UNIVERSITY STUDENTS' PERCEPTIONS OF CHATGPT: FACTORS THAT AFFECT THEIR BEHAVIOURAL INTENTION, USAGE AND UTILITY PERCEIVED

O. Silva[1], J. Nunes[2], Á. Sousa[3]

[1] Universidade dos Açores, CICS.NOVA.UAçores (PORTUGAL)
[2]Universidade dos Açores (PORTUGAL)
[3]Universidade dos Açores, CEEAplA (PORTUGAL)

Abstract

ChatGPT is one of many generative artificial intelligence (AI) tools with the potential to transform education, notably by improving student engagement and making learning more personalized and interactive. However, there are concerns in the educational community about some of its disadvantages, such as its potential to be used for plagiarism and to undermine students' ability to think independently. All potential benefits and disadvantages of using ChatGPT throughout the educational community and especially among higher education students must be properly investigated so that the most appropriate measures can be taken for use.

Given that young people have a strong appetite for technology innovations, it is in everyone's interest that higher education institutions and all their interlocutors implement recommendations for best practices in the use of ChatGPT. In this sense, it is essential that the main determining factors that affect behavioural intentions in relation to ChatGPT and its use are evaluated based on the perceptions of higher education students.

Based on a model adapted from the Unified Theory of Acceptance and Use of Technology (UTAUT1 and UTAUT2), the factors [Performance expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC)] that lead university students to ChatGPT 4.0 (free version) behavioural intention (BI) and use (GPTU) were examined.

The main objective of this study is to test whether factors associated with technology use have significant effects on behavioural intention towards ChatGPT and its use. Other hypotheses were tested, namely whether the use of ChatGPT impacts in the perception of ease of use (PEU) and perceived usefulness (PU), and whether perceived trust (PT) moderates the relationship between the constructs (PE, SI, EE, FC] and Behavioral Intention (BI).

The study was conducted at a Portuguese higher education institution, with 585 students, applying a questionnaire containing 32 items divided into 9 constructs [PE, EE, SI, FC, BI, GPTU, PU, PEU and PT) and sociodemographic variables.

The data were analyzed through Partial Least Square Structural Equation Modelling (PLS-SEM), and all requirements regarding reliability and validity (convergent and discriminant) were duly fulfilled for all constructs present in the model under exploration. Most hypotheses are confirmed by the significant results, being the most preponderant factors of behavioural intention (BI) to use ChatGPT in learning social influence (SI) and facilitating conditions (FC). The use of ChatGPT (GPTU) has significant impacts on perception ease to use (PEU) and perceived utility (PU). Perceived trust reveals a moderating role in the relationship between the constructs (PE, SI, FC] and behavioural intention (BI).

The results obtained could help provide policymakers in Higher Education with information on the determining factors in developing effective and efficient policies to improve the use of ChatGPT in higher education in Portugal.

Keywords: University students' perceptions, ChatGPT, data analysis, PLS-SEM.

1 INTRODUCTION

ChatGPT [Chat Generative Pre-trained Transformer] is a chatbot generated by the OpenAI company which launched the first version in 2022. There has been growing interest among students in using ChatGPT in higher education [1-3]. ChatGPT has the potential to transform teaching methods, enhance educational opportunities, and promote student independence and self-directed learning. However,

there are concerns in the educational community about some of its disadvantages, such as its potential to be used for plagiarism and to undermine students' ability to think independently. All potential benefits and disadvantages of using ChatGPT throughout the educational community and especially among higher education students must be properly investigated so that the most appropriate measures can be taken for use.

This topic is very recent and, although studies are being developed in this area, it is important to understand which variables are most relevant to students when using ChatGPT and their perceptions associated with this emerging technological challenge. All this technological transformation poses learning challenges to the university staff and students. There are still few models of research in this sense, with emphasis on the work of Strzelecki (2023) who adopted “Unified Theory of Acceptance and Use of Technology (UTAUT2)” to examine the variables that influence higher education students’ acceptance and use of ChatGPT in Poland. The research that is presented examines the perceptions of students about use of ChatGPT in a Portuguese higher education institution.

Applying the UTAUT [4] framework to integrate ChatGPT into higher education provides a structured approach to understanding students’ behavioral intentions (BIs). It can enable an understanding of how students’ perceptions of ChatGPT’s capabilities and its potential to contribute positively to their learning experiences directly influence their BIs [5–6].

According to Al-Emran et al. [7], the performance expectancy (PE) is revealed when students believe that ChatGPT can effectively assist them in learning complex topics or boosting overall academic achievement. So, students are more likely to exhibit a positive BI to use ChatGPT for various academic activities. With regard to effort expectancy (EE), it refers to users’ perceptions concerning the degree of simplicity or complexity involved in using the technology [8]. Social influence (SI) considers the impact of peers and instructors in shaping students’ attitudes towards ChatGPT [8]. It manifests when students observe the attitudes, opinions, and behaviors of those around them regarding the incorporation of ChatGPT into education [9]. The concerning facilitating conditions (FCs) factor assesses the availability of necessary resources for the effective use of ChatGPT [10].

The relationship between BI to use ChatGPT and actual usage is a critical aspect of the technology’s adoption and utilization. Venkatesh et al. [10] defined BI as the willingness and readiness of individuals to engage with a particular technology. This intention is often regarded as a direct precursor to the use of the technology [8]. Numerous studies, (e.g., [5,7]) showed that when students convey a positive BI towards ChatGPT, signifying their readiness to include it in their routines or tasks, there is a heightened probability this intention being translated into actual use. Furthermore, the more substantial the intention to use ChatGPT, the more likely students are to engage in active interaction with the platform and integrate it into their academic activities [10]. Perceived ease of use (PEU) refers to the degree to which users perceive a technology to be easy to understand, learn, and operate. Ease of use is a critical determinant of technology acceptance, as users are more likely to adopt and utilize ChatGPT if they find it intuitive, user-friendly, and accessible [11]. A study by Na et al. [12] indicated that students’ perceptions of ChatGPT’s ease of use significantly influenced their attitudes and intentions towards using the technology for academic purposes [12].

Perceived usefulness (PU) refers to the extent to which users believe that ChatGPT will enhance their performance, productivity, and learning outcomes [11]. Users are more likely to accept and adopt ChatGPT if they perceive it to be useful in achieving their educational goals, such as improving understanding, retention, and application of course materials. Examining the perceived usefulness of ChatGPT in facilitating collaborative learning activities among students, Rudolph et al. (2023) indicated that students valued ChatGPT for its ability to facilitate discussions, provide explanations, and support problem-solving tasks, contributing to their acceptance and engagement with the technology [13].

Perceived Trust (PT) in ChatGPT refers to users’ confidence in the reliability, accuracy, and security of the technology in helping and guidance [14]. Trust is essential for fostering users’ confidence and reliance on ChatGPT, particularly in higher education contexts where the accuracy and credibility of information are crucial.

Acceptance and use of ChatGPT in higher education refer to students’ overall willingness and readiness to embrace and utilize ChatGPT as a valuable tool for enhancing teaching and learning [15, 16, 17]. Acceptance reflects users’ overall receptiveness to and endorsement of ChatGPT, encompassing their attitudes, intentions, and behaviors towards the technology. Recent research by Bilquise et al. (2024) [18] indicated that factors such as perceived usefulness, ease of use, trust, and social influence significantly influenced students’ acceptance and use of ChatGPT in higher education [18, 19].

A summary of all the relationships in the research conceptual framework is presented in Figure 1.

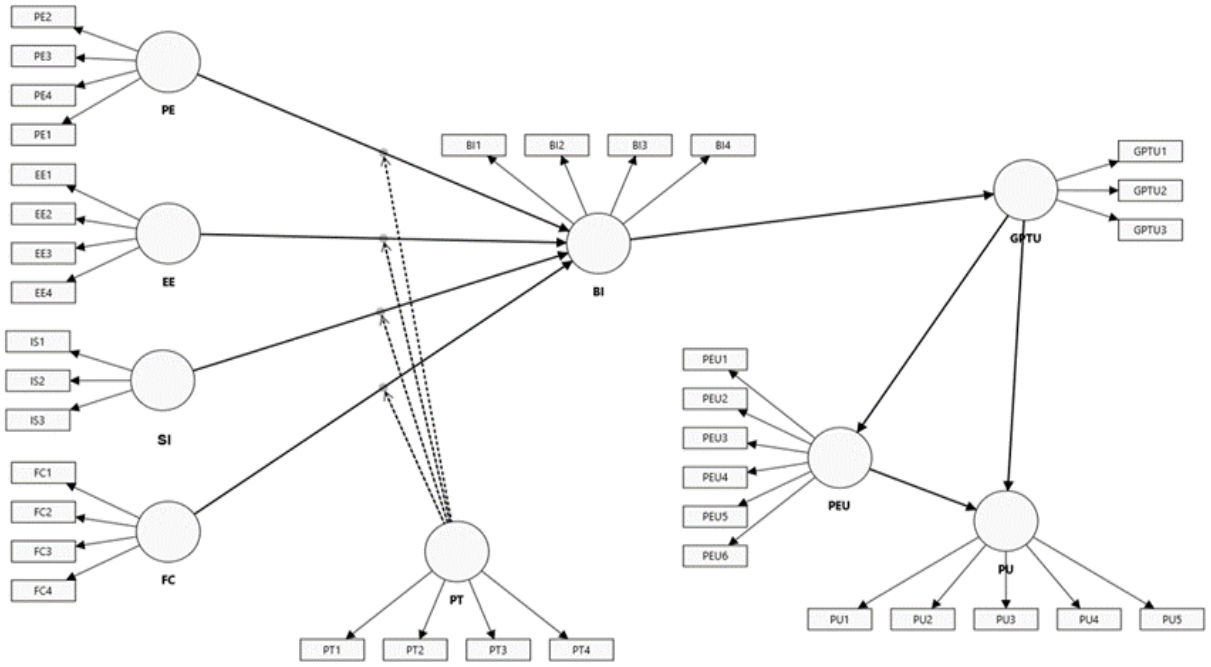

Figure 1. The conceptual model.

2 METHODOLOGY

A total of 585 university students participated in the survey regarding their perceptions towards the adoption and use of ChatGPT for higher education. Data were collected through a combination of online and physical survey administration methods during the second semester of 2023/2024 lective year (from May to June 2024) at a Portuguese university. The survey instrument comprised several factors [Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Behavioral Intention (BI), Use of ChatGPT (GPTU), Perception Ease to Use (PEU), Perceived Utility (PU), and Perceived Trust (PT)] and corresponding items, as detail in Table 1.

This research attempts to test the following hypotheses:

- H1: Performance Expectancy (PE) has effect on Behavioral Intention (BI)
- H2: Effort Expectancy (EE) has effect on Behavioral Intention (BI)
- H3: Social Influence (SI) has effect on Behavioral Intention (BI)
- H4: Facilitating Conditions (FC) has effect on Behavioral Intention (BI)
- H5: Behavioral Intention (BI) has effect on Use of ChatGPT (GPTU)
- H6: Use of ChatGPT (GPTU) has effect on Perception Ease to Use (PEU)
- H7: Use of ChatGPT (GPTU) has effect on Perceived Usefulness (PU)
- H8: Perception Ease to Use (PEU) has effect on Perceived Usefulness (PU)
- H9a: Perceived Trust (PT) moderates the impact of Facilitating Conditions (FC) on Behavioral Intention (BI)
- H9b: Perceived Trust (PT) moderates the impact of Social Influence (SI) on Behavioral Intention (BI)
- H9c: Perceived Trust (PT) moderates the impact of Effort Expectancy (EE) on Behavioral Intention (BI)
- H9d: Perceived Trust (PT) moderates the impact of Performance expectancy (PE) on Behavioral Intention (BI).

The data collected were analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine the relationships between the proposed constructs and their impact on the use of ChatGPT, as well as other perceptions associated with trust, ease of use and usefulness among university students.

Table 1. Measurement items for the constructs.

Performance expectancy [PE] Venkatesh et al. (2003); Venkatesh, Thong, and Xu (2012)
PE1. ChatGPT is useful to carry out my tasks.
PE2. Using ChatGPT would increase my work efficiency.
PE3. Using ChatGPT would improve the quality of my tasks.
PE4. Using ChatGPT would allow me to be more comfortable at work.
Effort Expectancy [EE] Venkatesh et al. (2003); Venkatesh, Thong, and Xu (2012)
EE1. It's easy to log in to the ChatGPT page.
EE2. My interactions with my mobile phone and transaction terminals when using ChatGPT are clear and understandable.
EE3. I find it easy to use ChatGPT.
EE4. It's easy for me to acquire skills in using ChatGPT.
Social Influence [SI] Venkatesh et al. (2003); Venkatesh, Thong, and Xu (2012)
SI1. My friends think I should use ChatGPT.
SI2. My family thinks I should use ChatGPT.
SI3. People who influence my behavior use ChatGPT.
Facilitating Conditions [FC] Venkatesh et al. (2003); Venkatesh, Thong, and Xu (2012)
FC1. I have the resources needed to use ChatGPT.
FC2. I have the necessary knowledge to use ChatGPT.
FC3. ChatGPT is compatible with the existing technology I use.
FC4. Can I get help from others when I have difficulty using ChatGPT.
Behavioral Intention [BI] Ashfaq et al., (2020); Balakrishnan, Abed, and Jones (2022)
BI1. I plan to use ChatGPT.
BI2. I like using ChatGPT.
BI3. I intend to continue using ChatGPT.
BI4. I will recommend my friends to use ChatGPT.
Use of ChatGPT [GPT] Patil et al. (2020)
GPT1. I frequently use ChatGPT.
GPT2. I depend on ChatGPT to learn.
GTP3. I use all ChatGPT functions.
Perception of Ease of Use [PEU] Gumbo, L. C., Halimani, D., & Diza, M. (2017)
PEU1. ChatGPT would be flexible and easy to use.
PEU2. ChatGPT would be easy to access for my studies.
PEU3. It would be easy and clear to interact with ChatGPT.
PEU4. I believe the skills needed to use ChatGPT are easy.
PEU5. It would be easy for me to access study-related information on ChatGPT.
PEU6. It would be easier to get things done and resolve queries using ChatGPT than if you didn't use it.
Perceived Usefulness (PU) Gumbo, L. C., Halimani, D., & Diza, M. (2017)
PU1. ChatGPT is useful for my studies.
PU2. I feel like if I used ChatGPT I would learn better.
PU3. ChatGPT would answer all my queries and provide answers as per my expectations.
PU4. ChatGPT would help me improve learning efficiency and quality.
PU5. ChatGPT would provide immediate access to study questions regardless of my location.
Perceived Trust [PT] Patil et al. (2020
PT1. I feel that interacting with ChatGPT would be secure enough.
PT2. I trust that my activities when interacting with ChatGPT will be private and secure.
PT3. I feel that my data available on ChatGPT will be kept confidential.
PT4. Overall, I feel like no one will be able to access my personal information on ChatGPT.

The PLS-SEM analysis was conducted using SmartPLS 4 [20]. The measurement model quality assessment includes an evaluation of convergent validity and discriminant validity. Convergent validity is assessed by analyzing the factor loadings of items, where higher loadings (above 0.7) indicate stronger relationships between items and their respective constructs (satisfactory convergent validity). Factor loadings represent the strength and direction of the relationship between each item and its underlying construct [21]. Common indicators used to assess convergent validity include factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). Generally, factor loadings above 0.7, Cronbach's alpha exceeding 0.7, CR above 0.7, and AVE greater than 0.5 are considered acceptable [21].

Discriminant validity analysis assesses the extent to which constructs in a measurement model are distinct from one another. Two common methods used for this purpose are the Heterotrait-Monotrait (HTMT) ratio and the Fornell-Larcker criterion [21, 22]. HTMT Ratio: The HTMT ratio compares the correlations between constructs to assess discriminant validity. A commonly used threshold value is 0.9, where values below this threshold indicate adequate discriminant validity [22].

Fornell-Larcker Criterion: The Fornell-Larcker criterion compares the square root of the AVE of each construct with the correlations between constructs. A construct's AVE should be greater than its correlations with other constructs to demonstrate discriminant validity [23].

3 RESULTS

Tables 2 and 3 present the results for the convergent and discriminant validity of the constructs in the measurement model under evaluation.

In Table 2, the values of Cronbach's alpha coefficient for all constructs exceeded the threshold of 0.7, indicating good internal consistency reliability. Additionally, composite reliability values ranging from 0.82 to 0.94 were observed, surpassing the recommended threshold of 0.7. This suggests that the measurement model is reliable and consistent in measuring the constructs. Moreover, average variance extracted values ranging from 0.54 to 0.84 were obtained, meeting the criterion of exceeding 0.5. These findings provide assurance regarding the accuracy and consistency of the survey instrument in measuring the intended constructs, enhancing the robustness of subsequent data analysis.

Table 2. Reliability and convergent validity indicators.

	Cronbach's Alpha	*Composite Reliability*	*Average Variance Extracted (AVE)*
BI	0,749	0,843	0,575
EE	0,787	0,864	0,618
FC	0,729	0,825	0,542
GPTU	0,801	0,883	0,717
SI	0,911	0,942	0,844
PE	0,880	0,916	0,731
PEU	0,910	0,929	0,686
PT	0,845	0,894	0,679
PU	0,904	0,929	0,722

As shown in Table 3, all ratios (Fornell and Larcker's and Heterotrait-Monotrait (HTMT)) remain below the specified threshold of 0.9, confirming discriminant validity. Additionally, the square root of the AVE for each construct exceeded its correlations with all other constructs (see Table 3).

Table 3. Discriminant Validity – Fornell larker Criterion and Heterotrait-Monotrait Ratio (HTMT).

	BI	*EE*	*FC*	*GPTU*	*SI*	*PE*	*PEU*	*PT*	*PU*
BI	**0,758**	[0,241]	[0,216]	[0,687]	[0,207]	[0,150]	[0,262]	[0,230]	[0,398]
EE	0,186	**0,786**	[0,087]	[0,105]	[0,804]	[0,445]	[0,176]	[0,065]	[0,404]
FC	0,169	-0,035	**0,736**	[0,113]	[0,058]	[0,089]	[0,166]	[0,627]	[0,092]
GPTU	0,536	-0,070	0,091	**0,847**	[0,372]	[0,182]	[0,244]	[0,117]	[0,357]
SI	0,174	0,685	-0,041	-0,316	**0,919**	[0,047]	[0,254]	[0,042]	[0,043]
PE	0,125	0,382	-0,053	0,150	-0,012	**0,855**	[0,127]	[0,028]	[0,896]
PEU	0,046	-0,152	0,147	0,140	-0,229	-0,122	**0,828**	[0,150]	[0,124]
PT	0,189	0,031	0,479	0,086	-0,001	0,002	0,141	**0,824**	[0,046]
PU	-0,325	-0,349	0,025	-0,305	-0,023	-0,805	0,111	-0,031	**0,850**

• *Bold figures show the square root of AVE; HTMT ratios are shown in brackets.*

The findings of the hypothesis test provide important insights into the relationships between several dimensions affecting ChatGPT's use in the context of higher education. As shown in Table 4, we investigated and confirmed almost all hypotheses and it was observed that Behavioral Intention (BI) is

significantly and positively affected by Performance Expectancy (PE) (β=0.121, p=0.004), Social Influence (SI) (β = 0.160, p = 0.002), and Facilitating Conditions (FC) (β = 0.123, p = 0.005), thereby providing support for H1, H3, and H4. In contrast, the hypothesis suggesting that Effort Expectancy (EE) influences Behavioral Intention (BI) is not supported, as indicated by the non-significant p-value of 0.629, leading to the rejection of H2.

The hypothesis (H5) that Behavioral Intention (BI) affects the Use of ChatGPT (GPTU) is strongly supported (β = 0.536, p = 0.000). This implies that Behavioral Intention to adopt ChatGPT for educational purposes is highly predicted by the users' desire to use it.

Use of ChatGPT (GPTU) has a significant effect on Perceived Ease of Use (PEU) (β=0.140, p=0.008) and Perceived Usefulness (PU) (β =-0.327, p=0.000), thereby supporting H6 and H7.

The hypothesis (H8) that Perceived Ease of Use (PEU) positively predicts Perceived Usefulness (PU) is also supported (β=0.157, p=0.000). This implies that users who perceive ChatGPT as easier to use are more likely to recognize its usefulness.

Table 4. Results of tested hypotheses.

	Coefficient (B)	***T Statistics***	***p-value***
H1: PE -> BI	0,121	2,864	***0,004***
H2: EE -> BI	0,027	0,483	0,629
H3: SI -> BI	0,160	3,029	***0,002***
H4: FC -> BI	0,123	2,837	***0,005***
H5: BI -> GPTU	0,536	12,382	**0,000**
H6: GPTU -> PEU	0,140	2,666	**0,008**
H7: GPTU -> PU	-0,327	7,305	**0,000**
H8: PEU -> PU	0,157	4,063	**0,000**
H9a: PT x PE -> BI	-0,194	2,770	**0,007**
H9b: PT x EE -> BI	0,056	0,761	0,447
H9c: PT x SI -> BI	-1,063	1,927	**0,044**
H9d: PT x FC -> BI	0,115	2,450	**0,023**

Perceived trust (PT) significantly moderates the relationship between: Performance expectancy (PE) and Behavioral Intention (BI) (β=-0.194, p=0.007); Social Influence (SI) and Behavioral Intention (BI) (β=-1.063, p=0.044); and Facilitating Conditions (FC) and Behavioral Intention (BI) (β=0.115, p=0.023), Supporting H9a, H9c, and H9d.

4 CONCLUSIONS

Most hypotheses are confirmed by the significant results. The most influential factors on behavioural intention (BI) to use ChatGPT in learning were Performance Expectancy (PE), Social Influence (SI) and Facilitating Conditions (FC). The use of ChatGPT (GPTU) significantly impacts Perceived Ease of Use (PEU) and Perceived Usefulness (PU). Perceived trust (PT) plays a moderating role in the relationship between the constructs [PE, SI, FC] and behavioural intention (BI). On contrary, the hypothesis (H2) suggesting that Effort Expectancy (EE) influences Behavioral Intention (BI) is not supported by the results.

This study incorporates the constructs deemed most relevant according to recent literature, enabling a better understanding of the factors that influence the use of ChatGPT and the perceptions that higher education students reveal about the interrelationships established between these constructs. Thus, these insights provide a more comprehensive and holistic view of the dynamics associated with the use of ChatGPT and provide some clues for developing strategies to create and implement rules for the suitable use of artificial intelligence by students in higher education to improve their learnings.

In conclusion, the findings underscore the critical importance of Performance Expectancy (PE), Social Influence (SI), and Facilitating Conditions (FC) as key determinants of Behavioural Intention (BI) to use

ChatGPT in the learning process. The significant impact of ChatGPT usage (GPTU) on Perceived Ease of Use (PEU) and Perceived Usefulness (PU) highlights the direct effect of the technology on students' perceptions of its effectiveness and accessibility. Additionally, the moderating role of Perceived Trust emphasises the complexity of the relationships between some constructs (namely, PE, SI, and FC) and behavioural Intention (BI).

These insights not only deepen the understanding of the factors influencing the adoption of AI tools like ChatGPT but also provide a robust foundation for developing strategies and guidelines aimed at promoting the responsible and beneficial use of technology in higher education. By considering these perceptions and dynamics, educational institutions can craft more effective policies that foster the productive and ethical integration of artificial intelligence within the academic environment.

The results obtained could assist policymakers by highlighting the determining factors and guiding the development of effective policies to enhance the use of ChatGPT in higher education in Portugal. However, in order for students' receptivity and expectations to be met, it is necessary to design appropriate teaching methods that lead to effective learning that minimizes risks and takes advantage of the benefits of using ChatGPT.

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