



Is Anxiety Affecting the Adoption of ChatGPT in University Teaching? A Gender Perspective

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Abstract

The emergence of ChatGPT and other AI-based tools has revolutionized the professional and educational world. This paper aims to analyze the factors that may lead university teachers to consider adopting ChatGPT in their work. This study examines how some relevant Unified Theory of Acceptance and Use of Technology (UTAUT) model variables (effort expectancy, facilitating conditions, and performance expectancy), technology-related anxiety and gender influence teachers' intentions to use ChatGPT. A questionnaire was developed and sent to professors at Spanish public universities, resulting in a sample of 249 valid responses. The results indicate that performance expectancy, facilitating conditions, anxiety related to student learning and gender are the main determinants of the intention to use ChatGPT by teachers. After conducting an exploratory analysis segmented by gender, it was found that men and women analyze the possibility of adopting ChatGPT through different variables. For male teachers, performance expectancy and facilitating conditions are the variables that affect the intention to use ChatGPT. In contrast, female teachers' intention is influenced by anxiety related to student learning and anxiety related to technology use, in addition to performance expectancy and facilitating conditions. Therefore, these results suggest that it is crucial to consider individual perceptions, gender as well as contextual factors when promoting the adoption of tools such as ChatGPT among university teachers. Educational institutions should provide teachers with the skills needed to create, adapt and use information and communication technologies, especially those based on generative AI. This training should adopt new strategies that take gender differences into account.

Keywords Artificial intelligence · Anxiety · Technology adoption · Gender · Higher education · Teachers

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1 Introduction

Artificial intelligence (AI)-based applications have been used in higher education for years (e.g., Wang et al., 2021; Zawacki-Richter et al., 2019), long before the emergence of ChatGPT (Dwivedi et al., 2023). However, it is the emergence of ChatGPT and the quality and sophistication of its results that have focused on AI applied to education and sparked a deep debate about its use (Sullivan et al., 2023). ChatGPT, an AI-based chatbot launched by OpenAI, is equipped with an extensive linguistic model that allows it to generate original text in response to user prompts. Launched in November 2022, the technology is available for free through an OpenAI account. ChatGPT gained more than one million users in the first few days of its launch, and more than 100 million users by January 2023. These data suggest a significant impact in all sectors of activity, and especially in the field of education. The adoption of this technology by higher education institutions requires an in-depth analysis of the reasons that may lead institutions, professors, and students to embrace or resist it (Dwivedi et al., 2023).

Research on the adoption of new technologies in general has concluded that employees are willing to adopt a technology if it helps them perform their tasks more effectively and efficiently. However, these employees resist change if the technology is difficult to use in their work environment and/or if it significantly changes the way they work (Laumer et al., 2016). The debate about ChatGPT in higher education follows a similar line, as it implies a change in academic working methods (Dwivedi et al., 2023) and even in the tasks associated with teaching positions (Sampson, 2021). One of the issues raised by ChatGPT is the rethinking of assessment and its use to improve learning (Strzelecki, 2023). This tool can be used to encourage students' critical thinking (Van Dis et al., 2023) and to support the development of written communication skills (Crawford et al., 2023). However, the use of ChatGPT has also been associated with the production of false citations (Cooper, 2023), plagiarism, and concerns about academic integrity (Sullivan et al., 2023).

To date, and due to its novelty, very few empirical academic studies have been published on the use of ChatGPT and other generative AI tools in education (Strzelecki, 2023; Sullivan et al., 2023). It is worth noting that while research on ChatGPT adoption has mostly focused on students (Pasupuleti & Thiyyagura, 2024; Strzelecki & ElArabawy, 2024), university faculty have received significantly less attention, which is reflected in the scarcity of work, especially empirical work in this area. In this regard, recent work has been found, but not at the university level (Al Darayseh, 2023; Chocarro et al., 2023).

In this context, the aim of this paper is to analyze the factors that may lead university teachers to adopt (or not) ChatGPT in their work activity. In particular, it is proposed to study the influence of anxiety generated by technology, since emotions are a very important concept in the acceptance of technology, especially in contexts where its use is voluntary (Gunasinghe & Nanayakkara, 2021; Khechine & Lakhali, 2018). Likewise, the influence of gender will be studied, since although its effect on technology adoption has been extensively studied, the reported results are inconclusive. We also propose to study the influence of performance expectancy (PE), effort expectancy (EE) and facilitating conditions (FC) on the intention to use ChatGPT (BI).

The paper is organized as follows: (1) a detailed description of the model proposed to explain the adoption of ChatGPT by university faculty, along with the formulation of hypotheses; (2) a comprehensive explanation of the methodology, utilizing mean difference

analysis, correlations, and regression techniques; (3) a presentation of the results derived from the statistical analyses; and (4) a discussion of the key findings, including both the theoretical implications and the practical implications for higher education institutions, as well as suggestions for future research directions.

This study provides an in-depth examination of the factors influencing faculty's adoption of ChatGPT in their academic activities, with a particular focus on the role of technology anxiety and gender. The findings confirm that both performance expectancy (PE) and facilitating conditions (FC) are essential in shaping faculty members' intention to use ChatGPT. However, concerns about the impact of technology on student learning generate anxiety among teachers, which in turn negatively affects their intention to adopt the tool. This work makes a meaningful contribution to an underexplored area of research, focusing on a group -teachers- that has not garnered as much attention as students in previous studies.

2 Literature Review and Hypothesis Development

The use of technology in the classroom has increased in recent years, but its adoption remains a challenge for educational institutions. Therefore, the question of what variables influence the adoption of technology in education has been raised repeatedly in the literature (Gunasinghe et al., 2019; Scherer et al., 2019).

Technology adoption in education has been studied over time using various models, such as the Technology Acceptance Model (TAM) (Scherer et al., 2019) or the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Strzelecki, 2023), and even different variants of each have been developed. For a detailed review of acceptance models for different types of technologies, industries, and activities, see Taherdoost (2018). Essentially, these theories state that users' BI is determined by the rational evaluation of the expectations generated by the adoption of the technology in question. Likewise, the literature shows that BI is one of the predictors of technology use, also in the educational domain (Farooq et al., 2017; Gunasinghe et al., 2019; Strzelecki, 2023; Williams et al., 2015).

The proposed model is based on UTAUT. UTAUT explains technology adoption based on a series of determinants, such as performance expectancy (PE), effort expectancy (EE) facilitating conditions (FC) and social influence. Nevertheless, in this work social influence is excluded. This was done for two reasons: (a) university professors are professionals with a high degree of autonomy and are used to making decisions based on their own critical judgment and empirical evidence, rather than on the influence or social pressure of colleagues or superiors (Bhat et al., 2024); (b) unlike other user groups, university professors tend to have a significant level of technological competence and experience. According to Venkatesh et al. (2003), social influence has less impact in contexts where users have previous experience with similar technologies, as they rely more on their own evaluation than on external opinions. In addition, various aspects of teacher anxiety and gender are included in the model. Each of the variables of the model is explained below.

2.1 Performance Expectancy (PE)

It is defined as the user's belief that the technology being analyzed will improve his or her performance in order to gain job benefits (Venkatesh et al., 2012). In this paper, PE refers

to the teacher's belief that ChatGPT will be useful in fulfilling their responsibilities more efficiently and effectively. The adoption of the technology is related to the positive aspects perceived by the teacher at the professional level (Butler & Shibaz, 2014; Han et al., 2015; Sharma & Srivastava, 2020). Since ChatGPT can be used for various professional purposes, both in teaching and research, the interest among academics is high (Dwivedi et al., 2023). Reported results include the following (Cotton et al., 2023; Dowling & Lucey, 2023; Dwivedi et al., 2023; Kikalishvili, 2023; Sullivan et al., 2023): (a) providing basic educational materials; (b) providing personalized feedback on grammar, organization, and content in written assignments; (c) automating administrative tasks such as grading assessments and answering frequently asked basic questions, thus freeing up teachers' time to focus on other aspects of teaching and research; (d) helping language learners by providing personalized feedback on grammar and vocabulary and assisting them with language translation in the classroom; and (e) providing support to users by answering their questions and providing explanations on various topics. Based on these arguments, the hypothesis is formulated:

H1 Performance expectancy positively influences the intention to use ChatGPT by university teachers.

2.2 Effort Expectancy (EE)

It is defined as the ease of use of technology for the individual (Venkatesh et al., 2012). In this paper, EE refers to the teacher's belief that ChatGPT is easy to use. If teachers believe that ChatGPT is easy to use in their classroom and that they have the necessary skills to use it effectively, it increases the likelihood that they will use this technology in the future (Al Darayseh, 2023; Chocarro et al., 2023; Nikou & Economides, 2019; Wang et al., 2021). Since the dialogues with ChatGPT are in natural language, the feeling of ease of use is shared by users, especially those who have extensive written communication skills, such as teachers (Chocarro et al., 2023). Therefore, the following hypothesis is formulated:

H2 H2: Effort expectancy positively influences the intention to use ChatGPT by university teachers.

2.3 Facilitating Conditions (FC)

FC refer to the user's belief that institutional support and infrastructure will be available to support the use of this technology (Venkatesh et al., 2012). Research in this area has found a positive relationship between FC and BI (Farooq et al., 2017; Lane & Lyle, 2011; Thomas et al., 2013). Following the argumentation of these authors, it is conceivable that in a context where there are limited resources to support the use of ChatGPT, this variable becomes important in predicting BI. FC is materialized in technical support and infrastructures that help teachers to use ChatGPT and to solve problems that may arise from its use. If teachers perceive that they have support from their institution and that they have the necessary mechanisms and devices to use ChatGPT, they will be more inclined to use it. With these arguments, the following hypothesis is formulated:

H3 The existence of facilitating conditions positively influences the intention to use ChatGPT by university teachers.

2.4 Teachers' Anxiety about the Impact of Technology Adoption in the Academic Environment

Anxiety can be defined as an emotional reaction that produces a negative response in people's intention to engage in some behavior (Bandura, 1986). In the area of technology adoption, this could include a temporary sense of unease or discomfort about the impact of using a technology (Duong et al., 2024; Gunasinghe & Nanayakkara, 2021; Martínez-Navalón et al., 2023; Venkatesh et al., 2012). As several studies have shown, this can be a significant barrier to adoption (Gunasinghe et al., 2019; Holzmann et al., 2020; Khechine & Lakhali, 2018; Lakhali & Khechine, 2021; Maican et al., 2019).

This paper analyses the anxiety related to the effects that ChatGPT can have on the academic profession, to the difficulties in using this technological tool and to the consequences that the use of ChatGPT can have on the students' learning. Examining these three dimensions of anxiety responds to the need to comprehensively understand how individual, ethical, and professional factors influence the adoption of AI in higher education. This approach aligns with recent research in psychology and education (Ashford et al., 2018; Tarafdar et al., 2019). These elements reflect both educators' personal experiences and the ethical and structural implications of technology in their work environment.

2.4.1 Anxiety about the Future of the Academic Profession (ANXP)

The development of AI will change and even threaten some jobs (Dwivedi et al., 2023). Teachers may be concerned that tools like ChatGPT could replace human intelligence (Sampson, 2021). Thus, works such as Felten et al. (2023) have found that English, literature, and history teachers are among those most at risk from the introduction of AI.

It is possible for ChatGPT to generate activities for students or notes on a subject in a few seconds without human intervention. Thus, it could reduce the need to develop certain skills, such as the ability to conduct a literature search on a topic to be worked on with students in the classroom. ChatGPT can replace teachers in tutoring students, as it could answer questions and provide students with additional resources and materials with less teacher intervention. It can also be used to create and distribute educational content, such as ad hoc quizzes, games, and interactive lessons, making the content creation and distribution process much faster and easier. Finally, ChatGPT can automate repetitive administrative tasks such as grading assignments and providing structured feedback, freeing up teachers' time for other tasks. As a result, the adoption of AI-based tools may require teachers to develop new skills (Van Dis et al., 2023; Sampson, 2021; Dwivedi et al., 2023) and this can also be a source of anxiety for teachers. Anxiety can arise when teachers perceive a gap between their current skills and those required to efficiently use the new tools, which can negatively affect their psychological well-being (Ragu-Nathan et al., 2008) and they can resist change. Ultimately, seeing themselves as unable to keep up with the pace of technological advancement can make them feel less useful as teachers and even lead to job loss.

Based on this reasoning, the following hypothesis is proposed:

H4 Anxiety regarding the impact that ChatGPT may have on the academic profession negatively influences the intention to use ChatGPT by university teachers.

2.4.2 Anxiety About using ChatGPT (ANXU)

Anxiety related to the use of technology is a feeling of apprehension that arises when a person is faced with the possibility of using a new technology (Gelbrich & Sattler, 2014). The effect of technology anxiety is strongest at the earliest stage of the adoption process (Venkatesh et al., 2003). Previous work has demonstrated the usefulness of ChatGPT for generating educational or research materials (Dowling & Lucey, 2023). The problem arises from the uncertainty that results from the use of these materials. Questions such as to what extent it is necessary to indicate that ChatGPT has been used, or whether this will reduce the legitimacy of the material produced, or even question its authorship, raise doubts (Thorp, 2023). Therefore, university teachers may question the integrity of their use of these tools in their teaching and research (Dwivedi et al., 2023; Else, 2023). Similarly, teachers may have doubts about the accuracy of the answers they receive from ChatGPT and may question its ethical implications and potential impact on their reputation. Thus, the hypothesis is formulated:

H5 Anxiety regarding the use of technology negatively influences the intention to use ChatGPT by university teachers.

2.4.3 Anxiety about Student Learning (ANXS)

After ChatGPT demonstrated its ability to write text, a debate has arisen as to whether AI, and ChatGPT in particular, should be banned in academia. Issues of plagiarism by students, the creation of fake content, and legal implications are being discussed. Teachers have raised concerns about maintaining academic integrity and ensuring student learning, as evidenced by the scarce academic literature (e.g., Cotton et al., 2023; Dwivedi et al., 2023; García-Peñalvo, 2023; Sullivan et al., 2023). Teachers may fear that students will not be able to do their work effectively because they are using ChatGPT. Determining whether students have used ChatGPT to create their assignments can be challenging due to the platform's ability to emulate human-generated content (Dwivedi et al., 2023). This can complicate traditional markers of originality assessment and cause anxiety among teachers who worry that the tool may undermine the authenticity of the learning process. Thus, the following hypothesis is formulated:

H6 Anxiety regarding the student learning negatively influences the intention to use ChatGPT by university teachers.

2.5 Gender

The influence of gender on technology adoption is a recurring theme in the literature. In education, the results are inconclusive. In research related to teachers' intentions to adopt technology, some find a significant relationship between gender and BI (Guillén-Gámez &

Mayorga-Fernández, 2020; Sharma & Srivastava, 2020), while others do not (Lane & Lyle, 2011; Onasanya et al., 2010; Romero-Rodríguez et al., 2020; Sánchez Prieto et al., 2020).

In general, women are considered to be less frequent and less intensive users of technology than their male counterparts (Acilar & Sæbø, 2023; Celik, 2016; Sharma & Srivastava, 2020; Venkatesh et al., 2003).

What might cause these differences? Cooper (2006) suggests three factors: (1) parents and teachers impose gender expectations and differential exposure to certain activities that influence the development of men and women; (2) social stereotypes shape behaviors; and (3) the differences are due to the different ways in which men and women attribute their successes and failures: women tend to attribute their failures to internal causes, i.e., they blame themselves for the problems they may have when using technological tools. As a result, women are more likely to experience anxiety when using certain technologies that are often considered masculine (Acilar & Sæbø, 2023; Cooper, 2006; Selwyn, 2007).

For Khechine and Lakhali (2021), anxiety is the most important predictor of continued technology adoption (in this case, persistence in an online course) for women. These authors related this anxiety to the lack of clear instructions, or their previous negative experience with the use of similar technologies. Additionally, Cai et al. (2017) reported that women exhibit more anxiety than men when using technology.

Stoilescu and McDougall (2011) observed that female students enrolled in undergraduate computer science programs may exhibit elevated levels of anxiety, lack of confidence, and tendencies toward lower levels of achievement. Also, Huang et al. (2013) found that women often experience greater anxiety when using Web 2.0 applications, except for social networking and online video sharing tools. In a study conducted by Yücel and Rızvanoğlu (2019), women were found to have lower perceived computer competence, lower self-efficacy, higher perceived difficulty of technology tasks, and higher anxiety than men. Jiang and Luh (2017), in their analysis of gender differences in computer and Internet use in Taiwan, identified gender differences as a key variable in explaining the differences in usage patterns between men and women. Finally, Lane and Lyle (2011), in a study conducted at the University of Washington, found that female teachers perceived more disadvantages than male teachers when using educational technology, citing learning time and lack of support for technical troubleshooting as the main barriers. However, these differences with male teachers disappeared when gender was controlled for experience and age. Based on these arguments, the following hypothesis is formulated:

H7 Male teachers have a higher intention to use ChatGPT than female teachers.

In addition, an exploratory objective is proposed to analyze whether the variables that determine the BI of men are the same as those associated with the BI of women. This analysis may be relevant even if no difference is observed between the BI of men and women, because although the BI of men and women may be the same or similar, it is possible that there are different determinants between the BI of men and the BI of women.

3 Methodology

3.1 Instrument

In order to gather the information to test the formulated hypotheses, a questionnaire was developed. The questionnaire was divided into three sections: the first contained an introduction and general information about the study's subject, while the second included 26 items that measured 7 factors (ANXP, ANXU, ANXS, EE, FC, PE, BI). The scales related to the UTAUT model (EE, FC, PE and BI) are based on the work of Farooq et al. (2017) and Venkatesh et al. (2003). The scale on anxiety about using ChatGPT (ANXU) is based on the work of Garone et al. (2019). The scale on anxiety about the future of the academic profession (ANXP) was developed from the works of Sampson (2019) and Felten et al. (2023). Finally, the scale on anxiety about student learning (ANXS) was developed from concerns and worries expressed in works such as Cotton et al. (2023) and Dwivedi et al. (2023). For all scales, adjustments were made to include ChatGPT.

The scales were translated into Spanish. The statements were measured on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) and are shown in Table 1. The third section contained demographic information such as gender (man, woman, other), age, professional experience, university affiliation (temporary or permanent), and work schedule (full-time or part-time).

3.2 Sample

The population studied consisted of the teaching staff of the 50 Spanish public universities that are part of the Spanish university system. According to the database of the Ministry of Universities (<https://www.universidades.gob.es/estadisticas-de-personal-de-las-universidades/>), in the academic year 2021-22 the teaching and research staff numbered 110,194 people. A sample of 249 valid questionnaires was obtained, according to the procedure presented in the next section. Following the procedure proposed by Anderson et al. (2014), and assuming an infinite population, the sampling error is 6.1% with a confidence level of 95%.

3.3 Procedure

Because the information is collected from a single source, several procedural precautions were taken to avoid common method bias. These precautions, recommended in the literature (Podsakoff et al., 2003, 2012), were (a) providing instructions that clarify there are no right answers and ensuring response confidentiality can reduce response bias; (b) keeping the questionnaire brief and avoiding redundant items is essential to reduce fatigue and demotivation; (c) formulating items with both positive and negative wording; (d) assessing independent and dependent variables presenting them in different parts of the questionnaire to prevent the informant from knowing of the researcher's interest in certain relationships between variables; and (e) conducting a pretest to detecting potential biases in responses.

Data were collected using Microsoft Forms. To improve content validity, a pretest was conducted with 10 university professors. After the pretest, improvements were made to the wording to facilitate the understanding of the questionnaire.

Table 1 Perceptions on ChatGPT and BI

Factors (McDonald's Omega)	Items	Average	SD	N
ANXP (0.911)*	I am worried that ChatGPT and other artificial intelligence systems will make me less useful as a teacher	2.06	1.28	214
	I am afraid that ChatGPT and other artificial intelligence systems will replace teachers	1.87	1.17	218
ANXU (0.892)	I am afraid to use ChatGPT	2.06	1.37	210
	I am afraid that the information I generate with ChatGPT will be misused	2.43	1.44	210
	I am afraid to use ChatGPT for fear of making mistakes that I cannot correct	2.18	1.40	210
ANXS (0.912)	Using ChatGPT intimidates me	1.93	1.26	215
	I am afraid that my students will use ChatGPT in their assignments without my knowledge	3.46	1.54	197
	I worry that my students' learning will be of lower quality if they use ChatGPT	3.37	1.46	196
EE (0.888)	I am afraid that my students will put less effort into learning if they use ChatGPT	3.61	1.50	194
	I can interact with ChatGPT easily	3.64	1.31	198
	I find it easy to use ChatGPT	3.88	1.26	199
	ChatGPT does not require much effort	3.82	1.24	193
FC (0.840)	I find it easy to understand the different ways to use ChatGPT	3.54	1.19	200
	I have a device (computer, tablet, mobile phone) to use ChatGPT	4.22	1.44	189
	I know how to use ChatGPT	3.85	1.34	207
	ChatGPT is compatible with the devices I have	4.38	1.07	180
	I have help if I have problems using ChatGPT	2.16	1.48	190
	I know how to use ChatGPT in my teaching activity	2.87	1.39	213
PE (0.935)*	I understand how to use ChatGPT in my research activity	2.90	1.42	210
	ChatGPT will be very useful for my professional future	3.22	1.45	196
	Knowing how to use ChatGPT will positively affect my career opportunities	3.29	1.49	197
BI (0.965)	I will continue to use ChatGPT in the near future	3.14	1.51	210
	I will recommend ChatGPT to my friends and colleagues	2.99	1.56	207
	I have a positive perception of ChatGPT	3.26	1.39	210
	I intend to use or continue to use ChatGPT for teaching purposes	3.07	1.46	211
	I intend to use or continue to use ChatGPT for researching	3.07	1.50	210

* Since McDonald's Omega cannot be calculated with a scale of less than three items, the figure shown corresponds to the correlation index between the two items of the scale

Note ANXS=anxiety about student learning; ANXU=Anxiety about using ChatGPT; ANXP=Anxiety about the future of the academic profession; FC=facilitating conditions; EE=effort expectancy; PE=performance expectancy

The questionnaire was sent to a random sample of 100-unit directors of Spanish public universities, requesting their collaboration in disseminating the questionnaire among their professors. The survey was carried out between March 2023 and April 2023. In May 2023, a reminder was sent to the same unit directors to improve the response rate. As indicated above, 249 valid questionnaires were received. By completing the questionnaire to the end, all participants gave their informed consent to participate in this study and accepted that

their data would be processed anonymously and aggregated. Participants had all the legal information about their informed consent on the first page of the questionnaire introduction. This first page had to be read to access the questions in the questionnaire, thus ensuring that participation in the study complied with the regulations on research involving human subjects. The survey tool automatically checked that all questions had to be answered before sending and that they could not be sent twice.

3.4 Data Analysis

Frequency analysis was used to determine the characteristics of the sample and the teachers' perception of ChatGPT and their BI. The reliability of the scales was also assessed using McDonald's Omega. A correlation matrix was used to determine the degree of association between the variables. T-tests were conducted to determine if there were differences between men and women with respect to the variables considered. Multiple linear regression analysis was used to test the proposed hypotheses and achieve the exploratory objective. Analysis were performed using SPSS version 26.

4 Results

Table 2 presents the characteristics of the sample. As can be seen, 53% of the respondents were women. About 55% of the respondents are over 50 years old. Most of the respondents have more than 20 years of professional experience (57.8%) and are part of the university's permanent staff (65.5%). In addition, most of them work full-time (78.3%) and are permanently affiliated with the university (65.5%).

Most teachers surveyed (89.6%) said they were aware of ChatGPT and its usefulness.

Table 2 Sample characteristics

Item	Category	<i>N</i>	%
Gender	Man	132	53.0
	Woman	117	47.0
	Other	---	---
Age (years)	20–25	10	4.0
	26–30	15	6.0
	31–35	15	6.0
	36–40	10	4.0
	41–50	62	24.9
	51–60	112	45.0
	61–65	19	7.6
	More than 65	6	2.4
Professional experience (years)	Less than 1	11	4.4
	1–5	28	11.2
	6–10	22	8.8
	11–20	44	17.7
	More than 20	144	57.8
Affiliation	Temporary	86	34.5
	Permanent	163	65.5
Work schedule	Full time	195	78.3
	Part time	54	21.7

Table 1 shows the teachers' perception of ChatGPT and their BI. The reliability of the scales was also assessed using McDonald's Omega. The required level of reliability was reached as the McDonald's Omega was between 0.840 and 0.965. The mean scores of the different items are also shown. Thus, the level of anxiety shown by the teachers that ChatGPT could replace their work and reduce their usefulness as teachers is low (ANXP). Similarly, the level of teachers' anxiety about using ChatGPT is also low (ANXU). On the other hand, there seems to be concern about the use that students might make of this artificial intelligence tool and the consequences for their learning (ANXS).

Teachers show a medium level of agreement that using ChatGPT is easy and does not require much effort (EE). Regarding the FC, teachers indicate that they have devices compatible with the use of ChatGPT. However, they have no help in case they have doubts about its use. Regarding the PE, the level of agreement is medium. The teachers also express a medium level of agreement regarding the BI of this artificial intelligence tool.

The average of each factor was calculated from the mean scores of each item. For instance, the average score of the PE factor was calculated as the mean of the scores of the two items that comprised it. Table 3 displays the mean scores, standard deviations, and correlations between the study variables. As shown, there is a positive and significant correlation between BI and PE. To the extent that teachers perceive ChatGPT as useful for their professional development, they are more likely to continue using it in the future. The anxiety variables, except for ANXP, correlate negatively and significantly with BI. It is worth noting that women are less inclined to use this AI tool.

T-tests were conducted to determine if there were differences between men and women with respect to the variables considered, given the existence of a significant correlation between gender and BI. Table 4 indicates that women experience more anxiety when using ChatGPT, while men perceive more conditions that facilitate its use. Men also have higher

Table 3 Descriptive statistics and correlation matrix

	Average (SD)	1	2	3	4	5	6	7	8
1. BI	3.08 (1.39)								
2. ANXP	1.97 (1.18)	-0.109	--						
3. ANXU	2.17 (1.21)	-0.303**	0.458**	--					
4. ANXS	3.49 (1.38)	-0.380**	0.304**	0.404**	--				
5. EE	3.69 (1.10)	0.523**	-0.081	-0.192**	-0.226**	--			
6. FC	3.33 (1.10)	0.586**	-0.033	-0.236**	-0.306**	0.677**	--		
7. PE	3.25 (1.42)	0.876**	-0.108	-0.209**	-0.287**	0.477**	0.468**	--	
8. Age	-	-0.012	-0.036	-0.109	-0.002	-0.065	-0.131	-0.088	--
9. Gender	-	-0.311**	0.070	0.173*	0.110	-0.075	-0.194**	-0.246**	-0.094

** $p < 0.01$; * $p < 0.05$

Note ANXS=anxiety about student learning; ANXU=Anxiety about using ChatGPT; ANXP=Anxiety about the future of the academic profession; FC=facilitating conditions; EE=effort expectancy; PE=performance expectancy

Table 4 Results of t-test between men and women

Dependent variable	Men average	Men SD	Women average	Women SD	Homogeneity of variances	t
ANXP	1.8950	1.13286	2.0600	1.23354	Yes	-1.031
ANXU	1.9846	1.01414	2.4024	1.37195	No	-2.512**
ANXS	3.3561	1.38462	3.6593	1.35836	Yes	-1.554
EE	3.7696	1.04657	3.6035	1.16931	Yes	1.085
FC	3.5260	1.03457	3.1011	1.12583	Yes	2.916**
PE	3.5575	1.43264	2.8571	1.30870	Yes	3.606***
BI	3.4764	1.37663	2.6080	1.26664	Yes	4.830***

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Note ANXS=anxiety about student learning; ANXU=Anxiety about using ChatGPT; ANXP=Anxiety about the future of the academic profession; FC=facilitating conditions; EE=effort expectancy; PE=performance expectancy

Table 5 Summary results of multiple regression analyses to predict BI

	B	<i>p</i>	Tolerance	VIF
ANXP	0.026	0.490	0.739	1.353
ANXU	-0.065	0.101	0.670	1.493
ANXS	-0.077	0.040	0.762	1.313
EE	0.020	0.662	0.511	1.956
FC	0.154	0.001	0.482	2.073
PE	0.739	<0.001	0.702	1.424
Gender	-0.113	0.001	0.872	1.147
Age	0.048	0.160	0.921	1.085
	F=98.395 (<0.001)			
	R ² =0.826			

expectations of ChatGPT being useful for their future careers than women. Lastly, men express a greater intention to continue using ChatGPT in the future.

To examine the relationship between BI and explanatory variables, a multiple regression analysis was conducted, with age introduced as a control variable. The results of the regression analysis are presented in Table 5, which shows the standardized coefficient values and their significance levels. The F-statistic (98.395, $p < 0.001$) indicates the model is globally significant. Although the correlation matrix did not show any values higher than 0.7, the variance inflation factor (VIF) was calculated and ranged from 1.085 to 2.073. These values are well below the recommended threshold of 10, as stated in the literature (Hair et al., 2010). The tolerance values range from 0.482 to 0.921, with none below 0.10, indicating the absence of multicollinearity problems. PE is the variable that best explains BI, while FC also positively affects the use of this AI tool. Additionally, ANXS negatively influences BI. The regression analysis revealed that the gender variable is significant, indicating a lower BI among women.

As indicated above, this study has the exploratory objective of investigating whether the variables that determine the BI of men are the same as those associated with the BI of women. An analysis was carried out to identify the variables that determine the intention to use ChatGPT by male and female teachers, in order to deepen this difference. The previous regression analysis is replicated in Table 6, taking into account the gender of the teachers. It

Table 6 Summary results of multiple regression analyses to predict BI by teacher gender

	Men				Women			
	B	<i>p</i>	Tolerance	VIF	B	<i>p</i>	Tolerance	VIF
ANXP	0.009	0.846	0.745	1.343	0.069	0.337	0.734	1.362
ANXU	-0.008	0.864	0.637	1.569	-0.148	0.049	0.695	1.440
ANXS	-0.035	0.424	0.788	1.268	-0.183	0.019	0.653	1.532
EE	0.005	0.940	0.427	2.341	0.026	0.752	0.573	1.746
FC	0.155	0.016	0.390	2.565	0.167	0.045	0.569	1.758
PE	0.832	<0.001	0.690	1.450	0.636	<0.001	0.742	1.347
Age	0.037	0.365	0.952	1.051	0.045	0.503	0.861	1.162
	F=79.818 (<0.001) R ² =0.857				F=28.354 (<0.001) R ² =0.750			

Note ANXS=anxiety about student learning; ANXU=Anxiety about using ChatGPT; ANXP=Anxiety about the future of the academic profession; FC=facilitating conditions; EE=effort expectancy; PE=performance expectancy

is important to point out that both models are globally significant. The analysis showed that the influence of the variables considered varies according to the gender of the teacher. For male teachers, the variables that affect BI are PE and FC. For women, in addition to these variables, ANXU and ANXS have a negative effect on BI.

5 Discussion

The main objective of this paper is to analyze the factors that may lead university teachers to adopt ChatGPT in their work, specifically studying the influence of technology anxiety on the intention to use ChatGPT and gender.

In relation to the proposed objective and based on the regression analysis, teachers BI is largely determined by the PE (H1). Thus, the more positive the perception of the usefulness of the tool for the teacher's professional future, the higher the BI. This is consistent with previous research (Lakhali & Khechine, 2021; Sharma & Srivastava, 2020). Furthermore, FC also has a positive effect on BI (H3), as has been found in the literature (Al Darayseh, 2023). In other words, when teachers know how to use ChatGPT, have compatible devices for its use and have help in case of doubts, their intention to use it increases. On the other hand, it is found that ANXS has a negative effect on the intention to use ChatGPT (H6). In other words, it is confirmed that there is a significant concern of how the introduction of AI will affect the teaching-learning process and the integrity of the education system. This is consistent with concerns about academic integrity and the use of ChatGPT raised in the literature (Cotton et al., 2023; Sullivan et al., 2023). Regarding the influence of gender BI, it is verified that being a man have a higher influence in BI than being a woman (H7). These results showing differences by gender are consistent with previous research (Sharma & Srivastava, 2020).

However, ANXP does not impact on BI (H4), probably because of the job security that the majority of teachers in the Spanish public university system enjoy. Neither EE (H2) nor ANXU (H5) were found to be predictors of intention to use. There seems to be no relationship between the ease of use of ChatGPT and the anxiety of using it incorrectly and the intention to use it in the future. This may be because ChatGPT's use of natural language

may make it easier to give instructions to the tool. On the other hand, since the university teachers consider themselves qualified to evaluate the results proposed by ChatGPT and, if necessary, to detect and correct any inaccurate results offered by it, their BI is not reduced.

Since the exploratory objective of the paper is to investigate whether the variables that determine men's BI are the same as those associated with women's BI, an analysis of the variables that affect men's and women's BI was carried out. To this end, a regression analysis was performed, dividing the sample according to gender, which led to relevant results. On the one hand, it was found that the variables that influence men's BI are PE and FC. On the other hand, women's BI is influenced, in addition to PE and FC, by ANXU and ANXS. Therefore, it can be concluded that males and females are influenced by different variables when considering the future use of ChatGPT in their academic activities. These results are in line with research on technology adoption that shows differences between men and women (Lakhal & Khechine, 2021; Lane & Lyle, 2011).

6 Implications, Limitations and Future Research Lines

6.1 Theoretical and Practical Implications

This paper makes theoretical contributions by investigating the relationship between the adoption of ChatGPT and the anxiety about negative consequences in the higher education environment. It finds significant relationships in the hypothesized sense and provides evidence on an under-researched topic such as the anxiety that teachers may experience when using a tool that has had a significant impact on the educational world.

The theoretical contributions of this study lie primarily in exploring how the unique features of generative AI technology, such as ChatGPT, influence adoption intentions among university educators. Unlike traditional educational technologies, ChatGPT raises unique anxieties concerning ethical usage, academic integrity, and the potential for shifts in the educator's role. Our study addresses these specific concerns by examining multiple dimensions of technology-related anxiety, which we classify into three categories: student-related anxiety (ANXS), technology usage anxiety (ANXU), and professional impact anxiety (ANXP). These dimensions capture the specific concerns that educators have regarding generative AI, adding depth to our understanding of the adoption process within this context.

In particular, this study highlights that while traditional predictors like performance expectancy (PE) and facilitating conditions (FC) continue to play significant roles, the differential effects of anxiety dimensions underline unique theoretical implications for generative AI technologies. We found that concerns regarding the ethical use of ChatGPT by students and its potential impact on academic integrity (ANXS) negatively affect the behavioral intention to adopt, suggesting a novel angle in technology adoption theories.

In addition, this paper contributes to the understanding of the influence of personal characteristics, such as gender, on technology adoption. It shows how BI of men and women is affected by different variables. This paper shows that gender is a variable that determines the factors that influence the intention to use ChatGPT, and that it is therefore an aspect to be considered in technology adoption. In addition, it was found that male and female teachers analyze the possibility of using ChatGPT in their academic activity in different ways. While for male teachers none of the anxiety-related variables explain their intention to use

ChatGPT, for female teachers both anxiety about using the tool and negative consequences for their students' learning significantly explain their intention to use ChatGPT.

In terms of practical implications, the anxiety generated among teachers by the misuse of ChatGPT by students can be mitigated by training both teachers and students. In this sense, it is necessary to train students in the ethical use of this tool. As Dwivedi et al. (2023), point out, it is crucial to educate students about the benefits, limitations and risks of AI-based chatbots and the value of developing a range of knowledge and skills. In this regard, teachers also need to require students to be able to incorporate the literature references used in completing their assignments, among other things to validate that the assignments are supported by solid texts and not just the ChatGPT response.

Training is also needed for teachers to maximize the use of AI-based tools and to reduce their potential mistrust in the use of them. In this regard, training has been shown to lead to greater user acceptance and success with the technology (García-Peñalvo, 2023; Rudolph et al., 2023; Scherer et al., 2019).

The findings of this work highlight the need to consider the gender of teachers when implementing this technology. The literature has focused on improving institutional policies to reduce the digital gender gap. These policies should focus on the development of women's digital knowledge and skills and technological competences (Acilar & Sæbø, 2023). Educational institutions should provide teachers with the necessary skills to create, adapt and use information and communication technologies, especially those based on generative AI. This training should adopt new training strategies (Huang et al., 2013) that take gender differences into account.

6.2 Limitations and Future Work

In this study, the intention to use ChatGPT was analyzed by testing for the existence of direct relationships. Future work would need to propose a model to capture the moderating and mediating relationships that may exist between the proposed variables, such as the relationship between the independent variables of the study, age and professional experience, and how this interaction affects both intention and behavior.

Another possible line of action would be to reconsider a scale such like the one used to measure ANXP. Given that ANXP was not a significant predictor of BI, despite the profound changes in training proposed by generative AI, it could be assumed that the items used do not fully capture the aspect related to anxiety about new skills.

In addition, the present study provides a cross-sectional analysis of a technology that is relatively new and not widely used, at least for the purposes of professional teaching. As ChatGPT and other similar tools become more common and known, educational institutions tend to limit the use of these technologies and facilitate responsible use in teaching-learning processes. Longitudinal analysis would be needed to see how anxiety and attitudes develop in the future.

In the field of educational technologies, there are open debates about generalizability and validity, especially given the different cultural contexts, participants and technologies analyzed (Scherer et al., 2019). This paper focuses on teachers in Spanish public universities. Ways should be found to disseminate it internationally and conduct comparative work, including private universities where, for example, job security is lower.

7 Conclusion

This study provides an in-depth understanding of the factors influencing university teachers' adoption of ChatGPT in their academic activities, with a specific focus on the role of technology anxiety and gender. The results confirm that both PE and FC play a crucial role in the intention to use ChatGPT. However, the impact of technology on student learning is a source of anxiety that negatively affects the intention to use it. Additionally, gender differences in the factors affecting the intention to use educational technology have been highlighted, emphasizing the need to address these differences in implementation.

These findings provide a strong basis for future research and for developing policies and strategies for implementing technology in education. It is crucial to consider individual perceptions, as well as contextual and gender factors, when promoting the adoption of tools such as ChatGPT among university teachers. By gaining a better understanding of the factors that influence usage intention, more effective strategies can be developed to facilitate the integration of smart technology in teaching and learning.

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Declarations

Competing interests The authors declare that they have no competing interests.

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