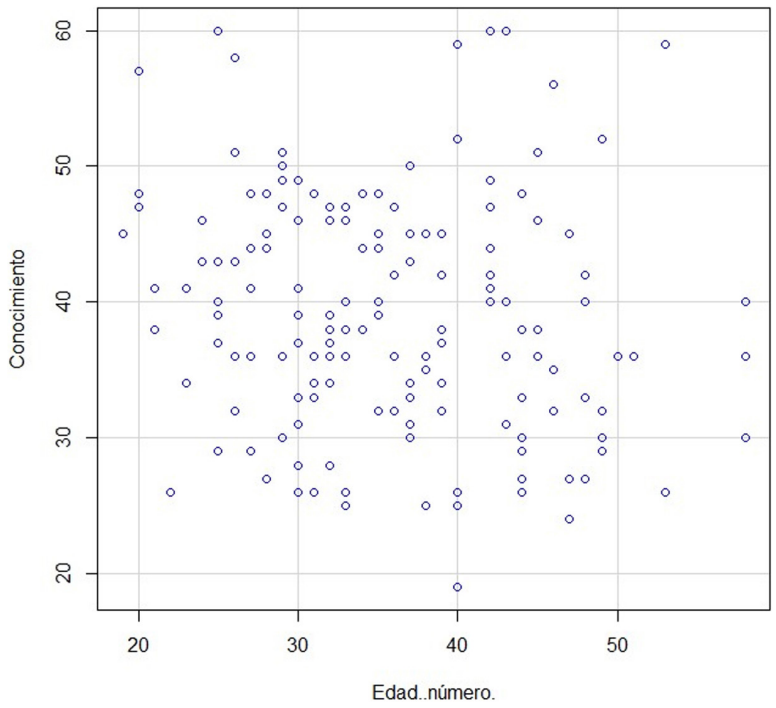

Fig. 1. Results of correlation analysis between the variables Age-Knowledge

Figure 2 shows the relationship between use and knowledge. The points are spread across a wide range of values, although there appears to be a concentration of data between the 30 and 50 values on both axes. The distribution of the points suggests a trend or relationship between the two variables, but a clear line of fit is not observed. This indicates that while there is an association between use and knowledge, the relationship is not perfectly linear or direct. It's possible that other factors may intervene, or the relationship between these two variables might be more complex than what a simple linear correlation could capture.

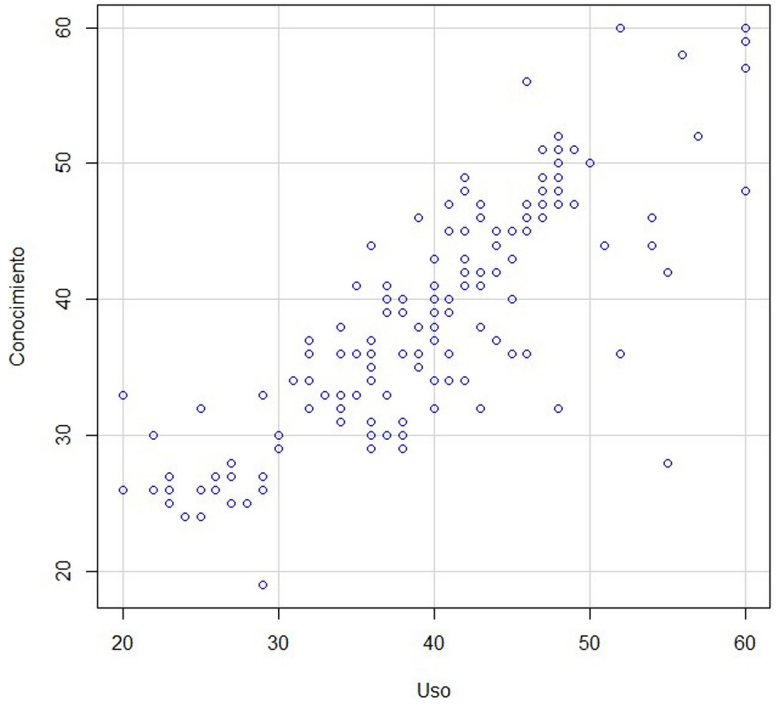

Fig. 2. Results of correlation analysis between the variables Use-Knowledge

4 DISCUSSION

The implementation of digital media in education has been highlighted in both scientific discourses and broader debates, gaining increased importance during and after the COVID-19 pandemic [41]. This situation has underscored the need to develop digital competencies among teachers and students for effective participation in digital learning and teaching ecosystems. Nevertheless, there is a division of opinion among future educators: while some view ICT as developmental opportunities and recognise their potential to enhance student engagement and motivation, others, categorised as techno-pessimists or techno-ignorant, express scepticism about their positive impact [43, 44]. Intriguingly, despite acknowledging the potential of new media, about half of these future educators advocate for banning smartphones during school education. This scenario reflects cognitive dissonance and underscores the complexity of integrating technologies into the educational sphere, highlighting the need for a balanced and thoughtful approach to school modernization [44].

The results of this study showed that the gender variable does not present significant differences between the attitude, knowledge, and use of ICT groups, with p-values > 0.05. In other words, men and women have similar levels of attitude,

knowledge, and use of ICT, at least according to the criteria set by the study. However, other research, such as that of Pedraza and Araiza [45], described those men rate themselves higher than women in competencies such as the management and use of ICT. In contrast, women show greater proficiency in the use of word processing programs. Similarly, there are other studies that corroborate this finding, where it is described that the male gender has a better level of use of ICT [46].

The study conducted by Mohamad Rosman et al. [47] examined the digital competencies of higher education students in Malaysia, focusing on their attitudes, knowledge, and usage of ICT. Through T-Test and ANOVA analyses, it was determined that gender did not significantly influence reference competencies or individual performance. Conversely, both educational level and age were found to have a substantial impact on performance. These findings suggested that education and age are pivotal factors in the development of reference competencies and overall performance, underscoring that the accumulation of knowledge during the study period positively contributes to the enhancement of these competencies [48].

In the study by Casillas et al. [49], aspects related to knowledge, use, and attitude towards ICT were analysed, with the aim of determining whether the gender variable influences these elements. Through the implementation of variance analysis, significant differences based on gender were detected. The results indicate that men achieve higher scores than women in terms of understanding and using ICT. On the other hand, it is observed that women exhibit a positive attitude towards ICT, achieving a higher score in this aspect. In contrast, studies by Romero et al. and Tondeur et al. [50, 51] show that gender does not interfere with the use and handling of information and communication technologies.

The statistical results from independent sample analyses conducted by Casillas et al. [49] concerning the use and service of electronic devices indicate the absence of gender discrepancies. Substantial disparities were detected in multiple sections, primarily in favour of male students, who, unlike female students, exhibit a stronger perception of understanding ICT concepts ($p = 0.000$) and a higher degree of control in their use ($p = 0.007$). Conversely, female students display a favourable disposition towards technologies, which is reflected in a positive attitude ($p = 0.0001$). At the same time, no gender differences were found regarding the use of ICT devices and services. This notion is also shared by Romero et al. [35], where they mention that students particularly value their ability to operate electronic devices.

Regarding the age variable, it also influences inclinations towards the use of ICT, as evidenced in the studies conducted by Cabezas et al. and Romero et al. [35, 36], where it can be deduced that there is a predilection for ICT in individuals over 25 years old. These data differ from the obtained results, as it is shown that there is no correlation between the age and use variables ($p = 0.1661$) or between age and attitude ($p = 0.1173$). However, a relationship was found between age and knowledge about ICT ($p = 0.0182$). Likewise, the age variable significantly diverges between those who own and do not own a computer ($p < 0.001$), with those owning a computer being on average older (37.04 years) and older in relation to the possession of a smartphone ($p = 0.0059$).

The influence of certain factors on the use of ICT has been the subject of research in various studies. Among these factors, Fernández et al. [33] mention that attitudes towards ICT have been especially highlighted as positive. This is corroborated by their statistical results from the Spearman's rho test. These tests revealed statistically significant correlations between the level of competence in using ICT for educational purposes and the application of these technologies for learning objectives. In the study by Iraola-Real et al. (2023) [52] focusing on Peruvian university students, the

research uncovered significant insights regarding digital competencies in higher education, with an emphasis on digital self-efficacy, digital anxiety, and virtual educational performance. It was found that students generally feel competent in using digital tools, indicating a positive attitude and a robust understanding of ICT. However, the study also noted the presence of a sense of insecurity, manifested as digital anxiety, though this does not seem to significantly impact their virtual academic performance.

With reference to the knowledge and use of ICT variables, a high correlation value of 0.8282 was obtained with an extremely significant p-value of <2.2e-16, indicating a strong positive relationship between these two variables. That is, as ICT use increases, knowledge grows. The student forms knowledge in various technological and digital areas, covering everything from basic office tools such as Word and PowerPoint to information search engines like Google and Bing. They become familiar with communication systems, such as email and video conferences, and access digital libraries and databases. They develop skills in multimedia editing programs like Photoshop and Audacity, use educational platforms such as Moodle, handle data analysis software such as SPSS, and access various online educational resources, from translators to learning repositories [37].

The findings derived from the questionnaire deployed within the framework of the study conducted by Aburto [24] reveal statistics that show a percentage of 35% in the category linked to knowledge in handling word processors, ability in operating spreadsheets, and electronic correspondence, as well as proficiency in creating multimedia presentations and competence in the use of online search engines. Although these results cannot be classified as diminished, they display a level that cannot be labelled as low, allowing the inference that students have basic skills in these areas.

The data from the study highlight a strong association between geographical location and access to a stable internet network (p-value 0.0000). This suggests that, depending on whether one is in a rural or urban environment, the opportunity to have a constant Internet connection changes significantly. Similarly, geographical location influences computer ownership and therefore its use for the learning process, being significantly different between areas (p-value 0.0028).

Through the study of Cabero et al. [53], it can be stated that having a computer at home, the availability of an Internet connection in that environment, and owning a laptop influenced the assessments carried out by students at the Autonomous University of Tamaulipas regarding their skills in managing ICT. In other words, facilitating students' interaction with technologies in their residential environment and in their daily routine has an impact on how they perceive themselves as competent in handling these technologies.

In the study by Aburto [24] on attitudes, use, and knowledge of ICT among students at the Autonomous University of Nayarit, it was evident that most of the student population in that programme consists of young people from rural areas who have limited competence in the use of ICT. It is important to highlight that the university welcomes students from different municipalities of the state, which generates a marked heterogeneity in terms of levels of competence, experience, and attitudes towards information and communication technologies.

5 CONCLUSION

In the postmodern era, society faces the challenge of adapting educational excellence through new methodological paradigms, placing the student as the main actor.

Digital technologies have profoundly transformed the work dynamics of educators and the learning process of students. ICTs have proven to be valuable tools for optimising individual and group teaching and promoting bidirectional interaction between teachers and students. However, despite the high level of technological familiarity of current students, the implementation and effective use of ICTs in educational settings still have room for improvement. Full integration of ICTs in education demands an adapted pedagogical approach, greater commitment from teachers, and adequate institutional investment.

The study showed that gender does not imply significant differences in terms of attitude, knowledge, or use of ICTs. On the other hand, age does show an influence on the inclination towards ICTs, particularly in individuals over 25 years of age, but it does not directly correlate with the use or attitude towards these tools. There is a strong relationship between an increase in the use of ICTs and the expansion of knowledge in technological and digital areas. An individual's geographical location, determining whether they live in a rural or urban area, has a direct impact on internet access and the possession of technological devices. These findings highlight the complexity of the relationships between demographic factors and the adoption and competence of information and communication technologies.

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