

**María Luisa Rico Gómez
Juan Antonio Plasencia-Soler
Clorinda Natividad Barrionuevo Torres
(coords.)**

La universidad emergente

**Hacia una educación
transformadora
e innovadora**

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Artificial intelligence in Spanish universities: identifying critical points

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1. Introduction

The current artificial intelligence (AI) revolution is focused on creating intelligent machines capable of thinking and acting like humans (Alam, 2021; Shneiderman, 2020). This includes task automation and the development of more intelligent robots that can interact with humans more naturally (Rao et al., 2023). As AI technology continues to evolve, it is likely to bring about a series of changes in the way we work, live, and interact with each other (Teigens et al., 2020).

The development of digital administration has enabled the establishment of the eIDAS regulation (electronic identification, authentication, and trust services at the European level, facilitating electronic transactions between citizens, businesses, and public administrations (European Commission, 2021). Furthermore, the European Union has launched the Digital Services Act (DSA) (European Commission, 2023), aimed at regulating all aspects affecting digital content—from algorithms to disinformation—to create a more responsible society regarding what is published. In addition, a common legal framework has been established for electronic identification and trust services across the EU, including the NIS2 Directive, which sets cybersecurity risk management measures in several sectors such as energy, transport, health, and digital infrastructure (Council of the European Union, 2022) and the EU Cybersecurity Act, which aims to

strengthen cybersecurity in the European Union by providing a standard certification system (European Union, 2019). The Cybersecurity Law Code (Boletín Oficial del Estado, 2023) is key in protecting cyberspace in Spain. The ease and low cost of generating this type of content make it foreseeable that we will soon be flooded entirely with AI-generated images, texts, videos, and music (Lyseggen, 2019). This opens enormous possibilities in many areas—creative production and research—while presenting serious threats such as deepfakes with false information or identity theft. AI can improve and enrich the teaching and learning process (Orhani, 2023) by providing rich teaching patterns and instructional content that help students analyze problems and explore new concepts (Rees et al., 2012; Hsieh, 2015). Furthermore, digital tools can make it easier for students to understand concepts, making computer use in the learning process more effective than books, films, or other traditional methods (Hashim et al., 2022). Artificial intelligence (AI) can be used to create more personalized learning experiences, automate task grading, and offer more contextualized feedback to students (Neller et al., 2010; Yang et al., 2007), as well as to create virtual tutors to help students understand complex concepts (Chaney et al., 2009).

AI represents a complex academic scenario, as neither university faculty nor administrative management systems are adapted to this new reality (Alam, 2021; Yelder & Codling, 2004). Its use has increased in recent months due to easy accessibility and the continuous emergence of new applications. Students are aware of both the benefits of using AI and the limitations of the university system in detecting its use, as well as the delays in implementing public solutions. This often leads to malpractice with significant educational, social, and legal consequences. As a result, ethical and legal issues related to AI use in universities are already becoming apparent, such as copyright infringement or plagiarism (Nakitare & Otiike, 2023; Sobrino-García, 2021), issues of fairness and equity, and concerns over data privacy and security (Donepudi, 2015). AI could also potentially be used to intimidate or harass other students, raising serious legal and ethical concerns.

This study aimed to identify critical points across the various dimensions that shape the university system, intending to prevent ethical and legal conflicts in knowledge generation.

2. Methodology

The study adopted a comprehensive methodological approach to identify critical points across the various areas of the university system, with a particular focus on preventing ethical and legal conflicts in knowledge generation through AI. The methodology was designed to capture a wide range of perspectives and experiences related to the implementation and effects of AI in the university context, covering innovation and transfer, teaching, research, and university management.

2.1. Data collection process

Data was collected over six months, during which various stakeholders within the university system, including faculty members (n=35), students (n=87), and administrative and service staff (n=6 and 16, respectively), were consulted. This broad representation ensured the inclusion of diverse viewpoints and experiences, enriching both the data and the study's outcomes. The consultations were conducted using a combination of semi-structured interviews and focus groups, facilitating open dialogue about individual and collective experiences with AI. These methods enabled an in-depth exploration of subjective impressions and allowed for the collection of detailed information on how AI affects day-to-day practice within the university.

2.2. Analytical tools

A qualitative approach was employed to analyze the collected data. Content analysis was used to identify recurring themes and patterns in participants' responses. This involved manually coding the transcripts, followed by thematic interpretation to consolidate the data into meaningful categories related to the impacts of AI in the university setting.

2.3. Identification of critical points

The final phase of the methodology focused on identifying critical points related to AI. This was achieved through data triangulation, comparing information across different stakeholder

groups and against the existing literature on AI ethics and university practices. This process helped ensure the validity of the findings and enabled the precise identification of potential risk areas and opportunities for improvement.

3. Results

3.1. Identification of critical points in the use of AI in innovation and knowledge transfer

The study of artificial intelligence (AI) in the university context, particularly in innovation and knowledge transfer, requires a meticulous approach to identify critical points that may arise from integrating these technologies. These critical points are essential to ensure AI’s ethical and practical use, encompassing ethics, transparency, data security, and equitable access to technology (Figure 1). One of the main challenges is the establishment of clear ethical standards that protect the rights of students and staff, ensuring that privacy and responsible data remain top priorities. Equally important is the need for AI algorithms to be transparent and explainable so that end users can understand

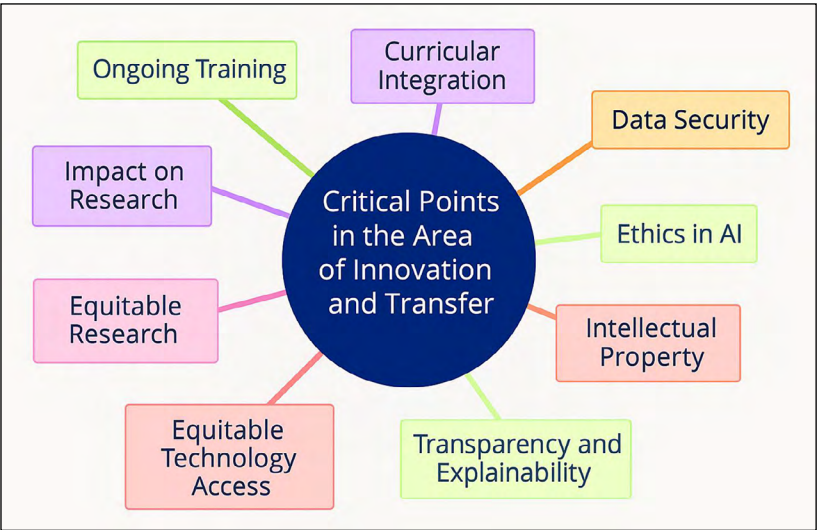


Figure 1. Identification of critical points in innovation and knowledge transfer

and justify all automated decisions. AI algorithms used in research must be clearly explained so that researchers understand how data is processed and managed. This level of transparency is essential for the correct interpretation of results, especially in studies where AI-based decisions may have significant scientific, ethical, or clinical implications.

Moreover, the integration of AI into academic curricula must be carried out to enhance the educational process without replacing the irreplaceable human component. In parallel, assessing how AI may alter research methodologies and promoting new forms of analysis and experimentation while setting clear boundaries to prevent unethical practices is necessary. For instance, some researchers cannot access or experiment with AI tools because their computers do not support advanced AI software, especially when no institutional licenses are available. Another critical point is the need to address potential inequalities in access to technology. AI implementation must be carried out so that all students and staff have equitable access to technological resources. This is especially evident in smaller departments, where staff cannot use AI platforms requiring credits, limiting participation in innovation projects. This is closely linked to intellectual property and the commercialization of AI developments, where clear policies must be defined to protect the rights of both creators and institutions. Finally, the security and protection of data used by AI systems are imperative. A strong commitment to implementing rigorous security protocols is required to safeguard data integrity and privacy. This is particularly relevant in medical faculties using clinical data to train AI models, where weak anonymization has already led to ethics concerns. Additionally, continuous training programs must be established to ensure that all university community members are prepared to adapt to and take full advantage of the opportunities offered by AI technologies.

3.2. Identification of critical points in the use of AI in teaching

The data reveal that using artificial intelligence (AI) in university teaching can offer transformative opportunities to personalize and enhance teaching and learning processes (Figure 2). However, its implementation may also introduce several critical points

that must be carefully addressed to ensure an ethical and practical impact. One of the most significant challenges relates to ethics and privacy, as AI requires access to large amounts of personal data. Managing this data transparently and ethically ensures compliance with privacy protection regulations. This is particularly sensitive in online exams monitored through AI-based proctoring software, which records students through webcams and tracks their facial movements, raising privacy concerns among students and even leading to formal complaints.

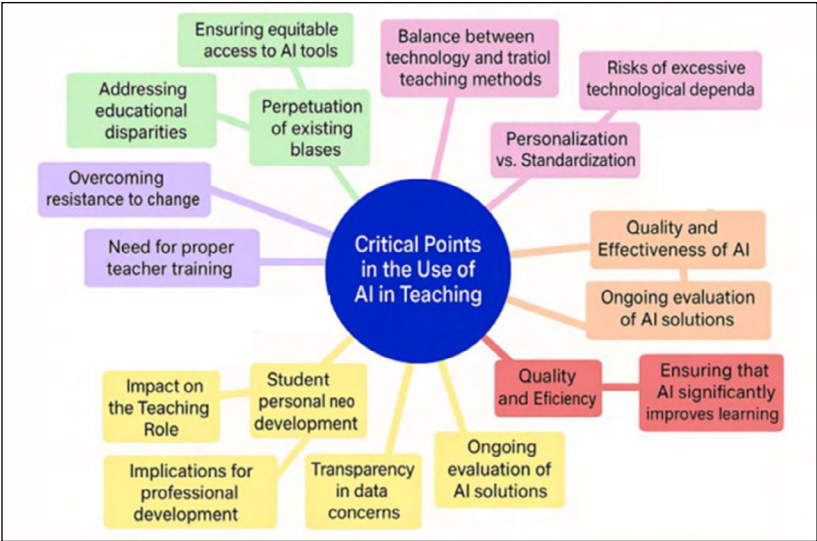


Figure 2. Identification of critical points in the use of AI in university teaching

Additionally, AI systems can perpetuate existing biases if not correctly handled. Implementing practices that ensure diversity in datasets and conducting ongoing algorithm reviews is crucial to prevent unintended discrimination. This issue is closely linked to the need for proper training of faculty and administrative staff in using and understanding these technologies, thereby reducing resistance to change and maximizing the potential benefits of AI. However, in many cases, teachers lack the digital competence or time to explore these tools, which leads to reluctance and missed opportunities for more efficient teaching.

Another critical aspect is the balance between personalization and standardization in education. While AI enables learning to

be tailored to each student's needs, it is vital to maintain consistent educational standards to ensure equitable learning outcomes. This technological dependence also raises the risk of reducing teaching to mere process automation; therefore, technology must complement traditional teaching methods, not as a replacement. Many students already use AI-generated content for assignments, making it difficult for instructors to assess genuine understanding.

Finally, unequal access to technology may exacerbate existing inequalities among students. Ensuring equitable access to AI tools is essential so no student is left behind. In this sense, AI is not only redefining teaching methods but also reshaping the role of the teacher, who must evolve from being a transmitter of information to a facilitator of learning and mentorship. While chatbots can answer frequent questions, they cannot replace the relational and emotional support of a human tutor.

3.3. Identification of critical points in the use of AI in research

Artificial intelligence (AI) in research presents a landscape rich in opportunities, but it also involves significant challenges that require careful management to optimize benefits and minimize risks. AI-driven research must be grounded in ethical principles, including ethics and data integrity. Researchers ensure data collection and usage, respecting participants' privacy and informed consent. Moreover, it is essential to prevent biases in datasets, as these can lead to erroneous or discriminatory conclusions, compromising the validity and fairness of results. This ethical commitment is closely linked to the need for transparency and explainability in AI models. Results must be accurate and understandable, particularly in critical fields such as medicine or law, where decisions directly affect human lives. Transparent and explainable models build trust in technology, enabling their conclusions to be appropriately interpreted and applied. Data security and privacy are another fundamental pillar. Implementing robust measures to protect data from unauthorized access and cyberattacks is essential, ensuring that only authorized personnel can access sensitive information. These practices protect participants and safeguard the integrity of the research process. Nonetheless, many research

teams still store sensitive files on cloud services without encryption or access restrictions, increasing the risk of breaches. Adhering to high quality and methodological rigor standards ensures that AI models are reliable and robust. Ongoing validation and verification support their practical application across different contexts and populations, which is crucial for findings to be generalizable and valuable in practice. Accessibility and the democratization of AI are also essential to ensure that the benefits of these technologies are widely shared. Promoting equitable access prevents only well-resourced institutions from reaping the advantages, allowing for a richer diversity of perspectives and approaches in research. This not only enhances the scientific knowledge base but also fosters inclusive innovation.

AI research must operate within a clear and updated legal framework regarding regulation and legal compliance. Remaining informed and adhering to current regulations protects researchers from legal implications and ensures that AI developments align with societal expectations and norms. Finally, consideration of AI technologies' long-term impact and sustainability is crucial. Researchers should evaluate how their applications affect the scientific field and society, including implications for employment, equity, and the environment.

3.4. Identification of critical points in the use of AI in the area of university management

The data collected indicate that university management tasks involving the use of AI present several critical challenges that require meticulous attention to ensure both effectiveness and ethical acceptance. One of the most important aspects to highlight is data privacy and security. Universities handle sensitive information about students, faculty, and staff, making compliance with data protection regulations essential. This not only safeguards individuals but also strengthens the integrity of educational institutions.

It has also been observed that AI systems could influence key decisions, such as student admissions or academic evaluations. Therefore, AI-generated decisions must be understandable to users, thereby fostering an environment of trust and accountability. This is closely related to the risk of bias and fairness, as algo-

rhythms may perpetuate existing prejudices if not adequately managed. Implementing protocols to identify and correct biases ensures fair treatment and equal opportunities for the entire university community. Another significant challenge is the integration of AI with existing systems. This integration must be smooth to avoid disruptions in academic and administrative processes, which requires careful planning and adequate technological resources. This process often involves considerable implementation and maintenance costs, so universities must thoroughly assess the cost-benefit relationship, anticipating expenses and aligning them with long-term institutional goals.

Finally, the impact on employment and the need for proper training should not be underestimated. Automating tasks through AI can raise concerns about job security, making it vital to consider strategies such as role reassignment and continuous staff training. To address this, several institutions have launched digital upskilling programs aimed at administrative personnel, enabling them to supervise AI tools or perform quality control. Additionally, ensuring that AI systems are accessible and user-friendly for all users, including those with disabilities, is essential for successful adoption. However, many platforms still lack compatibility with screen readers or alternative input methods, making them difficult to use for staff with visual or motor impairments. Only through continuous evaluation and adaptation can universities ensure that technology effectively fulfills its promise of improving academic performance and administrative efficiency.

4. Discussion

The adoption of artificial intelligence in universities is emerging as a potential revolution across various areas of academic and administrative life, offering promises of efficiency and technological advancement (Torres et al., 2023). However, this transformation comes with ethical and practical challenges that require meticulous management to ensure that the benefits are distributed equitably and that outcomes are fair for the entire university community. Ongoing developments in AI engines, which leverage deep learning and natural language processing (NLP) techniques, are changing how we interact with machines,

allowing them to generate responses that emulate the complexity of human discourse (Rivera-Berrío, 2023). These systems rely on language models extensively trained to respond realistically and naturally to various inputs, covering various knowledge domains. This technological advancement can streamline administrative and educational procedures, significantly saving time and resources, reducing human error, and providing more accurate and well-founded responses to user inquiries.

Nevertheless, despite these advances, AI technology still faces significant limitations, such as difficulty processing non-standard language, detecting emotional nuances, and operating effectively in highly humanized contexts (Blandón-León, 2023). As an institution deeply valuing autonomy and academic freedom, the university is uniquely positioned to lead adaptation and innovation in new forms of communication and knowledge generation. This commitment not only reinforces the traditional pillars of teaching, research, transfer, and innovation but also demands the integration of new digital tools in response to the constant changes faced by society. This process is crucial to maintaining relevance in the new economy and managing public and private entities. In innovation and knowledge transfer, the implementation of AI must be carefully balanced with ethical principles, ensuring that justice and respect for privacy are upheld without hindering innovation. Transparency in how these systems operate is vital for building and maintaining trust, enabling all stakeholders to understand and evaluate automated decisions that affect them. Integrating AI into teaching offers tremendous possibilities for personalizing and enriching the educational experience by adapting learning materials to students' needs. However, this must be done without compromising academic standards or equity while safeguarding students' data and ensuring equal access to advanced technological resources. In the research domain, the transparency of AI models is critical to ensuring that results are valid and replicable. Prioritizing data security is essential for protecting sensitive information and ensuring that research findings remain intact and free from manipulation. Finally, university management faces the challenge of integrating AI smoothly into existing systems, improving operational efficiency while safeguarding privacy and security. Anticipating changes in the labor market and preparing staff adequately for this transi-

tion are fundamental steps in managing the shift toward greater automation.

5. Conclusion

In conclusion, adopting AI in universities represents an opportunity to lead at the forefront of educational and administrative technology. However, for this transition to be successful and fair, informed and ethical governance is essential for proactively addressing emerging challenges to ensure that the benefits of AI are maximized while protecting and promoting academic values and equity within the university community.

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