

ChatGPT's role in Higher Education: Functional capabilities, and their impact on student satisfaction

Ruggero Colombari^{ID}, Frederic Marimon^{ID}, Marta Mas-Machuca^{ID}

Department of Economy and Business Organization, Universitat Internacional de Catalunya, Spain.

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Abstract

This study investigates how ChatGPT is perceived and utilized by university students who use it for academic writing, summarizing and brainstorming. It examines what drives satisfaction beyond usage frequency and ease of use, focusing on three core functional capabilities: quality of information, learning facilitation, and human language interaction. Structural modeling techniques applied to survey data reveal that student satisfaction is shaped by how these capabilities are experienced, along with perceptions of clarity and usability. The results highlight that educational impact depends not only on access to technology but also on how well AI tools align with students' academic needs and expectations. The study concludes with practical recommendations for educators and institutions seeking to integrate generative AI effectively in higher education.

Keywords: ChatGPT; generative AI; higher education; functional capabilities; student satisfaction; AI in education.

1. Introduction

Generative AI tools, particularly ChatGPT, have emerged as transformative assets in education. By offering personalized support, reliable information, and natural language interactions, ChatGPT enhances learning efficiency and fosters engagement. As Parasuraman and Colby (2014) highlight, readiness to embrace advanced technologies is critical to unlocking their potential. However, this study reveals that simply increasing usage frequency does not directly lead to satisfaction. Instead, functional capabilities and comparative ease and clarity act as key mediators in transforming usage into a fulfilling experience. ChatGPT's functional capabilities are defined across three dimensions: quality of information, which emphasizes accuracy, relevance, and reliability; learning facilitation, focusing on providing tailored support and problem-solving strategies; and human language interaction, which enhances accessibility

through natural, conversational exchanges. These dimensions, combined with ease of use, highlight the need for tools that not only perform well but are also intuitive and engaging.

2. Theoretical background and hypotheses

The Technology Acceptance Model (TAM) serves as the theoretical foundation for understanding the role of functional capabilities and usability in mediating satisfaction. Davis (1989) emphasized that perceived usefulness and ease of use are fundamental to technology adoption. Similarly, Parasuraman et al. (1988) stress the importance of service quality in shaping user satisfaction. Prior studies have also shown that effective communication and user-friendly design enhance satisfaction with AI-driven systems (Slaam et al, 2023, Ngo, 2023). This study develops the following hypotheses, summarized in Figure 1:

- H1: ChatGPT usage frequency positively influences perceptions of functional capabilities.
- H2: ChatGPT usage frequency positively influences perceptions of comparative ease and clarity.
- H3: Functional capabilities positively influence overall student satisfaction with ChatGPT.
- H4: Comparative ease and clarity positively influence overall student satisfaction with ChatGPT.
- H5: Functional capabilities mediate the relationship between usage frequency and student satisfaction.
- H6: Comparative ease and clarity mediate the relationship between usage frequency and student satisfaction.

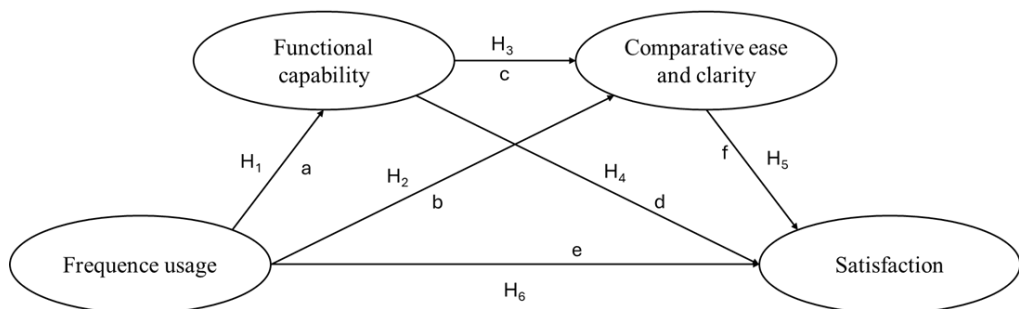


Figure 1. Research model.

3. Methodology

This study surveyed 610 university students, collecting data on ChatGPT usage, functional capabilities, comparative ease and clarity, and satisfaction. Constructs were measured using validated scales on a 5-point Likert scale, adapted from prior studies to ensure reliability and contextual relevance. The data were analyzed using structural equation modeling (SEM) to examine both direct and indirect effects. Table 1 shows loadings of the Exploratory Factor Analyses.

Table 1. Matrixes of the components extracted using PCA and Varimax rotation.

Usage frequency

	(1) Usage frequency	(2) -
UFR7	0.809	0.194
UFR5	0.774	0.131
UFR1	0.758	0.266
UFR3	0.635	0.305
UFR4	0.513	0.484
UFR8	0.110	0.744
UFR10	0.163	0.644
UFR9	0.274	0.621
UFR11	0.218	0.621
UFR2	0.443	0.527
UFR6	0.424	0.432

Comparative ease and clarity

	(1) Comparative ease of use and clarity
RPL1	0.870
RPL3	0.785
RPL2	0.767

Satisfaction

	(1) Satisfaction
SAT2	0.905
SAT3	0.837
SAT1	0.798

Functional capabilities

	(1) Information quality	(2) Learning facilitation	(3) Human lang. interaction
CAP4	0.774	0.124	0.164
CAP6	0.736	0.125	0.194
CAP7	0.724	0.203	0.202
CAP5	0.663	0.227	-0.029
CAP9	0.210	0.868	0.147
CAP10	0.214	0.863	0.185
CAP8	0.194	0.835	0.130
CAP2	0.196	0.104	0.831
CAP1	0.354	0.094	0.711
CAP3	-0.029	0.199	0.684

The reliability and discriminant validity were assessed through the recommended statistics: alpha of Cronback, composite reliability, average of extracted variance (AVE); and the correlations among constructs compared with the square root of AVE (Hair et al., 2010, Nunnally and Bernstein, 1994).

4. Results

The structural equation modeling (SEM) analysis revealed strong support for the proposed dual-mediation model, with key fit indices indicating excellent model fit. The Comparative Fit Index (CFI) was 0.948, exceeding the recommended threshold of 0.90, while the Root Mean Square Error of Approximation (RMSEA) was 0.052, with a 90% confidence interval between 0.050 and 0.053, meeting the commonly accepted standard of 0.06 or lower. These results suggest that the hypothesized model is well-specified and adequately represents the data. See the standardized coefficients alongside with its t-values on the arrows of Figure 2.

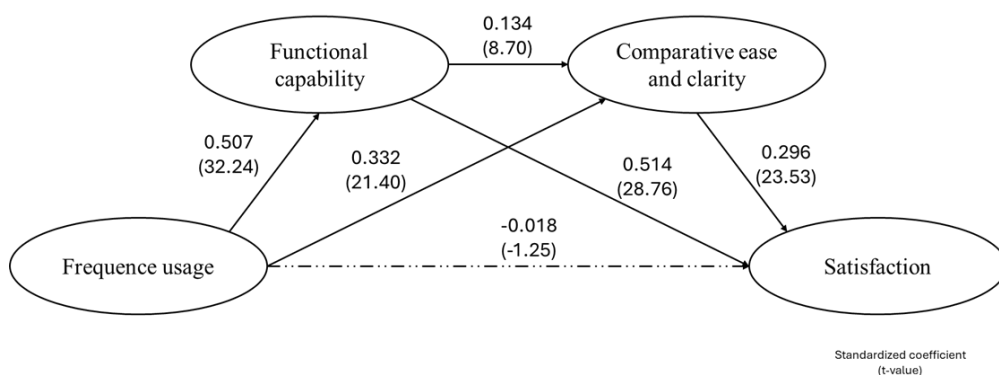


Figure 2. Research model with standardized coefficients.

The findings confirm that usage frequency does not directly lead to satisfaction, as the direct effect was insignificant. Instead, satisfaction is fully mediated by two key factors: functional capabilities and comparative ease and clarity. Functional capabilities contribute to satisfaction by delivering accurate information, facilitating autonomous learning, and engaging users in human-like interactions. This finding underscores the value of ChatGPT's ability to provide personalized and effective educational support, aligning with prior studies that emphasize the importance of service quality in user satisfaction (Parasuraman et al., 1988; Sallam et al., 2023).

Comparative ease and clarity further enhance satisfaction by ensuring that ChatGPT is perceived as intuitive and efficient compared to alternative resources. These results highlight that user

satisfaction arises from both the quality of the tool's functionalities and the simplicity of its interactions, emphasizing the importance of seamless usability in educational contexts.

5. Conclusions and Contributions

This study highlights the critical role of functional capabilities and usability in maximizing satisfaction with ChatGPT. The findings suggest that satisfaction arises not from frequent usage alone but from the interplay between what the tool can do and how intuitively it delivers its features. By introducing the construct of functional capabilities, categorized into quality of information, learning facilitation, and human language interaction, this research provides a detailed framework for understanding how ChatGPT supports learning.

For practitioners, the study emphasizes the need to enhance ChatGPT's usability, ensure reliable and relevant outputs, and foster natural interactions that meet user expectations effectively. Developers should focus on refining both functionality and ease of use to ensure the tool delivers meaningful educational value. Policymakers and educators can leverage these findings to integrate generative AI responsibly, ensuring it complements traditional learning methods while maintaining academic integrity.

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