Active ageing with digital technology: seniors' usages and attitudes

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Abstract. In today's society active ageing involves not only good physical and mental health but also quality of life and well-being, as well as social inclusion. Social participation requires digital technology for which seniors need to have both the material means and the opportunities to use technology and develop attitudes. The aim of this study is to find out about their uses and, especially, attitudes. To this end, a questionnaire including a scale of attitudes towards the use of technology (TAQ), was created, validated and subsequently answered by 182 people in Ibiza (Spain). The results show that just over a third of the participants have digital devices, and that the most frequent uses are to communicate with friends and family and keep informed. As for attitudes towards technology, data show that there are no differences between sexes and that those living with others, of younger ages and with higher levels of education have more positive attitudes. Conclusions reflect on the need to support seniors' digital skills in order to enhance their agency and cultural capital for society.

Keywords: active ageing; digital technologies; digital technology usage; attitudes; Likert scale

1 Introduction

Active ageing is a multidimensional term that includes growing old in good health. However, it also implies being autonomous and fulfilled in everyday life and involved in current society [1]. According to [2], the uptake of the active ageing approach in Europe took place in the late 90s, whereas in the USA it had already achieved popularity as early as the 60s. Its initial approach had rather negative connotations and the aim for active elders was to maintain occupations and acquaintances in middle age, also replacing them with new ones if they had lost touch with previous friends. The next term was coined to focus on the "productive" possibilities of the older population, although once more it implied a rather negative and unrealistic approach, highlighting

abilities for labour production. In the 90s, in particular due to the European Commission [3] and the World Health Organization [4, 5], the term active ageing was revisited by adopting the meaning of a holistic concept of healthy active ageing, referring more generally to quality of life, and physical and mental well-being while at the same time emphasising the importance of social participation and inclusiveness as citizens.

In today's information focussed society, being an active citizen also means participating in the online world, which requires developing digital skills [1]. Despite the importance of these skills, the elderly are reckoned to be those most affected by the digital divide [6], and in fact since early times, research observed how they "self-excluded" from using technology [7]. Against this backdrop, it is necessary to know more about seniors' usage of technology and their attitudes, which support further educational and social policies that are needed to foster digital skills among those who are over 65 years of age.

This study is a contribution to the extension of knowledge regarding the relationship between older people and technology.

The context of our study is the island of Ibiza, in Spain's Balearic archipelago. Other specific aspects, such as a high immigrant population and a very basic level of education as well as other possible factors, can add to the problem described.

Questions. The problem raises a number of questions that need to be answered in order to gain an overview of the situation.

- How much do older people use digital devices?
- What do they use them for?
- What is their attitude towards digital devices and the Internet?
- Are there any attitudinal differences with respect to factors such as age, sex, educational level, origin or place of residence?

Objectives. In accordance with the above, we propose the following general objective:

- Identify the attitudes of elderly people on the island of Ibiza regarding the use of digital devices and the Internet

This general objective gave rise to the following specific objectives:

- Identify the most commonly used internet applications and services
- Find out their attitudes towards the use of ICT
- Analyse possible attitudinal differences based on factors such as sex, age, education level, origin and place of residence

The remainder of this article is as follows: section two introduces the background, including an overview of usages and attitudes of adults highlighting those of seniors. Section three describes the methodology and fourth presents data analysis and results. Then, section five argues the discussion and conclusions, where results are commented under the light of what is known, the aims achieved and the future challenges to face.

2 Background

2.1. Internet users and daily activity

According to the AIMC (Asociación para la Investigación de Medios de Comunicación) report [8], in 2021 in Spain, the Internet was part of everyday life for nearly 88% of the population over 14 years old and 89.9% in the Balearic Island region, with greater impact, on a national level, for those with higher incomes (94.1) living in big cities (88.2%) and in particular, for men (85.7). Likewise, working activity is a relevant variable since 95% of the labour active population are Internet users, whereas the percentage is reduced to 74% for those who are unemployed. In general, the activities with the greatest penetration are: 60% to 70% of the Internet users use it to watch videos and news; social media and e-mail by 70%-79% of users; 80% use it to search for information and nearly the entire population for instant messaging (99%). Other daily activities are online banking (44%), photo and video sharing (42-36%) and shopping (29%).

According to Statista [9] in 2021 the percentage of internet users over 65 represented 5.5 percent of the entire world's digital population, whereas in Spain, and based on the IMC report (2022) [10], internet users between 65 and 74 years old represented 67.3 percent, decreasing to 35.1% for the oldest users (over 74 years old). According to the barometer by UDP [11], of these older users, more than 43% were frequent users of the Internet. A closer profile of these frequent users is described by the following characteristics: men (55%) are more frequent users than women (34%), between 54 and 74 years old rather than older (56% - 31%), with secondary (55%) and higher education (82%), higher (57%) and balanced (37%) incomes and living in big and small (48%- 44%) cities with other members of the family rather than alone (47%-33%). In general, the UDP report [11], sums up that seniors use digital tools for communication activities with family and friends using instant messaging apps (85%) to access information in particular with regard to news (81%) followed by other services such as banking (55%) and health services (52%) as well as videoconferencing (50%). However, the percentage of the population carrying out other activities decreases dramatically among those with lower income and education (administration management and social media). As for sex, men are the most frequent users among those who use the Internet for banking and administration management and women for social and communication purposes, and the same pattern is seen among those both younger and those older than 74. Additionally, the higher the level of education and wealth, the greater variety of activities. The following table summarises the most common profile of Internet users within both the general and senior population:

Table 1. Most frequent Internet user profile based on IMC and Statista 2022 reports (general population and senior population)

	Internet users	Sex	Main Usages	Income	Context
Population +14 (IMC Report 2021)	88%	Men (85.7)	Instant messaging (99%), search information (80%)	Higher incomes (94.1)	Living in big cities (88.2%)
Seniors 65-74 and +74 (Statisca, 2021)	67.3% (65 - 74) and 35.1% (+74).	Men (55%)	Instant messaging apps (85%) to access information in particular with regard to news (81%)	Higher (57%)	Living in big and small cities (48%-44%)

In the UDP (Unión Democrática de Pensionistas y Jubilados de España) report [11], among the non-users, the main reasons for not using the Internet are the lack of skills and the lack of interest followed by not owning devices or not having an Internet connection at home, or not having help from others. Interestingly, men justify their lack of digital habits with greater frequency due to lack of help while for women it is due to the lack of hardware and access. As for the perception of difficulties, administration (26%), health (16%) and banking (14%) management along with shopping (13%) are the activities that present greatest difficulties for senior citizens, whereas social media (10%), reading and information access (8%) and, instant messaging (1%) are the easiest for the vast majority of them. Studies from very different cultural contexts allow inferring similar patterns. For example, in Japan, results by Kwong [12] show that senior citizens access the Internet mainly to read news (83%) and for communication purposes (77.4%), and the reasons for not using the internet were mainly motivational along with the lack of devices, skills and usage opportunities.

2.2. The elderly's skills and attitudes towards active ageing

In general, it has been claimed that senior citizens value ICT (Information and Communication Technology), as it plays an important role for them to communicate with family and friends, searching for and accessing information, everyday life and to fulfil the needs derived from hobbies [13, 14]. Although there are studies suggesting a similar pattern of technology acceptance between younger and more senior adults, research has demonstrated that older people need greater assistance, encouragement and friendly interfaces [15]. Menéndez Álvarez-Dardet et al. [14] added that senior citizens use ICT to a lesser extent, for banking management and e-commerce.

Additionally, these authors showed the existence of three profiles corresponding to usage: active with high frequency and variety of use, and moderate (frequent usage but in less variety) and low users (low frequency and variety of use). Furthermore, they showed the existence of positive attitudes towards technology by senior citizens with an active profile, whereas those with moderate and low user profile showed negative attitudes [14]. Such negative attitudes have been observed as barriers for technology adoption and negative feelings such as fears, anxiety and demotivation have been observed in research [16] along with perception of having low levels of skills [17]. Going beyond the positive and negative simplistic descriptions, attitudes have been correlated with other variables and it was observed that the greater the self-perception as a competent user and the perception of usefulness for daily life, the more positive the attitude [14].

Early research was based on rather simple binary studies in which access was measured in terms of having or not having digital devices [18]. Olsson [18] states that recent studies include a wider variety of variables so senior's access can be described with more nuances. Furthermore, Olsson claims that in the case of senior citizens it is evident that ICT access and literacy cannot only be explained because of age constraints, but related to resources, supportive social relationships and intellectual resources.

In his study in Sweden, Olsson [18] explores senior citizen's access to digital technologies and observed a positive correlation with three of the aforementioned axes: greater resources such as income levels, greater intellectual skills and, to a lesser extent, social relationships. Gender seems not to be directly related to access but to a small extent correlated with digital literacies, whereas age has a clear negative correlation, meaning that the elderly have both less access and literacies [18].

Regarding mobile technology, there are a growing number of older people who own a mobile phone, but this fact is rather controversial. On the one hand, it has been claimed that these devices are being adopted more frequently by the elderly than regular computers but it has also been stated that only a small number of the elderly own a smartphone [19]. Klimova [19] lists the apps that might answer the needs of older people as follows: apps that keep the phone simpler and safer, healthcare, and entertainment and education for cognitive enhancement. Research by Fernández-Lores et al. (2021) [20] proves that seniors use mobile apps if they recognise their ease of use and usefulness, along with positive self-perceptions of their own skills and confidence. Furthermore, research in the context of China has evidenced that there is a greater mobile technology acceptance among younger and more highly educated seniors, those living with a partner as well as those with a higher income[21].

Older groups tend to approximate digital technologies based on their previous media experience, which they developed in their youth. Research has observed the strategies the elderly adopt with joy when discovering new affordances and, for example, [22] reports how writing becomes quicker and easier without the need to plan before starting writing since using computers helps in the drafting process, which facilitates rewriting and amending.. Building on Bordieu's terms, Schäffer [22] distinguishes the cognitive strategies to adopt digital technologies by senior citizens, being different to those for "incorporation and habituation" (p. 37) [22] of young

people. In contrast, seniors carry out "a method of laborious cognitive visualisation" (p. 37) [22], which observes the intellectual efforts that the elderly make to understand and use digital technologies.

Digital technologies can have an impact on older people's health and well-being (Vale et al., 2018a) [23]. On the one hand, there are studies that observe the usage for health aims, and conclusions by [24] show that ICT are used for self-care activities and their use mainly focused on mobile devices, motion sensors, and cloud applications [24]. On the other hand, technology has been addressed in terms of well-being and there are diverse lines of research. For example, it has been used to address loneliness among the elderly which is related to depression and less satisfaction with their way of living. Research by Zhang et al. (2022) [25] showed that Chinese senior citizens' self-efficacy beliefs and health awareness improved their communication and information usages of ICT, which, in turn, helped to mitigate loneliness [25]. Additionally, the lack of abilities has been related to negative emotions and Kwong [12] observed that some of the elderly mentioned feeling nervous, panicked, and stressed because they could not use digital devices. Furthermore, there is a strand of research that focuses on the emotional aspects and how game-based learning can also support active ageing and healthy senior citizen's lifestyle by fostering positive emotions among other aspects [24]. In this regard, although previous research has mainly focused on illness prevention and rehabilitation in game-based learning research, a positive impact has been observed regarding the general well-being shown by elderly gamers in contrast to non-gamers [26].

3 Methodology

The proposed study has a quantitative, descriptive, and in the second part, correlational perspective. The data were obtained through a questionnaire, the analysis of which was carried out with the SPSS 28 program. We used the statistical package R, version 4.2.0, to check the consistency of the second part of the questionnaire (which we will focus on later).

The tool was designed ad hoc and divided into two blocks, one about the use of devices and the internet and the other related to attitudes about ICT and the internet. The usage section was intended to be extensive, so it included different devices along with a wide range of usages considering access, content creation and sharing and collaborating with others. The first version was tested on a group of six senior users with whom language clarity was adapted to target users. A content validation process was followed by means of the International Panel on Educational Technology Research (PI2TE) <http://panel.edutec.es/index.php/pi2te/Pi2TE>. A total of 10 experts were relied on for this purpose.

Once the pertinent content changes suggested by the experts had been added, the final questionnaire remained structured in the initial blocks (if we exclude profile data): uses of devices and services, and attitudes towards technology. We include here a link

to access the questionnaire in its original version: https://doi.org/10.5281/zenodo.7456313

With regards to the second block, a Likert scale focused on attitudes, which we called the Technology Attitude Questionnaire (TAQ), initially consisted of 14 items with five response options, between total disagreement and total agreement, about phrases related to the use of technology.

Considering the difficulties in obtaining a truly representative sample of the population under study, we focused on senior citizens associations throughout the island. This would ensure, at least, that all population groups were included.

However, the only way to obtain as many questionnaires as possible and with the greatest reliability was to go to each centre and administer the questionnaire in person. Returning to the data collection tool and considering the importance we gave to the attitudinal aspects of our study, once the survey was provided, a psychometric analysis of the TAQ questionnaire was performed, having been created for specifically for that purpose, to check the consistency of the instrument, since a preliminary analysis of each item seemed to show a tendency towards neutral responses. To do this, a confirmatory factor analysis using the lavaan package of the R program was performed. Since the complete normality of the items could not be ensured (both univariate normality and multivariate normality are required), the Maximum Likelihood Robust ("MLR") method was used. The analytical strategy begins by testing a uni-factorial model in which the 14 items are saturated. For this, the most used items in the factorial analysis models were used: χ^2(Root Mean Squared Error of Approximation), CFI (Comparative Fit Index) and SRMR (Standardized Root Mean Square of Residuals). Using these criteria, if we analyse the adjustment indices of the model that hypothesises a factor for the 14 items of the questionnaire, we see that χ^2=169,081 is significant (p<.001), that RMSEA is clearly above 0.05 since it obtains a value of 0.081 (with confidence interval between 0.068 and 0.094), that the CFI is worth 0.73, and that SRMR is worth 0.096; all of them indicative of maladjustment. Therefore, it means that there are some items that present inaccurate psychometric behaviour.

Turning to the factor saturations, we see that items 2, 6, 7 and 13 are not significant, that is, they do not have an association with the attitude factor and can be eliminated from the structure. It should be noted that items 2 and 6 have inverted content (I am angry, I have no control), which may have affected their inaccurate behaviour.

If we repeat the previous process to re-estimate the model, eliminating these 4 items, we see that, although it has decreased, χ2=68.46 remains significant (p=.001), that RMSEA is slightly above 0.05 since it obtains a value of 0.072 (with confidence interval between 0.052 and 0.093), that the CFI is worth 0.88, and that SRMR is worth 0.074; all of them indicative of maladjustment, except SRMR. The deletion of these items greatly improved the adjustment though it could not yet be considered a well-adjusted model.

If we look at the analysis of the factor saturations obtained, we can see that, indeed, all of them are significant and, therefore, not to be eliminated. However, if we look at the value of each saturation, item 3 obtains a low value (0.38), which may be indicating an insufficiently accurate relationship. It was reasonable to assume that item 3 also contained inverted content, so it was also deleted.

We also deleted item 3 to see if it would finally result in a well-adjusted model where each item's saturation is significant and of relevant weight. To do this, we repeated the analytical scheme of confirmatory analysis employed to adjust the previous models, using the R program's lavaan package.

Analysing the adjustment rates of this second reduced model (eliminating items 2, 3, 6, 7 and 13), we saw a significant decrease of $\chi 2=37.44$, and which is not significant ($p=.087$), that RMSEA was clearly below 0.05 because it obtained a value of 0.046 (with a confidence interval between 0.007 and 0.072), including the value 0.05, and with a non-significant p value ($p=0.569$); that the CFI was 0.958, and that SRMR was 0.054; all of them indicative of being well-adjusted. The results indicated that the uni-factorial model composed of 9 items was accurately adjusted.

Once we checked the adjustment of the model, we analysed the factor saturations obtained by each item, and found that all of them were indeed significant ($p<.001$), and therefore, not to be eliminated. All were found to have adequate saturation values ranging from 0.48 to 0.76.

The reliability of the structure was then estimated using the ordinal alpha, omega (ω), Bentler's omega (ωB), and hierarchical omega (ωH) indices, obtaining the following values

- Alpha: 0.82
- Omega: 0.83
- Omega2: 0.83
- Omega3: 0.83

The values of the reliability coefficients obtained were above 0.80 in all cases, presenting an accurate psychometric behaviour.

The final analysis was carried out omitting the answers for items 2, 3, 6, 7 and 13, leaving the TAQ questionnaire, made up of 9 items.

4 Results

4.1 Uses of Technology and Internet Services

A total of 182 questionnaires were obtained, distributed almost identically, considering the gender variable (49.7% of men and 50.3% of women).

As for the level of education, the majority had a low level of formal education, with more than half having only completed primary education (52.8%), and about a third (29%) saying they received no education. About 10% completed secondary school, and only 4.5% received tertiary education.

To better understand the profile of the respondents, they were asked a series of questions related to the devices they used and what they used them for.

Of the total number of subjects, approximately half had an Internet connection, 48.7%, compared to 51.3% who say they do not have access to the Internet. The differences between men and women were minimal.

The number of respondents with a computer is a little lower, 35.7%, against 64.3% who said they do not have one. It is noteworthy that, within this group, the percentage of men with computers (43.8%) is almost double that of women (27.8%).
When asked if they had mobile devices (tablet or smartphone), just over a third (35.2%) said they had a smartphone, although only 18% said they had a tablet. In both cases, the differences between men and women were very small.

Online news media was the most widely used resource for accessing information on the Internet among respondents, with approximately one third (34%) saying they use this resource assiduously (almost always or always). The next preference is to use the Internet, in a non-specific way, to stay informed (almost 30%). As for blogs, forums, social media networks or microblogging, the use is minimal.

Just over half use the Internet to communicate, (57%), keeping in contact with family being the most frequently cited reason (37.6%).

With regard to the use of the Internet to purchase goods or services, the use is minimal. Only the purchase of airline tickets stands out, although still in quite a low percentage, with about a third of respondents using it for that purpose with a certain frequency (32%). It should be noted that almost 60% require help to make purchases online. It is also striking that men need help to a lesser extent than women (43%, compared with 76%).

In line with the above, the subscription to information or document sharing services is practically non-existent. The only exception is found in certain social media services such as Facebook or Instagram, although not in very high numbers, with about 20% having an account that they use with some frequency, and women being a little more active than men (26%, compared to 15%).

Only 15% use computers frequently to create documents, with a much more pronounced use by the male population (22%, compared to 8% for women).
The most used device to keep informed is the computer, with almost 28% of the population, followed by the mobile device, with 16%. Almost 45% of respondents do not use the Internet to find information. Almost 25% of respondents said they use a computer almost exclusively to make purchases (the remaining 75% do not buy anything online).

It should be noted that almost 60% use a mobile phone app to communicate (mainly, Whatsapp), with no difference in this regard between men and women. On the other hand, more than a third (36%) use mobile phones to listen to the radio, a similar percentage listen to music on a phone (31%). And most use some photo or video app (61.5%). Health apps are only used by 16.5%.

Among those who use the Internet for commercial purposes, the purchase of airline tickets stands out (32%), to a lesser extent the booking of hotels (16%) and banking (24.3%).

Lastly, it should be noted that, for the most part, they learn to use the devices and different services with the help of the youngest members of the family (53.6%), this is more so the case with women (64%, compared to 43% for men). This could be due in

part to the fact that men report learning autonomously to a much greater extent than women (26%, compared to 6%).

4.2 Attitudes towards the use of technology

First, we will briefly describe the results obtained after applying the TAQ scale. It should be remembered that items 2, 3, 6, 7 and 13 were deleted, as they were not consistent.

In item 1, "I have fun using technology", almost half of the respondents are in a medium position (44%), although, just over a quarter are in total agreement (26%) (Fig. 1)

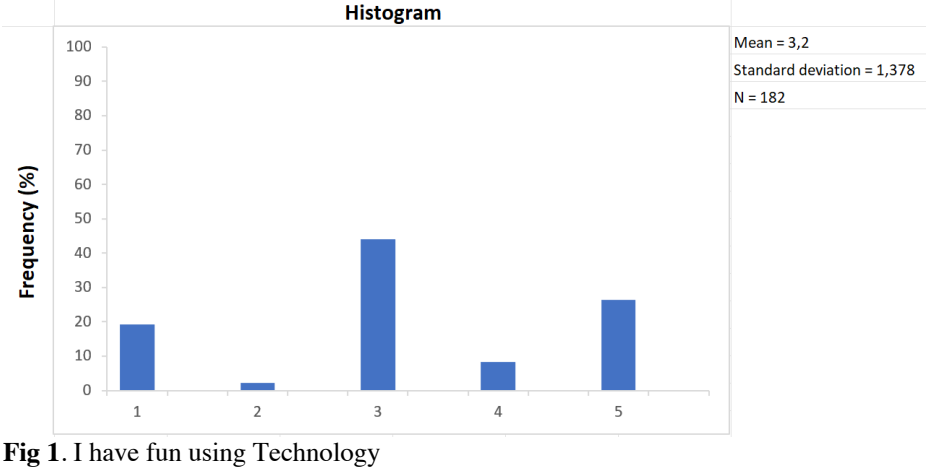

Fig 1. I have fun using Technology

Regarding item 4, "Using ICT is pleasant", the distribution of responses is quite similar with around half of the subjects (55%) expressing indifference and around a fifth (21%) in total agreement with the assertion (Fig. 2)

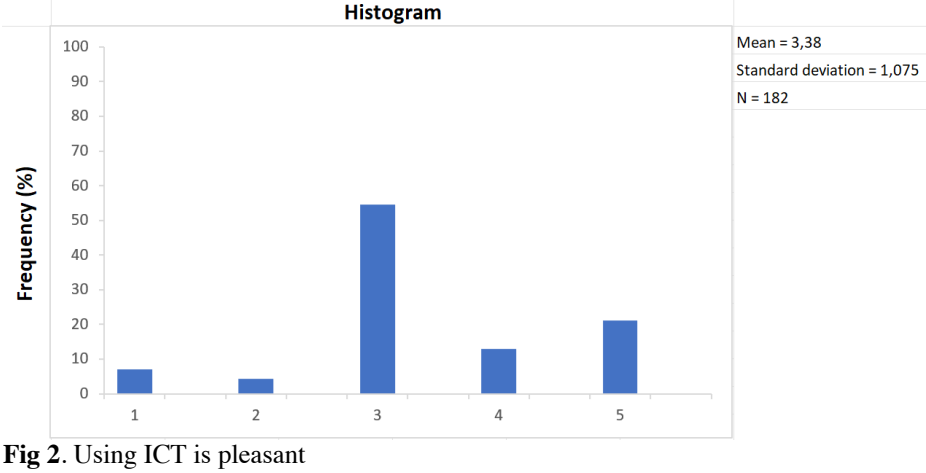

Fig 2. Using ICT is pleasant

Regarding the fifth item, "When I use ICT, I freely choose what to do or see", the number of subjects who opt for the medium option (indifferent) is even greater (69%), while approximately one fifth (19%) expressing total agreement (Fig. 3)

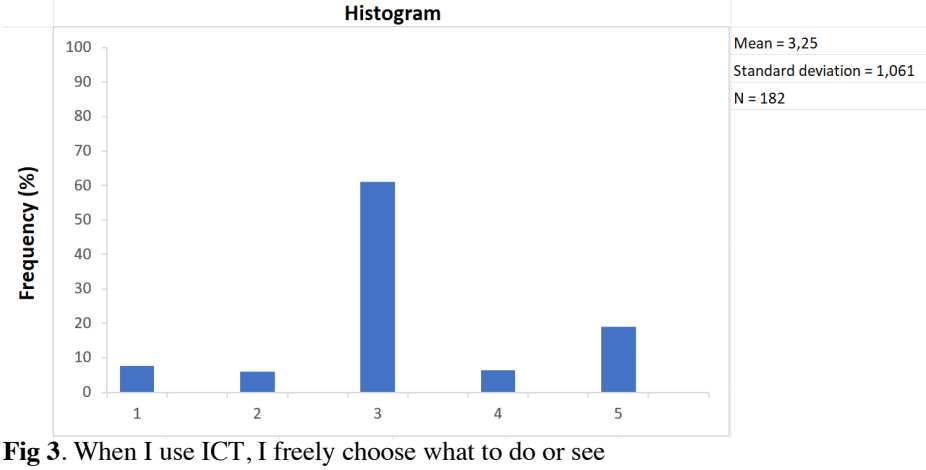

Fig 3. When I use ICT, I freely choose what to do or see

Item 8, responses to the statement "Time passes quickly when I use ICT", are very similar to the previous item, with about 70% of the subjects indicating indifference and the same percent saying they completely agree with the statement (Fig. 4)

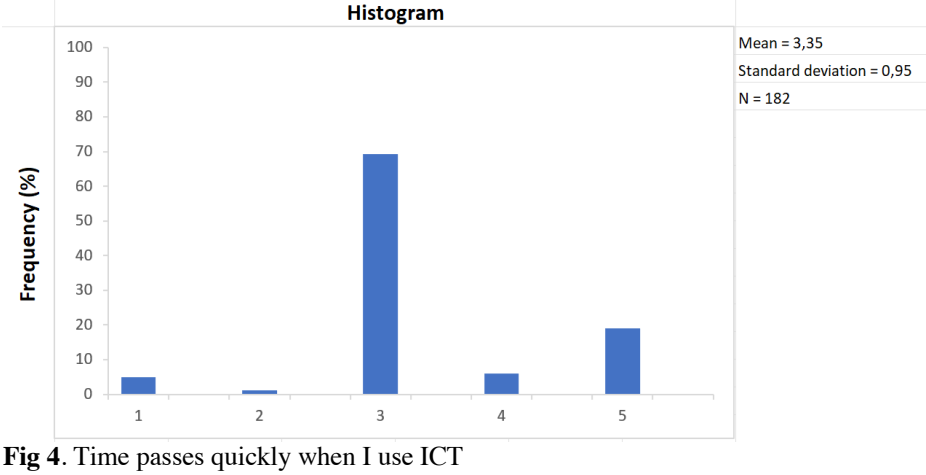

Fig 4. Time passes quickly when I use ICT

Responses to the ninth item, "Using ICT sparks my curiosity" were somewhat more dispersed. In this case, about half of the subjects (47.5%) sit in the medium range, although about a fifth (20.5%) said they totally disagree and about 28% said they quite agree or totally agree (Fig. 5).

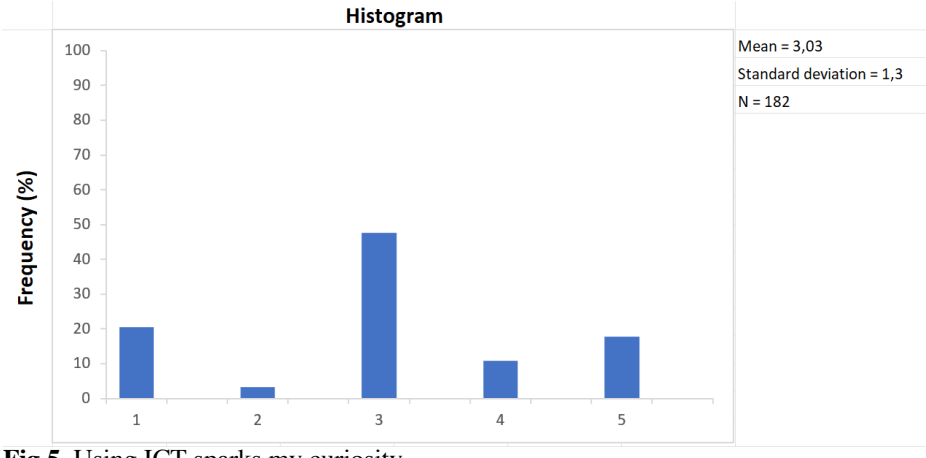

Fig 5. Using ICT sparks my curiosity

More than half of respondents (54%) were in the medium range of agreement with the statement in item 10, "I think ICT is easy to use", while about 28% said they agreed or totally agreed with the statement (Fig. 6).

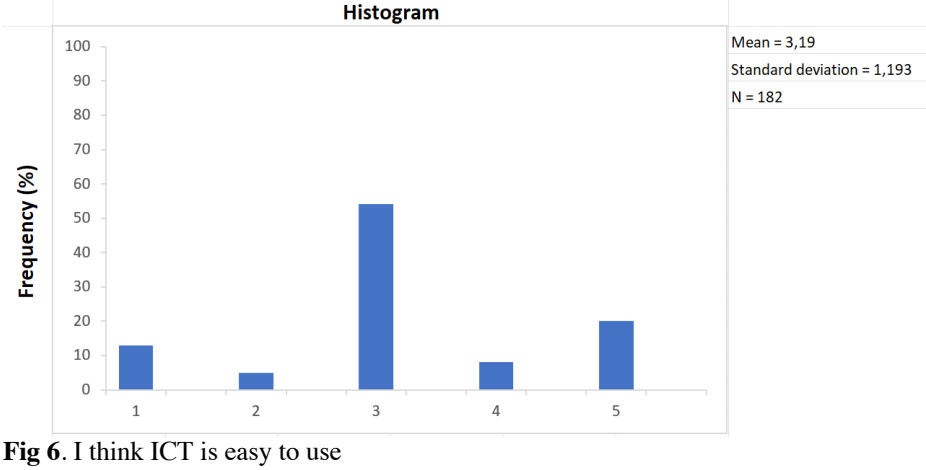

Fig 6. I think ICT is easy to use

Regarding the eleventh item, "Using ICT reduces my stress", the vast majority of subjects expressed indifference, accounting for almost three quarters of responses (71.3%) (Fig. 7).

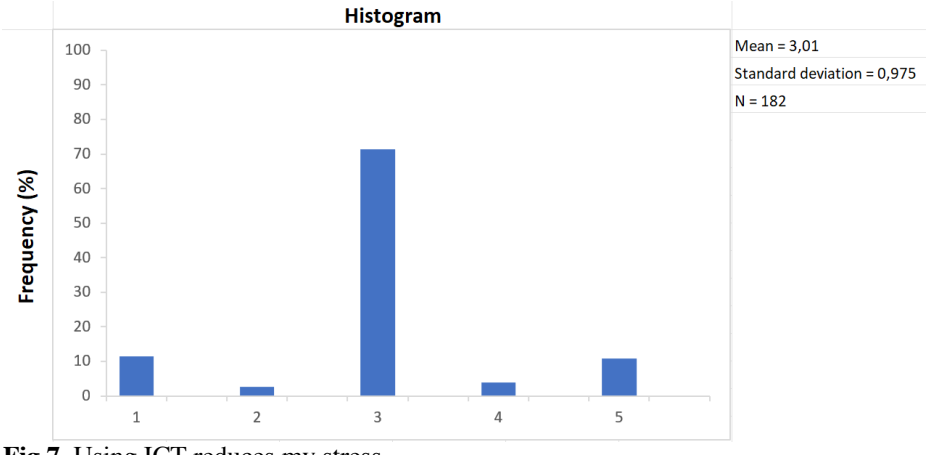

Fig 7. Using ICT reduces my stress

Item 12, "Using ICT helps me pass the time", had a similar behaviour. The choice of the medium position in relation to this statement was somewhat lower (68.1%); however, a little more than a fifth (22.6%), said they quite or totally agreed with the statement (Fig. 8)

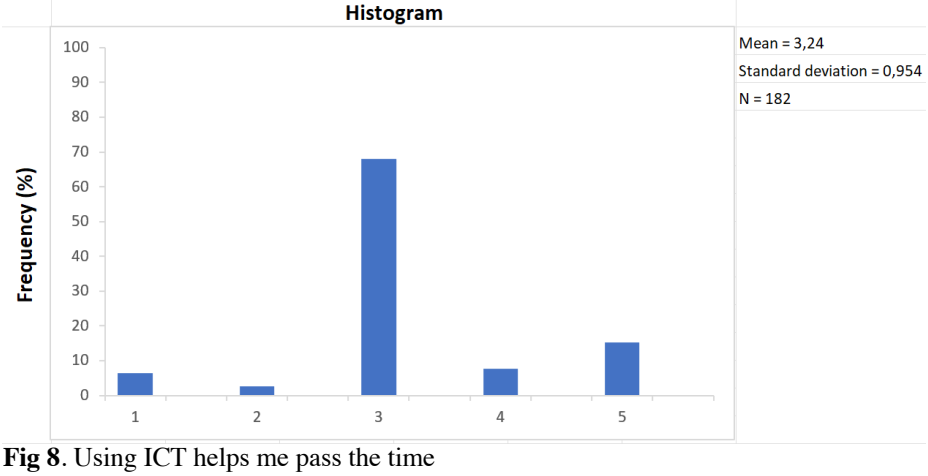

Fig 8. Using ICT helps me pass the time

The last item, "I hope to continue using ICT in the future", was more polarising: just over half of the answers (54%), somewhat or totally disagreed but about 35% gave a favourable or very favourable response (Fig. 9).

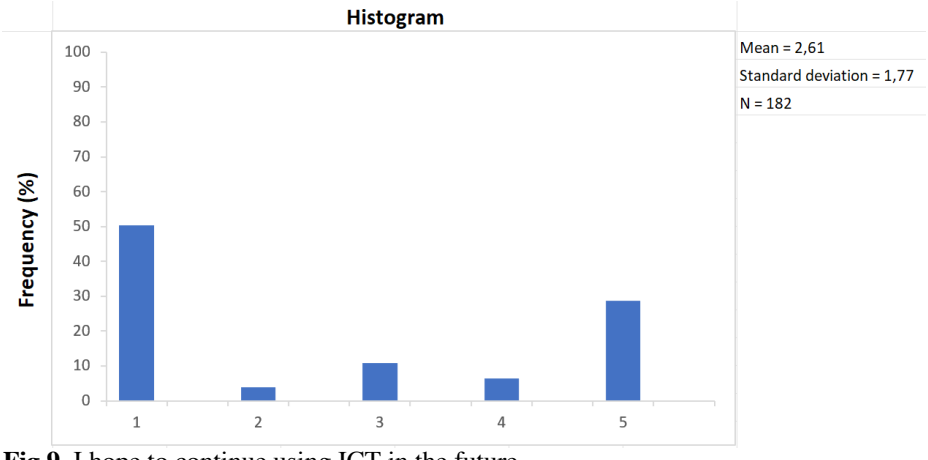

Fig 9. I hope to continue using ICT in the future

A deeper statistical analysis reveals that the average total score in terms of the attitude towards the use of technology is 28.26 points, taking into account that the range of the variable can go from a minimum score of 9 points to the maximum of 45 points. If we divide by 9, we get the average value on a scale of 1 to 5 (3.14). The mean value in the reference population of the sample, with a 95% probability of correcting, was between 27.23 and 29.29 points. The median was 26.00, so there may be a slight deviation from normal. Regarding variability, the standard deviation was 7.03 points (variance=49.44). The interquartile range was 8 points. Finally, the asymmetry and kurtosis indices indicate:

- Asymmetry: $.401 \pm 2 \cdot .180 \rightarrow [.041;.761]$
- Alignment: $.190 \pm 2 \cdot .358 \rightarrow [-.526;.906]$

In the case of asymmetry, there is a very slight positive asymmetry, since the 0 is not included in the range and the two limits are positive. Regarding alignment, the variable at the population level was normal, since zero is included in the confidence interval. Analysing both results together, the deviation from normal was small enough so that parametric tests were not affected in the estimates of the differential analyses to be undertaken. In any case, robust Brown-Forsythe and Welch corrections were provided to properly handle strict non-compliance with normality.

Applying the normality test considered most appropriate (in this case Kolmogorov-Smirnov, with Lilliefors correction) (Table 2), we can see that the distribution was not strictly normal, as already indicated by the specific asymmetry and alignment tests:

Table 2. Kolmogorov-Smirnov normality test, with Lilliefors correction.

TECAC_ALL	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	gl	Sig.	Statistic	gl	Sig.
	.175	182	.000	.940	182	.000

a. Lilliefors Significance Correction

The histogram that we can see in Fig. 10 shows the distribution of responses in the total attitude score in the sample, in which a significant number of responses are observed in the central part, reflecting the choice of medium scores on the items' response scale.

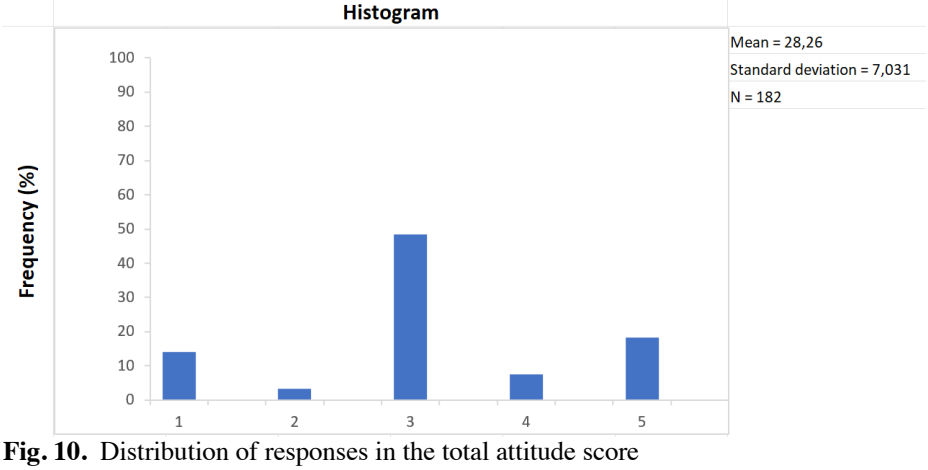

Fig. 10. Distribution of responses in the total attitude score

The boxplot (Fig. 11) shows the positive asymmetry indicated by the indices, both in the central box (50% central of the data; median shifted to the left) and at the ends (longer on the right side of the graph).

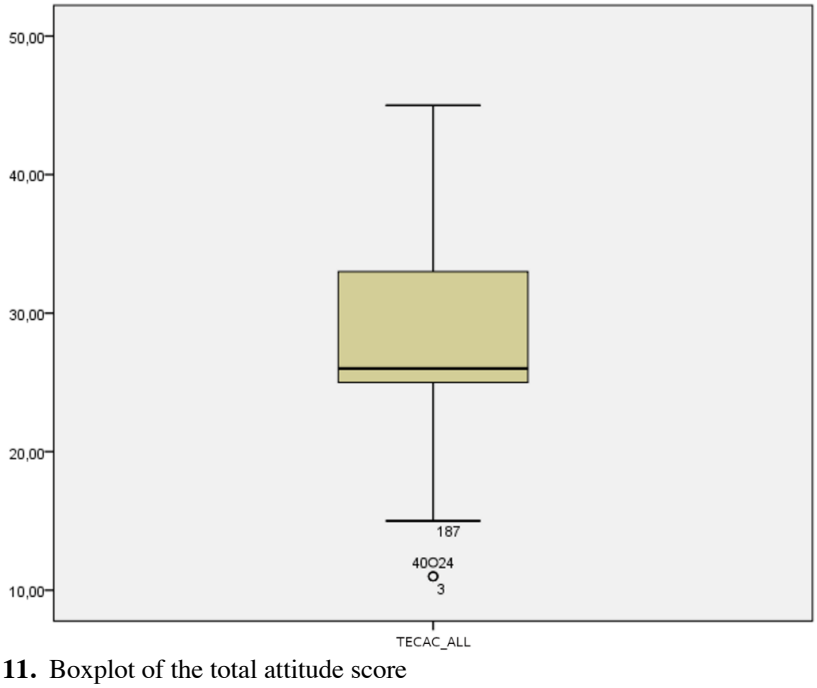

Fig. 11. Boxplot of the total attitude score

Below, we see the differential analyses of the variables Sex, Age Groups, Level of studies, and Status, with respect to the total score in attitude.

4.2.1. Sex

The average for men was 28.15 and the average for women was 28.36. The mean difference test for independent samples was not significant (t=-.200, gl=180, p=.842). In this case, the line "Equal variances" was analysed because the Levene test (equality of variances) was not significant (p=.990). In conclusion, there were no significant differences between men and women in attitudes to the use of technology (Table 3).

Table 3. Sex independent sample test

		Levene's Equal Variance Test		t test for the equality of means						
		F	Sig.	t	gl	p	Diff. of means	Standard Error Diff.	95% IC of the difference Below	Above
TECAC_ALL	Equal variances	.000	.990	-.200	180	.842	-.209	1,045	-2.271	1.854
	Unequal variances			-.200	179.88	.842	-.209	1,045	-2.271	1.854

4.2.2. Age group

Table 4. Age group descriptive statistics

TECAC_ALL	N	Mean	Standard deviation	Standard error	95% confidence interval for mean Lower Limit	Upper Limit	Minimum	Maximum
65-69 years	29	32.17	7.036	1.31	29.50	34.85	19.00	44.00
70-74 years	38	29.55	8,60	1.34	26,72	32.38	11.00	45.00
75-79 years	42	28.77	7.02	1.084	26.58	30.95	15.00	45.00

80 or older	73	25.74	5,04	.594	24.574	26.92	11.00	41.00
Total	182	28.26	7.03	.524	27.23	29.29	11.00	45.00

Table 4 shows the means of the attitude score by age group, with the 65-69 year-old group being the most favourable (32.17), followed by the 70-74 group (29.55), the 75-79 group (28.76), with the least favourable being the group of 80 or more, with 25.7397. Following this we can see if there are statistically significant differences or not.

Table 5. Age group homogeneity of variances test

TECAC_ALL			
Levene's statistic	gl1	gl2	Sig.
6.573	3	178	.000

Levene's test (Table 5) analysed whether or not the variances of the 4 groups are equal. The test was significant, and therefore unequal variances are assumed. For the a posteriori tests, Dunnett's T3 statistical test will be analysed (Table 6).

Table 6. ANOVA Age group

TECAC_ALL			Sum of squares	gl	Root mean square	F	Sig.
Between groups	(Combined)		981.656	3	327.219	7.311	.000
	Linear term	Unweighted	834.218	1	834.218	18.638	.000
		Weighted	944.497	1	944.497	21.102	.000
		Deviation	37.159	2	18.579	.415	.661
Within groups			7967.207	178	44.760		
Total			8948.863	181			

The F test, which contrasts if at least the means of a pair of groups are different, was significant (F=7.311, gl=3.178, p<.001), as was the linear trend of decreasing scores (F=21.102, gl=1.181, p<.001). That is to say, there were some means that differed significantly; to detect such differences it is necessary to analyse the tests a posteriori. But before that, let's look at what Welch and Brown-Forsythe's robust evidence concludes (Table 7):

Table 7. Age group robust equality of means test

TECAC_ALL	Statistic[a]	gl1	gl2	Sig.
Welch	8.259	3	73.593	.000
Brown-Forsythe	6.411	3	121.989	.000

a. Asymptotically distributed F

Both tests also confirm the existence of statistically significant differences, with a probability value lower than a .001.

Table 8. Post hoc testing. Age Group multiple comparisons

Dependent variable:							
	(I) Age group	(J) Age group	Mean difference (I-J)	Standard error	Sig.	95% confidence interval	
						Lower Limit	Upper Limit
T3 Dunnett	65-69 years	70-74 years	2.61978	1.90978	.675	-2.5554	7.7950
		75-79 years	3.41051	1.69664	.255	-1.1970	8.0180
		80 or older	6.43269*	1.43276	.000	2.4781	10.3873
	70-74 years	65-69 years	-2.61978	1.90978	.675	-7.7950	2.5554
		75-79 years	.79073	1.76541	.998	-3.9795	5.5609
		80 or older	3.81291	1.51356	.085	-.3225	7.9483
	75-79 years	65-69 years	-3,41051	1.69664	.255	-8.0180	1.1970
		70-74 years	-.79073	1.76541	.998	-5.5609	3.9795
		80 or older	3.02218	1.23377	.096	-.3196	6.3640
	80 or older	65-69 years	-.6,43269*	1.43276	.000	-10.3873	-2.4781
		70-74 years	-3.81291	1.51356	.085	-7.9483	.3225
		75-79 years	-3.02218	1.23377	.096	-6.3640	.3196

*. The difference in means is significant at the 0.05 level.

Dunnett's T3 test (Table 8), applied to unequal variances, only detected significant differences between the attitudinal means of the groups 65-69 and 80 or older

(difference=6.43269, p<.001), while there were no differences between any of the other comparisons.

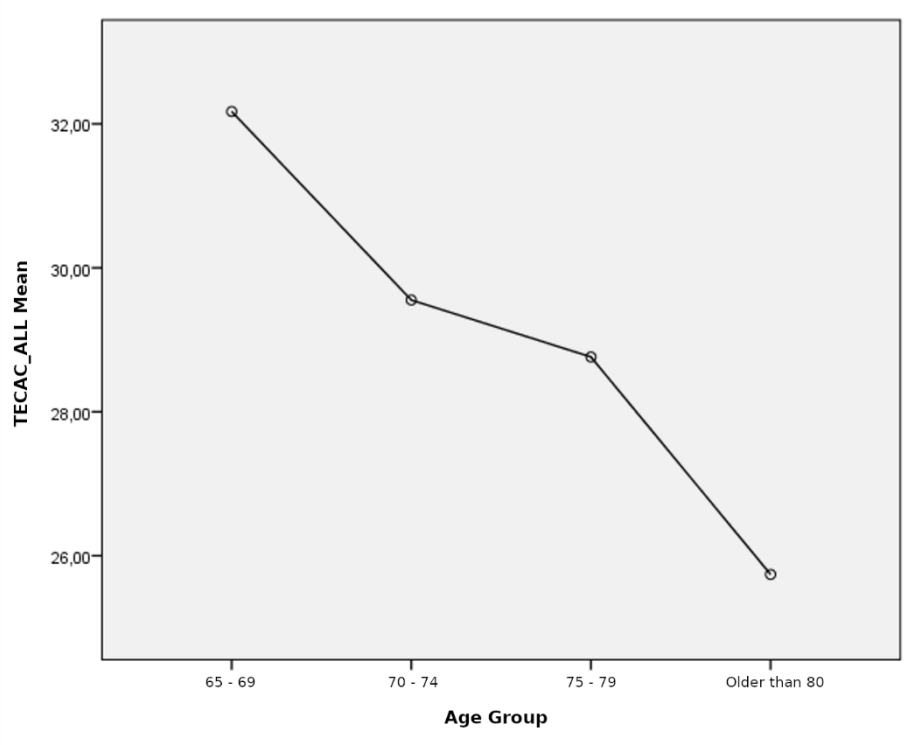

Fig. 12. Mean graph in attitude per age group

Although the graph (Fig. 12) clearly shows the decreasing linear trend, do not be fooled by the view, since statistically, there is only significant difference between the extreme groups (younger and older), but not between the rest. The trend seems clear, a worse attitude as age increases.

4.2.3. Education level

We will proceed in the same way with the variable education level. First, with the descriptive statistics (Table 9) to check if there were significant differences (Table 10)

Table 9. Education level descriptive statistics

TECAC_ALL	N	Mean	Standard deviation	Standard error	95% confidence interval for mean		Minimum	Maximum
					Lower Limit	Upper Limit		
1 No education	54	25.33	4.86807	.66246	24.0046	26.6621	11.00	38.00
2 Primary education	93	28.65	7.35386	.76256	27.1307	30.1597	11.00	44.00
3 Secondary education	20	31.85	6.89985	1.54285	28.6208	35.0792	24.00	45.00
4 Vocational training (PT)	6	33.83	7.83369	3.19809	25.6124	42.0543	25.00	45.00
5 University education	9	30.11	8.32833	2.77611	23.7094	36.5128	15.00	40.00
Total	182	28.26	7.03145	.52121	27.2298	29.2867	11.00	45.00

Table 10. Education level homogeneity of variances test

Levene's statistic	gl1	gl2	Sig.
5.274	4	177	.000

As can be seen, the equality of variances is not assumed, so Dunnett's T3 test will be applied (Table 11).

Table 11. ANOVA Education level

TECAC_ALL			Sum of squares	gl	Root mean square	F	Sig.
Between groups	(Combined)		951.300	4	237.825	5.263	.000
	Linear term	Unweighted	312.352	1	312.352	6.913	.009
		Weighted	672.063	1	672.063	14.874	.000

	Deviation	279.237	3	93.079	2.060	.107
Within groups		7997.563	177	45.184		
Total		8948.863	181			

The ANOVA was significant, both for the study level factor (F=5.263, gl=4.177, p<.001) and for the linear trend (F=14.874, gl=1.181, p<.001).

Table 12. Education level robust equality of means test

TECAC_ALL	Statistic[a]	gl1	gl2	Sig.
Welch	5.891	4	22.066	.002
Brown-Forsythe	4.514	4	32.782	.005
a. Asymptotically distributed F				

Robust testing (Table 12) confirmed the existence of significant differences between the means (at least between some pairs of means).

Below is the table of ex post comparisons (Table 13) between all educational levels regarding variable attitudes to the use of technology:

Table 13. Post hoc testing. Education level multiple comparisons

	(I) Education	(J) Education	Mean difference (I-J)	Standard error	Sig.	95% confidence interval	
						Lower Limit	Upper Limit
T3 Dunnett	No education	Primary education	-3.31183*	1.01012	.013	-6.1821	-.4416
		Secondary education	-6.51667*	1.67906	.006	-11.6125	-1.4209
		Vocational training	-8.50000	3.26598	.258	-22.0925	5.0925
		University education	-4.77778	2.85406	.643	-14.9328	5.3773
	Primary education	No education	3.31183*	1.01012	.013	.4416	6.1821
		Secondary education	-3.20484	1.72101	.497	-8.3884	1.9787

		Vocational training	-5.18817	3.28775	.703	-18.7273	8.3510
		University education	-1.46595	2.87894	1.000	-11.6253	8.6934
	Secondary education	No education	6.51667*	1.67906	.006	1.4209	11.6125
		Primary education	3.20484	1.72101	.497	-1.9787	8.3884
		Vocational training	-1.98333	3.55080	.999	-15.2211	11.2544
		University education	1.73889	3.17603	1.000	-8.7164	12.1942
	Vocational training	No education	8.50000	3.26598	.258	-5.0925	22.0925
		Primary education	5.18817	3.28775	.703	-8.3510	18.7273
		Secondary education	1.98333	3.55080	.999	-11.2544	15.2211
		University education	3.72222	4.23492	.984	-10.5907	18.0352
	University education	No education	4.77778	2.85406	.643	-5.3773	14.9328
		Primary education	1.46595	2.87894	1.000	-8.6934	11.6253
		Secondary education	-1.73889	3.17603	1.000	-12.1942	8.7164
		Vocational training	-3.72222	4.23492	.984	-18.0352	10.5907

*. The difference in means is significant at the 0.05 level.

Dunnett's T3 tests detected significant differences between the means of the group with no education and the group with primary education (diff=-3.31183, p=.013), and between the group with no education and the group with secondary education (diff=-6.51667, p=.06). There were no significant differences between the other groups.

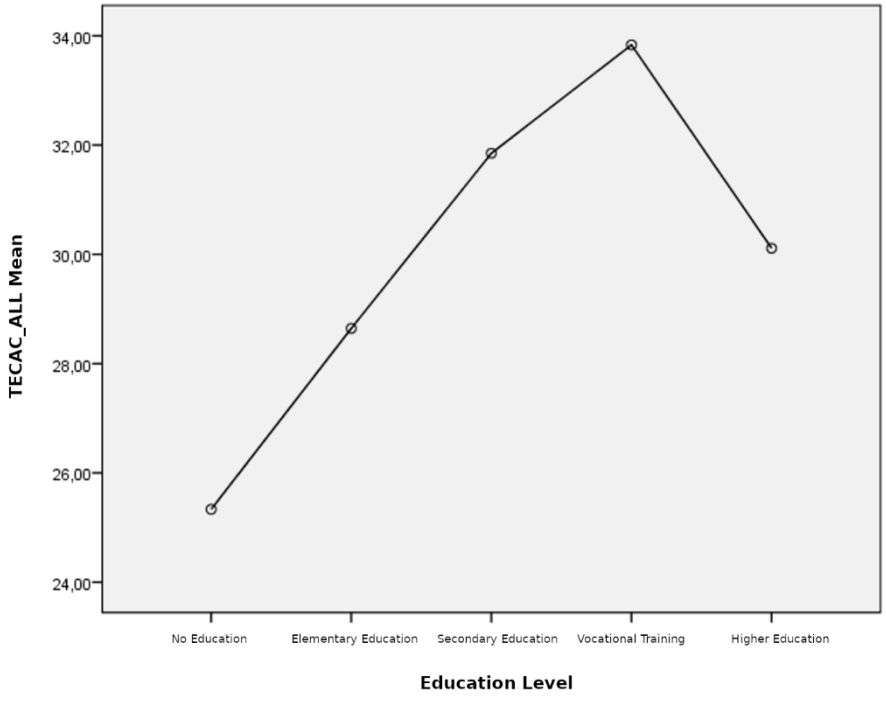

Fig. 13. Mean graph in attitude per education level

The mean graph (Fig. 13) can be deceptive since there are only significant differences between the group without education and the group with primary education as well as and that of secondary education, but there are no differences between those without and education and those with vocational training, or those without education and those with university education. There are also no differences between primary, secondary, vocational training and university education. This is probably due to the fact that the size of the groups is very small, as we can see in the descriptive table: secondary, 20; PT, 6; and university, 9). It likely explains why there were no differences in the statistical tests. Perhaps in a future study with a larger group size, we would find significant differences. However, the trend is clear: the higher the education level of the respondent the more favourable their attitude.

4.2.4. Status

Now we are going to check the variable Status, for which we will carry out tests similar to those done previously. We will begin, therefore, by finding the descriptive statistics (Table 14), and then checking if there is significance (Table 15).

Table 14. Status descriptive statistics

TECAC_ALL	N	Mean	Standard deviation	Standard error	95% confidence interval for mean		Minimum	Maximum
					Lower Limit	Upper Limit		
Single	39	26.0256	4.56236	.73056	24.5467	27.5046	19.00	41.00
Living in couple	105	28.7714	7.56162	.73794	27.3081	30.2348	11.00	45.00
Living with family members	38	29.1316	7.27889	1.18079	26.7391	31.5241	15.00	45.00
Total	182	28.2582	7.03145	.52121	27.2298	29.2867	11.00	45.00

Table 15. Status variance homogeneity test

Levene's statistic	gl1	gl2	Sig.
6.627	2	179	.002

There is variance inequality and therefore Dunnett's T3 test will be applied (Tab. 16).

Table 16. ANOVA Status

			Sum of squares	gl	Root mean square	F	Sig.
Between groups	(Combined)		251.032	2	125.516	2.583	.078
	Linear term	Unweighted	185.671	1	185.671	3.821	.052
		Weighted	187.832	1	187.832	3.866	.051
		Deviation	63.200	1	63.200	1.301	.256
Within groups			8697.831	179	48.591		
Total			8948.863	181			

As can be seen, the F test is not significant (F=2.583, gl=2.179, p=0.078), so there are no significant differences between any of the three situations with respect to attitude. In any case, robust evidence (Table 17) is inconclusive, as Welch indicates that it does exist (p=.015) while Brown-Forsythe indicates otherwise (p=.052).

Table 17. Status robust equality of means tests

	Statistic[a]	gl1	gl2	Sig.
Welch	4.379	2	85.945	.015
Brown-Forsythe	3.044	2	113.041	.052

a. Asymptotically distributed F

To try to get a little more assurance about the results, we will carry out a non-parametric Kruskal-Wallis H test. The test result says that there are statistically significant differences, with a probability of 0.015. Therefore, we will analyse the tests a posteriori using Dunnett's T3 statistical test (Table 18).

Table 18. Post hoc testing. Status multiple comparisons

	(I) Lives	(J) Lives	Mean difference (I-J)	Standard error	Sig.	95% confidence interval	
						Lower Limit	Upper Limit
T3 Dunnett	Single	Living in couple	-2.74579*	1.03840	.028	-5.2614	-.2302
		Living with family members	-3.10594	1.38852	.084	-6.5099	.2980
	Living in couple	Single	2.74579*	1.03840	.028	.2302	5.2614
		Living with family members	-.36015	1.39242	.991	-3.7657	3.0454
	Living with family members	Single	3.10594	1.38852	.084	-.2980	6.5099
		Living in couple	,36015	1.39242	.991	-3.0454	3.7657

*. The difference in means is significant at the 0.05 level.

Dunnett's T3 test detects only one statistically significant difference: between those living alone and those living in couple (diff=-2.74579, p=.028), with those who live in couple having a more favourable attitude. The Mann-Whitney U test also considers this difference to be significant (p=.005). Likewise, the Mann-Whitney U test also finds the difference between living alone and living with other family members significant (p=.024). Finally, the non-parametric test indicates that there is no difference in attitude between living in couple and living with other family members (p=.897).
In conclusion, if you live alone, you have a more unfavourable attitude than if you live with a partner or relatives, but there is no difference between those who live with a partner and those who live with other family members (Fig. 14).

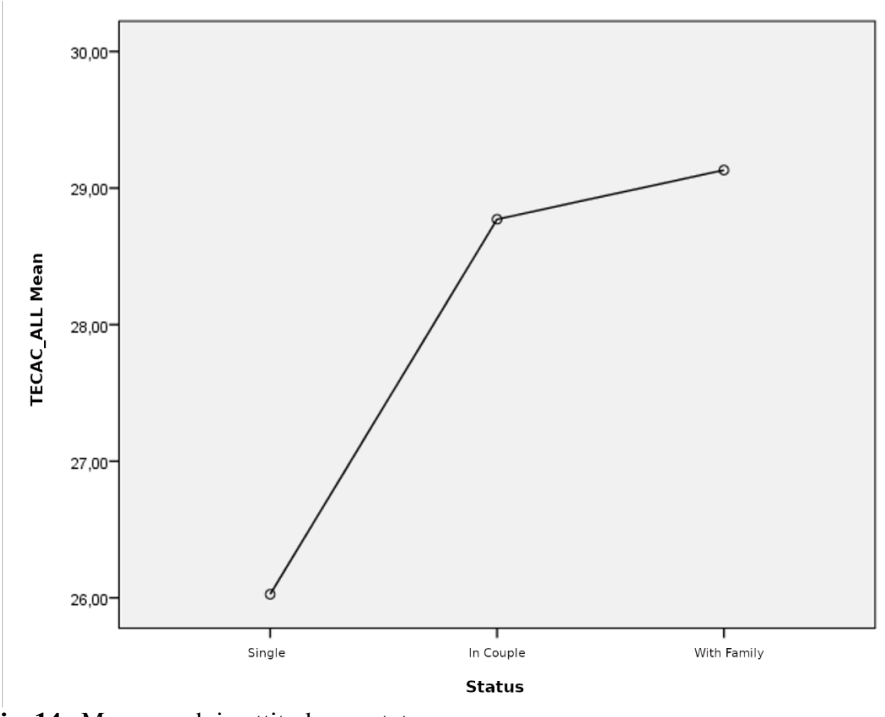

Fig. 14. Mean graph in attitude per status

5 Discussion and Conclusions

The European Union has an increasing percentage of senior citizens, and it is expected that in 2030, people aged 65 years and older will make up nearly 25% of the population and those older than 80 will make up slightly more than 7%, according to [22]. Other calculations have increased this to 30% of the population older than 60 by 2050 [27]. This sharp ageing of the population has a series of social consequences that need to be addressed in order to minimise its impact. Among them is, of course, the digital divide which, although not a new problem, may widen if the appropriate measures are not taken. The UDP report (2021) [11] observes that 27% of the elderly population have not been able to carry out a citizenship activity due to the lack of digital skills, and this rises to 58% in the case of those with the lowest income. Within this context, it is of the utmost importance to foster the digital inclusion of senior citizens by facilitating access and skills development.

Technology acceptance by seniors has been shown to be highly dependent on the local context [28]. Previous research has been mostly focused on health, nutrition, illness and loneliness, [29, 30] so more research is needed to learn about local contexts and usages for active and agentic ageing.

In general, it has been said that the elderly use computers for instrumental and social purposes, which involve technology to manage their own files (text or multimedia files) and to communicate with others [14]. In this study, results partially align with this description and there seems to be widespread use of devices for communication purposes among senior citizens. The instrumental usages, although only observable to a lesser extent, are still visible in our results, in particular derived from the management that can be deduced in file management and photo sharing. Also, in line with previous research, it can be observed that men are the greatest users, and that age is a variable that also predicts usage, with younger people showing more frequent and varied usage [31, 32]. However, the user's profile in this study cannot be described as active in terms of high frequency and diversity.

This article is aligned with that of [18] as the many options included describing senior citizen's access and usages is a contribution to the field offering a wider range of nuances. In this regard, the usage is represented by the different devices they are asked about and the quantity or diversity of devices owned may be an indicator of the elderly person's material resources. In our study, we have found that the use of digital devices is far from being widespread, given that only about 50% of elderly people have an Internet connection and just over a third of them have a computer, a similar percentage to those who state they have a mobile device. Furthermore, the level of studies is related to the discourse (intellectual) resources and the question with regard to who introduced them to the world of technology evidences the supportive social relationships available to the elderly. In this regard, this current study explores the hardware with which the elderly access the Internet, with a rather small quantity of senior citizens owning more than one device. The most commonly used device to keep informed is the computer, although that most used to communicate is, by far, the smartphone. Their social support can be inferred from the help senior citizens mention having received and it can be stated that most of the participants have had some kind of support from family or friends, although, in particular men, they also prefer to explore on their own. The educational level to which the discursive resources refer to in terms of [18] show a rather medium and low-level population, so in this regard, this is coherent with the rather limited variety of the habits and routines that shown by our group of participants.

Some recommendations can be made based on this study. The socially supported learning that seems to better answer the training of senior citizens for digital skills recommends fostering courses which are elder-friendly [12]. Their tendency to use technology to access information may also be a good indicator for online learning, and in this line there are previous experiences based on MOOCs, which in a pilot experience, were assessed with only moderate success, since although the video-based content meet seniors needs whereas the social interaction was not enhanced in the course design [13]. Furthermore, other recommendations can be derived from this study and since information access seems to be at the core of their digital skills, as suggested in previous research by [12], elder-friendly news websites and mobile messaging apps would be recommended to support the introduction of the non-digital ones.

While the majority of participants in our work expressed a somewhat lukewarm stance regarding the use of technology, it is noteworthy that a good number of them,

about a quarter have a somewhat positive attitude. This is evidenced, for example, in items related to the pleasure of using ICT and the curiosity that it arouses in them.

Meanwhile, there were no significant differences in attitude as regards sex, although there were differences between the younger age groups (65-69 years) and the older age groups (over 80 years), showing a more unfavourable attitude over the years. Also, as noted, the respondents' education level is a factor affecting their attitude with a significantly more unfavourable opinion in those groups with lower levels of education. Additionally, living alone is also a factor associated with a negative attitude, if we compare it to living with a partner or relatives.

Finally, one of the contributions of our study is the creation of the scale of attitudes towards the use of digital technology by the elderly, TAQ, the consistency of which has been statistically proven. It is in the early stages of development and therefore subject to future improvements, but we consider it a solid starting point from which to propose new research. The instrument built was necessary for a number of reasons, mainly based on the need for a survey that has more context and can offer a more nuanced picture of seniors' active and agentic usage. In this case, the survey was carefully adapted to the context by adding elements aligned with current national trends (social media, apps and mobile usages); it was also adapted to target participants, with validation through a pilot phase in which a group of seniors answered and commented on the clarity and meaning of each question. The survey also included items about usage and attitude, so it was designed to be more comprehensive than the general studies that analyse population usage, but it also gives a more accurate picture of seniors by relating their perceptions and attitudes with their usage. In addition, it is important to note that the survey explores seniors' active role with technology by dividing participants into four ages groups, thus it gives a more detailed picture of seniors' behaviour and attitudes than other instruments which place seniors into more general groups [12, 14, 17].

The limitations of the study are related to the participants and, although they were approached in terms of a socio-demographic design, balancing ages and regional distribution around the whole island, the rather small part of those who stated that they had digital skills does not allow us to state the general representative value of the results. In addition, the vast amount of data generated allows for further exploration and new correlations could add interesting insights into senior citizens' usages and attitudes. Closely related, further research could also look into technology usage in terms of agency enactment [33], following previous research [34]. If adult learners have been described as autonomous learners [35], and capable of self-regulated learning [36], senior citizens' usage of technology should also be explored under these approaches. Finally, and aligned with current trends in international research into educational technology, further studies from a socio-material approach are needed [37], which require a more complex and holistic approach to gain a greater understanding of the way technology enters into the life of the elderly, whose cultural capital is of the utmost importance for the world's future.

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