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Excessive use of artificial intelligence in accounting undergraduate courses: risks of technological dependence on the development of analytical skills

Uso excesivo de inteligencia artificial en las carreras de contabilidad: riesgos de la dependencia tecnológica en el desarrollo de habilidades analíticas

Uso excessivo da inteligência artificial na graduação em contabilidade: riscos da dependência tecnológica para o desenvolvimento de habilidades analíticas

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Abstract

Purpose: To analyze students' and lectures' perceptions about the effects of the excessive use of Generative Artificial Intelligence among students enrolled in the Bachelor's Degree in Accounting Sciences at a public higher education institution.

Methodology: A mixed-methods approach was adopted, combining quantitative and qualitative procedures. The quantitative approach was administered through structured questionnaires to 204 Accounting students, enabling the measurement of variables and the identification of statistical patterns using Pearson's correlation. The qualitative approach consisted of semi-structured interviews with accounting lectures, allowing and in-depth understanding of subjective perceptions regarding the use of Generative Artificial Intelligence in the teaching-learning process. This methodological combination enabled an integrated and consistent analysis of the impacts of the excessive use of such tools on academic training and the development of analytical skills essential to accounting practice.

Results: The analysis revealed significant associations between variables, including between the frequency of use of Generative Artificial Intelligence and the perceived impairment of intellectual autonomy, autonomy and risk to professional education, as well as between analytical reasoning and risk to professional education. Negative correlations were also observed between the clarity of institutional guidelines and variables such as autonomy, analytical reasoning and professional education. The interviews highlighted lecturers' concerns regarding superficial learning and the loss of critical skills among students.

Study Contributions: The findings highlight the risks associated with the excessive use of Generative Artificial Intelligence tools, highlighting that, although they have the potential to support the learning process, their indiscriminate use can compromise the development of fundamental skills for accounting practice, requiring pedagogical interventions that encourage the conscious, critical, and responsible use of Artificial Intelligence within the university environment.

Keywords: Generative Artificial Intelligence; Analytical Skills; Accounting Education; Higher Education; Professional Ethics.

Resumen

Objetivo: Analizar la percepción de estudiantes y docentes sobre los efectos del uso excesivo de la Inteligencia Artificial Generativa entre estudiantes de la Licenciatura en Ciencias Contables de una institución de educación superior pública.

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Metodología: Un enfoque mixto que combina procedimientos cuantitativos y cualitativos. El enfoque cuantitativo se administró mediante cuestionarios estructurados a 204 estudiantes de Contabilidad, lo que permitió la medición de variables y la identificación de patrones estadísticos mediante la correlación de Pearson. El enfoque cualitativo consistió en entrevistas semiestructuradas con docentes de contabilidad, lo que permitió una comprensión más profunda de las percepciones subjetivas sobre el uso de la Inteligencia Artificial Generativa en el proceso de enseñanza-aprendizaje. Esta combinación metodológica permitió un análisis integrado y consistente de los impactos del uso excesivo de estas herramientas en la formación académica y el desarrollo de habilidades analíticas esenciales para la práctica contable.

Resultados: El análisis reveló asociaciones significativas entre variables como la frecuencia del uso de la Inteligencia Artificial Generativa y la percepción de autonomía intelectual comprometida, autonomía y riesgo para el desarrollo profesional, así como entre el razonamiento analítico y el riesgo para el desarrollo profesional. También se observaron correlaciones negativas entre la claridad de las directrices institucionales y variables como la autonomía, el razonamiento analítico y el desarrollo profesional. Las entrevistas pusieron de relieve la preocupación del profesorado por la superficialidad del aprendizaje y la pérdida de habilidades de pensamiento crítico entre los estudiantes.

Contribuciones del Estudio: Los hallazgos resaltan los riesgos del uso excesivo de herramientas de Inteligencia Artificial Generativa, resaltando que, si bien tienen el potencial de apoyar el proceso de aprendizaje, su uso indiscriminado puede comprometer el desarrollo de habilidades fundamentales para la práctica contable, requiriendo intervenciones pedagógicas que fomenten el uso consciente, crítico y responsable de la Inteligencia Artificial en el entorno universitario.

Palabras clave: Inteligencia Artificial Generativa; Habilidades Analíticas; Formación Contable; Educación Superior; Ética Profesional.

Resumo

Objetivo: Analisar a percepção de discentes e docentes sobre os efeitos do uso excessivo de Inteligência Artificial Generativa entre estudantes do curso de Bacharelado em Ciências Contábeis em uma instituição pública de ensino superior.

Metodologia: Abordagem mista, combinando procedimentos quantitativos e qualitativos. A vertente quantitativa foi aplicada por meio de questionários estruturados direcionados a 204 estudantes de Ciências Contábeis, permitindo mensuração de variáveis e identificação de padrões estatísticos com o uso da correlação de Pearson. Já a abordagem qualitativa consistiu em entrevistas semiestructuradas com docentes da área contábil, possibilitando a compreensão aprofundada das percepções subjetivas acerca do uso da Inteligência Artificial Generativa no processo de ensino-aprendizagem. Essa combinação metodológica permitiu uma análise integrada e consistente dos impactos do uso excessivo de tais ferramentas na formação acadêmica e no desenvolvimento das competências analíticas essenciais à prática contábil.

Resultados: A análise revelou associações significativas entre variáveis, como entre a frequência de uso de Inteligência Artificial Generativa e a percepção de comprometimento da

autonomia intelectual, da autonomia e o risco à formação profissional, e entre o raciocínio analítico e o risco à formação. Também foram observadas correlações negativas entre a clareza das diretrizes institucionais e variáveis como autonomia, raciocínio analítico e formação. As entrevistas evidenciaram a preocupação dos docentes quanto à superficialidade das aprendizagens e à perda de habilidades críticas entre os discentes.

Contribuições do Estudo: Os achados evidenciam os riscos do uso excessivo de ferramentas de Inteligência Artificial Generativa, destacando que, embora apresentem potencial para apoiar o processo de aprendizagem, seu uso indiscriminado pode comprometer a construção de competências fundamentais à atuação contábil, exigindo intervenções pedagógicas que estimulem o uso consciente, crítico e responsável da Inteligência Artificial no ambiente universitário.

Palavras-chave: Inteligência Artificial Generativa; Habilidades Analíticas; Formação Contábil; Ensino Superior; Ética Profissional.

1 Introduction

The growing incorporation of technologies into the university environment has transformed the way students access, process and apply knowledge, particularly because of their ability to optimise repetitive tasks and facilitate the interpretation of complex data (Zhai *et al.*, 2023; George & Wooden, 2023). However, this new reality raises important questions, chiefly because of the scarcity of empirical evidence on the drivers of its adoption and its consequences for student learning (Dalalah & Dalalah, 2023). Studies indicate that the recurrent use of these tools may affect intellectual autonomy and the development of higher-order cognitive skills, such as analytical thinking, logical reasoning and decision-making—competences that are essential to professional practice, especially in accounting (Dergaa *et al.*, 2023; Peters *et al.*, 2024; Yilmaz & Yilmaz, 2023).

Against this backdrop, concern has grown regarding the excessive use of Artificial Intelligence (AI) in the education of accountants, given that their competences are increasingly linked to the use of technology, which is transforming accounting practice (Leitão, 2024). Contemporary accountants must interpret complex data, support strategic decision-making and keep pace with regulatory and legislative changes, while remaining alert to the risks of the indiscriminate use of AI, particularly when it replaces critical reasoning and the autonomous construction of knowledge (IBRACON, 2023, p. 15; Holanda & Negreiros, 2024; Barbosa, 2022; Abbas *et al.*, 2024).

Araujo and Cornacchione (2024) emphasise that AI automates operational tasks, enabling accountants to act more strategically, while Lang (2024) notes that the ongoing improvement of these technologies is redefining professional competences. In the academic environment, Azevedo *et al.* (2023) report the growing use of Generative AI by students, even in the presence of warnings about possible errors (Bahroun *et al.*, 2023), which worries specialists because it may replace cognitive effort and the critical construction of knowledge (Keller, 2023; Azambuja & Silva, 2024; Rodrigues *et al.*, 2023; Chan, 2023; Ray, 2023).

In this context, it becomes clear that, despite the automation of tasks carried out by students and professionals, the indiscriminate use of AI may compromise competences essential to accounting practice (Holanda & Negreiros, 2024), in addition to contributing to the

superficial consumption of information and a false sense of learning (Barbosa, 2022), since AI tools are based on the description and prediction of patterns, without providing explanations grounded in causal mechanisms and restricted to probabilistic patterns, lacking the analytical depth characteristic of the human intellect (Chan, 2023; Chomsky, 2023).

Thus, in view of the impacts that AI may cause through its frequent use (Abbas *et al.*, 2024), this study seeks to answer the following research question: **what are the perceptions of students and lecturers regarding the effects of the excessive use of Generative AI among students enrolled in the undergraduate Accounting programme at a public higher education institution?** Accordingly, the objective of this research is to analyse the perceptions of students and lecturers regarding the effects of the excessive use of Generative Artificial Intelligence among students enrolled in the undergraduate Accounting programme at a public higher education institution.

Previous studies have focused on analysing how the indiscriminate use of AI tools may trigger new cognitive and personal challenges, such as procrastination, memory loss and a decline in academic performance (Abbas *et al.*, 2024), as well as on discussing how these technologies tend to redefine the environment and the professional competences of accounting (Holanda & Negreiros, 2024; Lang, 2024). Despite these advances, empirical studies that specifically investigate the excessive use of Generative AI in undergraduate Accounting Sciences programmes, articulating its perceived effects on intellectual autonomy, analytical reasoning and professional education in local contexts, remain scarce. The discussion is still incipient, both because of the novelty of the phenomenon and because of the speed with which these tools have been incorporated into everyday academic life, which reinforces the need for research that takes into account different institutional and regional realities.

In this regard, the choice of this topic is justified by the urgency of understanding how the intensification of AI use affects competences that are central to the work of accountants, especially in programmes that train professionals for a market that is strongly digitalised, data-oriented and supported by intelligent automation. By covering Bachelor of Accounting students from higher education institutions located in the city of Recife – PE, this study contributes by offering a detailed picture of a specific regional context, generating evidence that may in future be compared with findings from other locations and may support important decisions in different institutions. In this way, the results have the potential to inform pedagogical, curricular and regulatory decisions in different higher education institutions and professional bodies, as well as to guide students and lecturers in building more informed and critical practices in the use of AI in accounting education.

The relevance of the research is also grounded in the normative guidelines of the profession. NBC PG 12 (R4), approved by the Accounting Federal Council (with Brazil acronym CFC) in 2023, regulates the Continuing Professional Education Programme (CPEP) and requires the continuous updating of accountants' technical and behavioural competences, providing that continuing education should encompass productivity, technical mastery, service quality, interpersonal development and strategic management capacity, thereby ensuring the ethical and qualified exercise of the profession (CFC, 2023). Complementarily, International Education Standard 3 (IES 3), issued by IFAC, defines essential competences distributed across four areas: intellectual, interpersonal and communication, personal and organisational. In addition, it establishes that, in the intellectual sphere, professionals must critically evaluate information from multiple sources, develop investigation, logical reasoning and critical analysis, and identify and solve problems with autonomy and technical discernment (IFAC, 2025).

In this context, by analysing the extent to which the excessive use of Generative AI may compromise these competences, the study offers relevant evidence for different stakeholder groups: degree programmes and higher education institutions, which need to formulate policies for the use of AI; professional councils and bodies, which are responsible for ensuring that education adheres to professional standards; and the students themselves, who recognise risks to their education and may benefit from guidance for a more informed use of technology (Smith *et al.*, 2024; Zelaya-Guzmán *et al.*, 2024).

2 Literature Review

2.1 Excessive Use of Generative Artificial Intelligence: Implications for Higher Education

Competence is an ancient concept, present since the Code of Hammurabi, in 1750 BC, when authority and capacity to govern were attributed to a sovereign. In the modern context, McClelland (1973), in his article *Testing for competence rather than for intelligence*, questioned the effectiveness of theoretical tests as assessment instruments, arguing that competence should be measured through the direct observation of performance. Thus, a driver's aptitude, for example, could only be validly ascertained while driving a vehicle, rather than through traditional examinations.

In the contemporary accounting landscape, the evolution of competences reflects the Industrial Revolution 5.0 and the digitalisation of organisational processes, requiring not only technical mastery but also advanced digital skills and multidisciplinary sensitivity (Alia & Lestari, 2025). The accountant's profile has come to demand adaptive, critical and analytical competences, in line with the increasing complexity of business environments (Araújo, 2024; Severino & Silva, 2024). The World Economic Forum (2025) emphasises that analytical thinking, lifelong learning, creativity and the ability to solve complex problems have become essential. In parallel, IES 2 recommends that accountants master information and communication technologies for data analysis and the optimisation of organisational processes (IFAC, 2025).

In this context, AI tools have played a leading role in redefining accounting functions. Techniques such as machine learning and natural language processing enable the analysis of large volumes of financial and operational data, the identification of patterns and the proposal of accurate recommendations (Moreira, 2024). The automation of routine tasks through Robotic Process Automation (RPA) frees professionals for higher value-added activities, such as auditing, strategic consulting and performance management (Bertoni, 2024). Sector firms such as PwC and KPMG are already investing heavily in AI solutions, while a Deloitte and IMA survey (2024) indicates that 16% of professionals already use Generative AI tools, and 44% plan to adopt them over the next five years.

From 2022 onwards, these tools became firmly established across educational, education, production and creative sectors (UNESCO, 2024). Platforms such as Imagen, DALL·E 2, Stable Diffusion and ChatGPT, based on deep neural networks, generate original content with syntactic complexity and semantic coherence, approximating the logic of human creative thought (Holmes & Miao, 2025).

The impact of these technologies is visible across multiple sectors: in the legal field, they automate petitions and legal opinions, increasing efficiency (Conselho Nacional de Justiça, 2024); in the corporate sphere, adoption rose from 33% in 2023 to 65% in 2024 (Santos, 2024). In higher education, an ambivalent effect is observed: on the one hand, AI facilitates learning, especially in Accounting Sciences, with 43% of students admitting partial use of AI-generated

excerpts (Alves *et al.*, 2024); on the other hand, debates arise concerning originality, autonomy and technological dependence (Pinheiro *et al.*, 2025).

Despite the benefits, the unregulated use of AI entails structural risks, such as the "digital illiteracy" that marginalises individuals without technical preparation (Muawanah *et al.*, 2024). ABMES research indicated that 71% of university students use such technologies frequently, with 29% doing so daily, while knowledge of these tools increased from 69% to 80% between 2023 and 2024, and frequent use in the academic context rose from 53% to 71%.

These advances show that, although AI enhances efficiency, its excessive use may compromise competences essential to accountants, such as critical thinking, independent analysis and ethical judgement, which are fundamental to strategic decision-making and to qualified professional practice (CFC, 2023; IFAC, 2025). By replacing personal reasoning with automated production, there is a risk of harming intellectual autonomy, the ability to solve complex problems and the practical application of accounting knowledge, thereby running counter to the objectives of the full development of competences set out in international and national standards (Soares *et al.*, 2023).

Given this scenario, it is essential that accountants' academic education integrates technological training with the development of critical, analytical and ethical skills, promoting a balance between innovation and professional rigour. The next topic examines, based on recent studies, the effects of the excessive use of Generative AI tools among students and its implications for the professional profile required in contemporary accounting.

2.2 Effects of the Excessive Use of Artificial Intelligence Tools among Students

Since the accelerated introduction of Generative AI tools into society, these technologies have become deeply integrated into higher education learning environments, generating significant debate about their ethical, cognitive, educational and social impacts (Butson & Spronken-Smith, 2024).

The recurrent and excessive use of these tools by students, especially to perform complex tasks, has challenged established pedagogical practices and strained criteria of authorship and assessment (Ferreira *et al.*, 2023). Dempere *et al.* (2023) emphasise that this practice compromises students' cognitive engagement, requiring an urgent review of prevailing assessment models. Similarly, Luo (2024) warns that the indiscriminate use of algorithm-generated content calls into question the authenticity of academic work and blurs the limits between authorial creation and automated production.

The transfer of fundamental cognitive functions, such as reasoning, text production and critical analysis, to AI-based systems has produced what Dwivedi *et al.* (2023) term the epistemological erosion of higher education. Depending on the frequency and mode of use, Generative AI tends to reduce students' intellectual agency, weakening essential competences such as authorship, logical argumentation and the autonomous construction of knowledge. Chan (2023) observes that students who are continuously exposed to these technologies show increasing difficulty in formulating their own ideas and developing original texts, demonstrating a decline in intellectual autonomy, a skill central to accounting practice and required by the CFC (2023) and IFAC (2025) guidelines.

Empirical evidence reinforces this concern. Yankova *et al.* (2023) point out that, although students recognise the pedagogical potential of educational chatbots, practical results in assessment tasks are limited. The intensive adoption of these tools, when not accompanied by teaching guidance and rigorous pedagogical criteria, may lead to the superficiality of learning and compromise formative assessment.

In addition to pedagogical aspects, relevant ethical dilemmas emerge. Slimi and Carballido (2023) highlight risks such as algorithmic bias, the replacement of human educators and the lack of transparency in automated decisions. The implementation of Generative AI in academic contexts therefore requires pedagogical reflection and institutional accountability, with a view to justice and equity in the treatment of students' data.

Ivanov (2023) identifies a series of adverse effects resulting from the indiscriminate adoption of AI in higher education, including the reproduction of bias, factual inaccuracies, excessive dependence on technology, erosion of creativity and compromised privacy. These impacts extend to the teaching and learning process, to administrative structures and to interpersonal relationships, affecting the well-being of the academic community.

On the conceptual plane, Popenici (2023) emphasises that belief in the "intelligence" of technology is a dangerous misconception: the texts generated by language models display syntactic and grammatical coherence, but do not express critical thinking or wisdom. Excessive use of Generative AI therefore replaces deep reflection with standardised solutions, which are incompatible with human cognitive complexity.

In terms of reliability and informational integrity, Hasanein and Sobaih (2023) stress that these tools may generate outdated, biased or inaccurate data, in addition to fictitious references, increasing the risk of plagiarism that cannot be detected by traditional systems. Regulatory gaps also persist regarding copyright and intellectual property rights in algorithm-generated content, further increasing the complexity of the contemporary educational context.

Pisica *et al.* (2023), in a study with academics in Romania, reinforce the ambivalent perception of AI in higher education: although its potential is recognised, concerns persist regarding the loss of the human dimension of education, institutional inequalities arising from asymmetrical access to technology and the absence of articulated national policies for balanced implementation. Lack of familiarity with the deeper implications of the technology contributes to an uncritical or reactive adoption, often guided by restrictive or palliative measures.

Given this multifaceted scenario, the need becomes evident to investigate systematically the perceptions of lecturers and students regarding the effects of the excessive use of Generative AI, especially considering its direct relationship with the development of professional competences essential to accounting practice. The following chapter presents the methodology adopted in this study, focusing on the comparative analysis between the main actors involved in the educational process, with the aim of understanding how these tools are perceived and which impacts have been attributed to their use in academic and professional education.

3 Methodology

This study was grounded in exploratory and descriptive research, as this approach makes it possible to understand the human behaviour and social dynamics involved (Losch *et al.*, 2023), offers relevant interpretative support for future investigations and contributes to constructing a faithful picture of the observed reality (Ferrer & Dias, 2023), while also allowing greater delimitation and systematisation of the variables under study (Mazalo & Ramos, 2024).

A mixed methodological approach (quantitative and qualitative) was adopted, grounded in the premise that both complement each other in the analysis of complex phenomena (Theóphilo, 2023). The quantitative strand was employed in order to capture objective, measurable data amenable to statistical treatment, making it possible to identify patterns, trends and correlations among the variables analysed (Tuzzo *et al.*, 2024; Souza *et al.*, 2024). In turn, the qualitative aspect was incorporated with the aim of deepening understanding of the

subjective elements present in students' relationship with Generative AI tools (Assis & Monteiro, 2023).

3.1 Selection of Participants

The criteria for selecting the participants in this research included, in the first group, students regularly enrolled in Accounting programmes at higher education institutions located in the city of Recife – PE (Brazil), including one federal public higher education institution offering the programme in the municipality and three local private university centres, chosen through non-probabilistic convenience sampling, considering participants' availability and accessibility (Salgado, 2024). During visits to the institutions, the researcher presented the objectives of the study and distributed QR codes linking to the online questionnaire, a strategy that proved effective, as there were no refusals among the approached students. Dissemination was supplemented by emails and social media, broadening the reach of the sample.

The second group consisted of lecturers who teach accounting subjects at the same institutions attended by the students. Their contacts were obtained through institutional searches and visits to the campuses, followed by the questionnaire being sent by institutional email.

The selection of these groups was based on the intention to compare complementary perceptions: on the one hand, students, who directly experience the academic training process; on the other, lecturers, who are responsible for the development and mediation of learning. This approach made it possible to identify convergences and divergences regarding the impacts of intensive use of Generative AI tools on the development of intellectual, analytical and critical competences.

3.2 Data Collection

Data were collected from students through a structured questionnaire designed and administered via the Google Forms platform. The instrument consisted of five self-assessment and attitudinal items constructed on a five-point Likert scale (1 to 5), allowing participants to express different degrees of agreement or disagreement with the statements presented (Oliveira, 2023). The questionnaire addressed aspects such as frequency of use of Generative AI, intellectual autonomy, analytical development, digital ethics and perceptions of risks to academic education. For lecturers, in turn, an interview was conducted using a guided script aimed at understanding their perceptions of the influence of these technologies on students' learning processes, as well as assessing the risks and challenges that excessive use may pose to the ethical, technical and reflective education of future accountants.

Table 1 presents a Theoretical-Methodological Matrix developed to demonstrate the coherence between the research objectives and the theoretical framework used in constructing the data collection instruments. The matrix establishes connections between the theoretical concepts addressed, their respective authors, the observable indicators in the instruments applied to students and the questions directed at lecturers, allowing an integrated view of the study's theoretical framework and methodological operationalisation.

Table 1

Theoretical-Methodological Matrix for the Development of the Research Instruments.

Dimension/ Theoretical Variable	Authors/ Theoretical grounding	Indicators	Item – Students	Item – Lecturers
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1. Frequency and purpose of Artificial Intelligence use	Abbas <i>et al.</i> (2024); Alves <i>et al.</i> (2024); ABMES (2024); Scarfe <i>et al.</i> (2024); Bahroum <i>et al.</i> (2023).	Frequency of use and academic purposes	How often do you resort to Generative Artificial Intelligence tools to carry out academic activities?	How often do you perceive students using Artificial Intelligence tools in academic activities?
2. Impact on intellectual autonomy	Chan (2023); Ray (2023); Dwivedi <i>et al.</i> (2023); Ivanov (2023); Chomsky (2023)	Ability to think independently even when using Artificial Intelligence	In your perception, has the use of these tools negatively influenced your ability to reflect critically and solve problems autonomously?	Has the use of Artificial Intelligence negatively affected students' autonomy in solving accounting problems?
3. Development of analytical skills	Holanda & Negreiros (2024); Popenici (2023); IFAC (2025); CFC (2023);	Perception of impairment or gain in critical analysis capacity	In your opinion, has the recurrent use of Artificial Intelligence contributed to the improvement or impairment of your analytical reasoning?	What impacts do you observe on the development of students' analytical skills as a result of the frequent use of Generative Artificial Intelligence?
4. Ethics and responsible use of AI	Slimi & Carballido (2023); Pisica <i>et al.</i> (2023);	Clarity of academic guidance on the ethical use of Artificial Intelligence	In your opinion, are the institutional guidelines on the ethical use of Artificial Intelligence sufficiently clear and accessible?	How do you assess your institution's action with regard to guiding students towards the ethical, critical and responsible use of these technologies?
5. Perceived risks in accounting education	Dergaa <i>et al.</i> (2023); Peters <i>et al.</i> (2024); Rodrigues & Rodrigues (2023); Azevedo <i>et al.</i> (2023); Hasanein & Sobaih (2023).	Negative consequences for the future accountant's technical, ethical and critical education	Do you consider that excessive use of Artificial Intelligence may represent a risk to your professional education in the accounting field?	In your opinion, what risks or challenges may the excessive use of Artificial Intelligence represent for the ethical, technical and intellectual education of future Accounting professionals?

Source: *Research data* (2025).

In order to ensure alignment between the empirical instruments and the profession's normative frameworks, the benchmarks of NBC PG 12 (R4), which addresses the general competences of accountants, and IFAC's IES 3 (2025), which details the intellectual competences expected in higher accounting education, were taken into account. Table 2 presents the analytical, technical, ethical and investigative competences, articulated with the main observable indicators and the normative guidelines that underpinned the construction of the empirical research.

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Table 2

Indicators of Analytical Competences – Aligned with NBC PG 12 (R4) and IES 3.

References	Competence Assessed	Proposed Indicators
NBC PG 12 (R4)	Critical evaluation of accounting and financial information	<ul style="list-style-type: none"> - Ability to interpret financial statements; - Preparation of comparative analyses and financial indicators; - Application of updated accounting standards;
	Ability to solve complex problems	<ul style="list-style-type: none"> - Proposal of solutions for practical cases; - Ability to identify accounting inconsistencies; - Use of logical reasoning and technical justifications;
	Application of technical knowledge to professional practice	<ul style="list-style-type: none"> - Ability to transfer theoretical concepts to real cases; - Use of accounting software and digital tools with technical judgement;
	Responsibility in the use of technological resources	<ul style="list-style-type: none"> - Ethical stance in the use of Artificial Intelligence; - Ability to recognise the limits of automation in professional judgement;
IES 3	Critical analysis capacity	<ul style="list-style-type: none"> - Logical evaluation of arguments; - Identification of fallacies or errors in texts or reports;
	Research and investigative capacity	<ul style="list-style-type: none"> - Development of hypotheses; - Data collection and analysis; - Cross-referencing of information sources;
	Professional judgement capacity	<ul style="list-style-type: none"> - Evidence-based decision-making; - Technical substantiation of conclusions; - Ability to estimate risks and uncertainties;
	Problem-solving and adaptation to complexity	<ul style="list-style-type: none"> - Identification of emerging problems; - Formulation of viable strategies; - Ability to adapt to new professional contexts;

Source: *Adapted from CFC (2023) and IFAC (2025).*

The research investigated five dimensions related to the use of Generative AI tools among Accounting students and lecturers. The first dimension addressed frequency and purposes of use, considering that excessive use may replace essential cognitive processes (Azevedo *et al.*, 2023; Abbas *et al.*, 2024). The second assessed intellectual autonomy, identifying in students the perception of AI's influence on their ability to think critically and solve problems, and in lecturers the perception of loss of this autonomy, indicating dependence on automated solutions (Holanda & Negreiros, 2024; Chomsky, 2023). The third dimension focused on analytical skills, examining whether students perceived gains or losses and whether lecturers noticed a negative impact on the competences required by IFAC (2025) and CFC (2023). The fourth dimension considered ethics and responsible use of AI, in order to examine whether institutions provide clear guidelines to avoid plagiarism, undue outsourcing and the production of unvalidated content (Scarfe *et al.*, 2024; Chan, 2023) and whether lecturers perceive effective promotion of ethical education. Finally, the fifth dimension addressed the perception of risk in accounting education, investigating whether students recognise negative impacts of excessive AI use and whether lecturers identify technical, ethical and analytical deficits, anticipating effects on graduate quality.

3.3 Processing for Data Analysis

The quantitative data, derived from the structured questionnaires administered to students on the Accounting Sciences course, were organised in spreadsheets and subjected to descriptive statistical analyses (frequency, mean and standard deviation) and inferential analysis. To verify associations between continuous variables, Pearson's correlation was applied, a technique widely used to measure the strength and direction of the linear relationship between two datasets (Sousa, 2019). In the present study, Pearson's correlation was used to examine multiple relationships, such as between the frequency of use of Generative AI and the perception of its impacts on students' autonomy, analytical reasoning and professional education, making it possible to identify relevant association patterns for understanding the risks arising from technological dependence in the academic context.

Although the variables used in the research are originally ordinal, having been collected by means of Likert-type scales, they were treated as interval variables, in accordance with recognised practice in studies in the Applied Social Sciences (Marôco, 2021; Pallant, 2020). The sizeable sample ($n=204$) and the number of points on the scales (five categories) also contribute to the approximation of the data to a continuous distribution, which justifies the use of Pearson's correlation coefficient in the analysis of the relationships between variables. In addition to calculating the correlation coefficients, the p-value corresponding to each association was verified in order to test its statistical significance. The p-value indicates the probability that the observed correlation occurred by chance. Thus, associations with $p < 0.05$ were considered statistically significant, ensuring greater rigour in the interpretation of the results. Even so, the limitations of this approach are acknowledged, and future studies are recommended to apply non-parametric methods jointly, such as Spearman's correlation, for comparative purposes.

With regard to the qualitative data arising from the interviews conducted with lecturers in the accounting field, the analysis comprised the phases of pre-analysis, material exploration and interpretation of results. Deductive categories, grounded in the research's theoretical framework, were employed, as well as inductive categories emerging from the analysis of the interviewed lecturers' statements.

4 Results and Analyses

4.1 Quantitative Analysis of Students' Responses

This section presents the analysis of the responses of 204 students on the Accounting Sciences course to the five questionnaire items concerning the use of Generative Artificial Intelligence in academic activities. The questions were organised into five dimensions: (i) frequency of use and academic purposes; (ii) ability to think independently, even when using Artificial Intelligence; (iii) perception of loss or gain in critical analysis capacity; (iv) clarity of academic guidance on the ethical use of Artificial Intelligence; and (v) negative consequences for the technical, ethical and critical education of future accountants. All responses were based on a five-point Likert scale, in which 1 represents "strongly disagree" and 5 represents "strongly agree". Table 3 summarises the means and standard deviations for each dimension:

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Table 3

Means of the dimensions assessed by students

Dimension assessed	Mean
Frequency of AI use in undergraduate education	3,66
Interference with autonomy and critical thinking	3,52
Impact on analytical reasoning	2,79
Clarity of institutional guidelines	2,39
Risk to professional education	3,78

Source: Research data (2025).

The statistical assessment of the data collected through a Likert-type scale made it possible to identify relevant perceptions among students regarding the effects of the use of Generative AI in their academic and professional education. According to classical methodological guidance (Boone & Boone, 2012; Clason & Dormody, 1994), and supported by authors such as Bishop and Herron (2015), the analysis of means on Likert scales becomes appropriate when robust samples are available and when the categories display characteristics close to an interval scale. Thus, the mean values obtained in this research were considered valid for statistical interpretation, especially when accompanied by an inferential test such as Pearson's correlation.

The variable with the highest mean was "Risk to professional education", with a value of 3.78, revealing a strong tendency towards agreement among respondents. This result shows that students recognise that intensive and unmediated use of Generative AI may compromise essential competences required in accounting practice, such as critical judgement, technical substantiation and ethical conduct, as set out in NBC PG 12 (R4).

The mean of 3.66 for "Frequency of AI use in undergraduate education" reinforces a scenario of high technological incorporation, consistent with national surveys indicating frequent or very frequent use of AI by a large proportion of university students (ABMES, 2024; Sousa & Cardoso, 2025). However, when this high frequency is confronted with the perception of risk, the tension already described by Abbas *et al.* (2024) and Bahroun *et al.* (2023) emerges, according to whom recurrent use of AI, without pedagogical mediation, is associated with procrastination, reduced performance and the weakening of higher-order cognitive skills (Abbas *et al.*, 2024; Bahroun *et al.*, 2023).

The mean of 3.52 for "Interference with autonomy and critical thinking" reveals a consistent perception that AI may erode students' intellectual agency, in line with the "epistemological erosion" associated with the transfer of cognitive functions to AI systems described by Dwivedi *et al.* (2023) and Chan (2023). The mean of 2.79 for "Impact on analytical reasoning" points to moderate harm, consistent with the notion of cognitive offloading, according to which the systematic delegation of analytical processes to technology reduces, over time, personal effort and capacity for analysis (Gerlich, 2025; Firth *et al.*, 2019).

The lowest mean (2.39), in turn, found for "Clarity of institutional guidelines", suggests that students experience this process in a scenario of limited regulation, converging with Lem's (2023) finding that fewer than half of the world's leading universities have public AI guidelines. The findings also converge with UNESCO data indicating that only about 10% of educational institutions have explicit policies on the subject (Lem, 2023; UNESCO, 2024).

4.1.1 Pearson's Correlation

In order to verify the existence and intensity of linear associations between the variables investigated, Pearson's correlation coefficient was used. According to Field (2009), Pearson's correlation is a statistical measure that expresses the degree of linear association between two quantitative variables or ordinal variables with equivalent intervals, ranging from -1 (perfect negative correlation) to +1 (perfect positive correlation). Values close to 0 indicate the absence of a significant linear correlation. Hair *et al.* (2009) point out that correlations between 0.30 and 0.49 are considered moderate, whereas values between 0.50 and 0.69 are classified as strong.

The use of Pearson's correlation in research on higher education and student behaviour is widely documented. Lemos *et al.* (2021) used this method to identify relationships between the use of educational technologies and academic performance, showing its effectiveness in contexts involving student perception and behaviour. In the present study, the results of Pearson's correlation made it possible to observe relevant patterns, which are shown in Table 4.

Table 4

Pearson's correlation between the questionnaire variables

Pair of variables	Pearson's Correlation	p-Value	Interpretation
Q1 – Frequency of use × Q2 – Autonomy	0.405	0.0000	Moderate positive correlation
Q1 – Frequency of use × Q5 – Risk to training	0.171	0.015	Weak positive correlation
Q3 – Analytical reasoning × Q5 – Risk to training	0.462	0.0000	Moderate/strong positive correlation
Q2 – Autonomy × Q5 – Risk to training	0.418	0.0000	Moderate positive correlation
Q1 – Frequency × Q4 – Clarity of guidelines	0.036	n.s.	No relevant correlation

Source: *Research data (2025).*

The association between the frequency of use of AI tools (Question 1) and the perception of impairment of autonomy and the ability for critical reflection (Question 2) presented a coefficient of ($r = 0.405$), which was statistically significant at 1%, characterising a moderate positive correlation. This indicates that, as the frequency of use of Generative AI tools increases, the perception that students' ability to reflect critically and solve problems autonomously is being harmed also increases. This pattern was confirmed by a longitudinal study with 326 university students, which identified a significant positive correlation ($r = 0.41$) between daily use of Generative AI and self-reported cognitive dependence (Guzmán, 2024). The study also pointed out that 22.89% of frequent users developed what the authors termed analytical fatigue, characterised by difficulty in initiating reasoning processes without automated support (Guzmán, 2024).

The relationship between the frequency of AI use (Question 1) and the perception that this represents a risk to professional education (Question 5) showed a weak positive correlation ($r = 0.171$), with statistical significance at 5%, of weak intensity. Although the correlation is of low magnitude, the finding still indicates a tendency for recurrent use of AI tools to be associated with concerns about negative impacts on preparation for the exercise of the accounting profession. A similar result was observed in the study by Pitts *et al.* (2025), conducted with 262 students at the University of Florida. The findings showed that, despite recognising the benefits of AI in the academic environment, students reported fears regarding the loss of essential skills, particularly those related to autonomous problem-solving (Pitts *et al.*, 2025).

The correlations observed between frequency of use, autonomy, analytical reasoning and risk to professional education reinforce the hypothesis that technological dependence is intrinsically linked to the perception of weakened intellectual competences. The moderate association between impairment of analytical reasoning and risk to professional education ($r = 0.462$) indicates that, as students perceive a loss of analytical capacity, they come to view excessive AI use as a direct threat to the quality of their professional trajectory.

A moderate correlation ($r = 0.418$) was also identified between the perception of impaired autonomy (Question 2) and the view of risk to professional education (Question 5), with statistical significance at 1%, reinforcing the existence of a perceptual link between the negative effects attributed to the use of AI and concerns about the quality of education in the accounting field. This association is corroborated by Zhang *et al.* (2024), who identified that high levels of academic stress and performance expectations contribute significantly to excessive AI use. The authors demonstrated that this dependence is related to decreased academic self-efficacy and results in several negative effects, including reduced critical thinking, loss of intellectual autonomy and decline in creativity.

Finally, the correlation between the frequency of AI use (Question 1) and the perception of the clarity of institutional guidelines (Question 4) was $r = 0.036$, without statistical significance. This result indicates that students' level of AI use bears no significant relationship to their level of knowledge or understanding of institutional rules concerning the ethical use of these technologies, which may reflect a gap in the communication or effectiveness of such guidelines. Linked to this issue, Pola Lem (2023), when analysing the 50 best universities in the world, found that fewer than half of them have public guidelines on the use of AI in the academic context, which places lectures and students in a grey area regarding what is acceptable.

Furthermore, the statistically significant negative correlations identified between the variables in Question 2 and Question 4 ($r = -0.2308$; $p < 0.01$), Question 3 and Question 4 ($r = -0.2582$; $p < 0.01$), and Question 4 and Question 5 ($r = -0.1870$; $p < 0.01$) reveal a relevant pattern in students' perceptual behaviour. These results indicate that, as students perceive greater clarity in institutional guidelines related to the ethical use of AI, there is a tendency for a reduction in the perception of impairment of intellectual autonomy (Q2), analytical reasoning (Q3) and technical, ethical and critical training (Q5). This inversely proportional statistical pattern suggests that the existence of clear institutional guidance may play a mitigating role in students' concerns about the training-related risks associated with the excessive use of these technological tools, reinforcing the importance of more explicit and accessible normative action by higher education institutions.

In summary, the results obtained through the application of Pearson's correlation reinforce the existence of significant links between the intensive use of AI tools and students'

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perceptions of possible impacts on intellectual autonomy, analytical reasoning and professional education. These findings corroborate growing concerns highlighted in the literature, such as those of Carr (2011), who discusses the effects of cognitive automation on the reduction of individuals' critical capacity, especially in higher education contexts.

4.2 Qualitative Analysis of Lecturers' Responses

The analysis of the responses provided by lecturers in the accounting field reveals critical concerns regarding the adoption of Generative AI tools in accounting education, showing partial consensuses and multifaceted pedagogical challenges. The responses were categorised according to the main themes emerging from each of the five proposed questions and were subsequently interpreted in the light of the recent scientific literature on the subject.

Table 5

Categorisation of lecturers' responses regarding the use of Artificial Intelligence in accounting education.

Question	Response Category	N	%
Q1 – Frequency of use perceived by lecturers	High frequency / recurrent use	9	82%
	Moderate / contextual use	1	9%
	Rare use	1	9%
Q2 – Impact on student autonomy	Yes, it negatively affects it	5	45%
	Depends on use and profile	4	36%
	It does not negatively affect it	2	18%
Q3 – Effects on analytical skills	Reduction in reasoning, reading and criticality	6	55%
	Positive impacts with reservations (writing, insights)	1	9%
	Capacity for rapid response and research	2	18%
	Harm to logical reasoning	2	18%
Q4 – Assessment of institutional action	Absence of institutional guidelines	6	55%
	Timid or incipient action	3	27%
	Action considered positive	2	18%
Q5 – Risks to professional education	Loss of autonomy, criticality and technical capacity	6	55%

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	Moderate risk / requires pedagogical mediation	3	27%
	Potential for positive use with guidance	2	18%

Source: Research data (2025).

With regard to the frequency with which students use Generative Artificial Intelligence tools in academic activities (Question 1), it was observed that the majority of lecturers identify this use as recurrent, constant or increasing. Situations of daily use were described, including in more complex activities, such as the production of final-year dissertations. This organic incorporation into students' everyday lives is corroborated by Sousa & Cardoso (2025), who found that around 64% of university students reported "frequent" or "very frequent" use of Generative AI in academic tasks. In addition, a survey with 326 Harvard students showed that almost 90% already use Generative AI tools, and around 25% stated that AI replaces attendance at tutoring sessions or in-depth reading (Hirabayashi *et al.*, 2024).

As regards the impact on students' autonomy in solving accounting problems (Question 2), most lecturers reported that the use of such tools is harming the autonomy of accounting students. The main problems identified were the absence of intellectual autonomy and the reduction of critical reading. These findings converge with the study carried out by Kosmyna *et al.* (2025), which showed that students who frequently use Generative AI tools have 30% less brain activity in areas responsible for critical thinking, as well as poorer performance in tasks requiring personal analysis and difficulties in engaging deeply with content.

Regarding the effects on analytical skills (Question 3), six lecturers associated Generative AI with the superficiality of reasoning and loss of critical capacity. Two lecturers pointed to positive impacts in aspects such as quality of writing or agility in content production, albeit with reservations. The association between AI and the superficiality of reasoning is corroborated by a study conducted by Gerlich (2025), which identified a significant negative correlation between constant use of these tools and the performance of analytical skills, especially among university students. The study attributes this effect to so-called "cognitive offloading", that is, the tendency to delegate reflective processes to technology, which may weaken analytical capacity over time. The evidence therefore reinforces the need for pedagogical practices that encourage the critical and responsible use of these technologies in higher education.

Regarding institutional action in guiding the ethical, critical and responsible use of AI (Question 4), more than half of the lecturers assessed that there are no clear or effective guidelines on the part of the institutions where they work. Although three lecturers reported individual efforts to address the topic in the classroom, such initiatives remain isolated and do not reflect a structured institutional policy. This institutional gap has also been diagnosed by international bodies. According to Audrey Azoulay, Director-General of UNESCO, the adoption of AI in education will only be beneficial if guided by ethical principles ensuring that "this technology complements the human and social dimensions of learning, rather than replacing them" (UNESCO, 2024). However, current data indicate that only 10% of schools and universities have official guidelines on the use of AI, according to a survey conducted by UNESCO itself with 450 educational institutions worldwide.

Finally, with regard to the risks and challenges related to the ethical, technical and intellectual education of future accounting professionals (Question 5), lecturers were unanimous in highlighting that excessive dependence on Generative AI tools may compromise the development of competences fundamental to accounting practice. Six responses explicitly pointed to the loss of essential skills, such as the technical interpretation of standards, logical

reasoning and ethical judgement. This erosion of cognitive competences in accounting education responds to mechanisms widely documented in the cognitive sciences. As Firth (2019) demonstrates in a study on neural processing in digital environments, phenomena such as fragmented attention (typical of consumption from multiple online sources), externalisation of memory (dependence on external sources for information storage), and algorithmic mediation of interactions reconfigure neural patterns essential to complex thought. Thus, the replacement of human cognitive processes by automation — although efficient for operational tasks — compromises skills that are crucial to the accounting profession when not critically mediated.

In this way, the analysed responses reinforce the existence of a partial consensus among lecturers regarding the risks of excessive and unguided use of Generative AI in higher education. There is recognition of the tools' potential, but also a generalised warning about adverse effects that may compromise the construction of fundamental skills for professional practice in accounting.

5 Final Considerations

The research analysed the perceptions of Accounting students and lecturers regarding the impacts of the excessive use of Generative AI tools on academic education, with a focus on the development of analytical skills essential to the ethical and technical practice of the profession. Adopting a mixed-methods approach, with a questionnaire administered to 204 students and interviews conducted with lecturers, relevant patterns were identified regarding frequency of use, intellectual autonomy and pedagogical effects.

The quantitative and qualitative results converge in indicating that the excessive use of Generative AI in undergraduate Accounting education is perceived as ambivalent: while it enhances efficiency and access to information, it is associated with the loss of intellectual autonomy, the superficiality of analytical reasoning and risk to professional education. These perceptions are in dialogue with studies describing epistemological erosion, cognitive offloading and the reduction of critical thinking in contexts of intense technological mediation. In the light of NBC PG 12 (R4) and IES 3, the findings suggest that the perceived risks affect precisely the intellectual competences required for the exercise of the accounting profession, such as the critical evaluation of information, professional judgement and the solution of complex problems. The combination of high frequency of use, perceived loss of autonomy and absence of clear institutional guidelines creates a scenario in which technological dependence tends to become naturalised, without robust pedagogical and ethical counterweights.

As a practical implication, the results point to the need to make institutional policies on the use of AI in accounting education explicit and to design assessment strategies that require demonstrations of independent reasoning (such as manual stages, technical justifications and the critical confrontation of AI responses with accounting standards), as well as lecturer training aimed at the critical use of these tools in the classroom. Such measures may contribute to aligning the exploitation of the potential of Generative AI with the preservation and strengthening of the analytical, ethical and intellectual competences that sustain the contemporary professional accounting profile.

By articulating, within the same empirical design, (i) quantitative measures of the perception of risk, autonomy and analytical reasoning; (ii) qualitative evidence of lecturers' practices and concerns; and (iii) the normative-professional framework of accounting, the present study contributes to filling a gap between general discussions on AI in higher education and the specific requirements of accounting education. In this respect, the study not only

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confirms previous warnings about technological dependence but also specifies them in relation to analytical, ethical and professional judgement competences.

It is suggested that future studies expand the empirical scope to other regions and institutional contexts, allowing comparisons between student profiles and different models for regulating the use of Generative AI, as well as longitudinal research tracking the impact of intensive use of these tools on academic performance and on the professional trajectories of graduates in Accounting Sciences. In addition, it is recommended that investigations be developed to test specific pedagogical interventions and to assess, by quantitative and qualitative methods, their effectiveness in preserving or strengthening the analytical, critical and ethical competences envisaged in standards such as NBC PG 12 (R4) and the IFAC' IES.

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