How Universities Shape Responsible AI Use? A Three-Layer Gap Model

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Abstract: The development of artificial intelligence (AI) is increasing the role of universities as actors shaping responsible practices in its use. Despite the growing number of strategies and regulations concerning AI, knowledge remains limited regarding the extent to which institutional actions impact students' educational experiences and the development of their competencies. This article proposes and empirically verifies a model of universities' influence on responsible AI use, covering institutional governance, teaching practice, attitude internalization, and future diffusion. The mixed-methods study combined Likert-scale survey items with open-ended responses. Quantitative data were analysed using descriptive statistics, Spearman rank correlations, and Cronbach's α; qualitative data were analysed through content analysis. The analysis reveals varying strengths of relationships between successive levels of the model. A significant relationship was found between the institutional level and educational experiences, and between internalization and the declared diffusion of responsible practices. At the same time, the relationship between educational experiences and internalization of attitudes proved weak and statistically insignificant, indicating the limited impact of formal education on developing student competencies. The contribution of this article lies in the development of a sequential model and the identification of three gaps between successive levels: institutional governance, educational practice, internalization of competencies, and diffusion. The findings show that universities' influence on responsible AI use is not uniform, but varies across the levels of the model. These findings point to the need to design educational activities that more effectively support the internalization process. In this way, the article contributes to research on AI governance in higher education by highlighting the importance of linking institutional actions with educational experience and the process of shaping student attitudes.

Keywords: AI in education, Responsible AI, AI governance, Transformative accountability, Societal diffusion, Educational effectiveness

1. Introduction

AI-based tools, such as generative language models, are becoming common in students' and professionals' work, influencing information seeking, problem-solving, and decision-making (Dwivedi et al., 2023). However, their use often outpaces educational system adoption. In this context, responsible AI use is a key competency, encompassing the ability to critically evaluate generated content, awareness of the risks associated with the operation of AI systems, such as disinformation, algorithmic biases, intellectual property infringement and the limitations of critical thinking associated with overreliance on model-generated results, as well as responsibility for decisions made using them (Floridi et al., 2018).

The growing importance of AI is reflected in educational policies and the development strategies of academic institutions, including the creation of guidelines for the use of AI, the development of regulations, and attempts to integrate this technology into the teaching process (EDUCAUSE, 2024). In this perspective, the role of universities goes beyond the traditional imparting of knowledge and encompasses shaping students' attitudes that influence their future professional and social activities. University graduates can be seen as carriers of norms and practices related to the responsible use of technology, which fits into the broader perspective of the impact of higher education on social and economic development (Marginson, 2016). Despite the growing interest in AI in education, existing research has focused primarily on the regulatory or teaching levels, with limited analysis of the connections between these levels and the process of internalizing competencies and their subsequent diffusion into professional practice. In particular, there is a lack of research integrating the level of formal regulations (AI governance), the teaching process, and the effects of internalized attitudes and their impact on individuals' future actions.

The aim of this article is to fill this gap by proposing and empirically verifying a model of university influence on the responsible use of AI. The study also adopts the perspective of transformative accountability, understood as the ability of educational institutions to influence students' attitudes and responsible technology use beyond formal policy declarations.

2. Literature Review

2.1 Universities and AI Governance in Higher Education

The literature on the subject is increasingly focusing on the role of universities in shaping the responsible use of digital technologies, including artificial intelligence. AI governance in higher education encompasses strategies, regulations, and guidelines for the use of AI tools in teaching and research, aimed at mitigating risks, ensuring transparency, and supporting ethical practices in the use of technology (Jobin et al., 2019; OECD, 2022).

From the perspective of institutional theory, these activities can be interpreted as a manifestation of the institutionalization of specific norms and standards of conduct regarding new technologies. Universities operate within a regulatory and normative environment that shapes their policies and the way they respond to the challenges associated with AI development (DiMaggio, Powell, 1983; Scott, 2014). This means that the university's efforts to introduce specific standards for the use of AI in research and teaching are not merely a result of internal factors (such as the university's organisational culture, digital transformation strategy, and the digital skills of lecturers and students), but also take into account the external context, particularly factors such as: national and European regulatory frameworks for digital transformation, the expectations of accreditation bodies and publishers, labour market requirements, and public debates on AI.

At the same time, research indicates that the mere existence of regulations does not guarantee their effectiveness (Alsharefeen, Al Sayari, 2025; Eaton et al., 2020; Tan, Qu, Wang, 2025). Their implementation in teaching practice and the level of their perception by teachers and students are crucial (Abedi, 2024; Coburn, 2001). In many cases, a discrepancy is observed between formal documents and the actual experience of users of the educational system, leading to limited effectiveness of the adopted solutions (Viennet, Pont, 2017).

2.2 AI Education and Attitude Development

Developing competencies related to the responsible use of AI requires critical thinking, ethical reflection, and informed decision-making. The effectiveness of AI education depends on how these elements are integrated into teaching practices and student learning experiences (Luckin et al., 2016). However, AI education in higher education remains fragmented, with uneven implementation across disciplines and courses and a lack of coherent competency frameworks (Salhab, 2024; Fu et al., 2026). This fragmentation limits the conditions for informed and responsible use of AI in academic and professional contexts.

Institutional policies are effective only when consistently communicated, implemented, and applied across courses (Anohina-Naumeca et al., 2020; Tan et al., 2025; Contractor, Reyes, 2025; Alsharefeen, Al Sayari, 2025). In the GenAI environment, information gaps and inconsistent course-level standards may cause confusion and reduce compliance, despite the existence of formal regulations (Fu et al., 2026; Simpson, 2025).

2.3 Internalization of Competencies and Social Diffusion

In this perspective, the role of universities is to shape students' attitudes and ways of thinking, which can influence their future professional and social decisions (Yang et al., 2025). The internalization process refers to the transformation of educational experiences into lasting competencies and attitudes (Kong et al., 2021; O'Sullivan et al., 2025). In the context of AI, this means developing risk awareness, critical evaluation skills, and a sense of responsibility for the use of technology (O'Dea et al., 2026; UNESCO, 2024).

This process can be interpreted in light of the concept of internalization of knowledge and values, in which declarative knowledge is transformed into practical patterns of action (Nonaka & Takeuchi, 1995), as well as in relation to the concept of habitus, understood as enduring cognitive and social dispositions that shape an individual's perception and actions (Bourdieu, 1990). In this perspective, the internalization of AI-related competencies encompasses not only knowledge of the technology but also the development of a specific way of thinking about its applications and limitations. From a systems perspective, however, the diffusion of these competencies within professional and social environments is crucial (Guerrero-Dib et al. 2020). University graduates can act as actors transferring developed norms and practices to the organizations in which they operate, thus influencing the use of technology in the broader social context (Jackson, 2016). This mechanism can be analysed in relation to the theory of innovation diffusion, according to which individuals act as carriers of new solutions and practices in social systems (Rogers, 2003).

2.4 Research Gap and Contribution

Despite the growing number of studies on AI in education, existing analyses often focus on selected aspects, such as institutional policies, teaching practices, or student competencies, treating them as relatively separate areas. Consequently, there is a lack of approaches that integrate the institutional, teaching, and learning outcomes levels within a coherent process perspective. In particular, the extent to which actions undertaken at the university level translate into the actual development of students' competencies and their subsequent behaviour in the professional environment remains insufficiently researched. This gap particularly concerns the mechanisms linking the formal AI governance framework with the processes of internalization and social diffusion of competencies.

To address this gap, this article proposes and empirically verifies an integrated, process-based model of universities' influence on responsible AI use, presented in Figure 1. The model includes four interconnected levels: institutional governance, educational practice, internalization, and social diffusion. Institutional governance refers to AI strategies, regulations, and guidelines, while educational practice captures their translation into curricula, teaching methods, critical reflection, and assessment. Internalization concerns the development of students' awareness, critical evaluation skills, and responsibility for AI-supported decisions, whereas social diffusion refers to the transfer of these competencies into professional and social environments. The model assumes that the links between these levels are not fully linear and may be weakened by gaps between policy, practice, attitudes, and future behaviour.

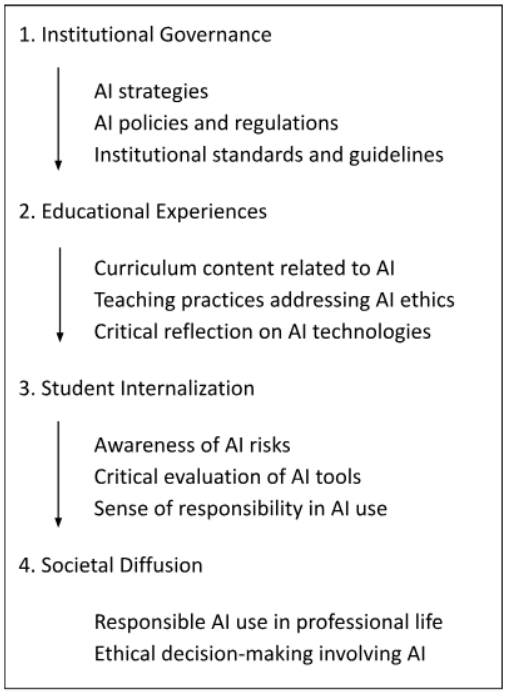

Figure 1: Conceptual model of university influence on responsible use of AI (Source: Authors)

This article contributes by proposing an integrated model of university influence on responsible use of AI and empirically validating it. It also identifies three key gaps between successive stages of this process, allowing for a better understanding of the limitations of current educational solutions.

3. Methodology

The study was exploratory and used a mixed-methods approach combining qualitative and quantitative analysis. The research strategy triangulated survey data, open-ended student responses, and institutional document analysis, integrating institutional, educational, and student attitude levels. Research was conducted in March 2026 at two Polish universities: Gdańsk University of Technology, Faculty of Management and Economics, and the University of Gdańsk, Faculty of Management. A purposive sample of 41 students with prior experience in using AI-based tools was recruited. The institutions were selected due to their comparable profiles, allowing for variation in institutional context while maintaining disciplinary consistency.

The study was conducted in two stages. In the first stage, an analysis of official internal university regulations regulating the use of AI in the educational process was conducted. The analysis included guidelines and recommendations adopted at the institutional level, including rector's directives and official regulations in force at the universities studied. The analysis was qualitative in nature and focused on identifying key elements of AI governance, such as ethical principles, the approach to responsibility for the use of technology, transparency in the use of AI tools, and implications for teaching and assessment. The analysed documents emphasized, among other things, the need for critical evaluation of AI-generated content and user responsibility for its use, as well as the need for informed and ethical use of generative AI tools and the development of competencies in this area.

The document analysis revealed both similarities and differences in institutional approaches to AI governance. Both universities frame generative AI as a tool supporting academic and teaching processes rather than replacing human agency, while emphasising responsibility, transparency, academic integrity, intellectual property issues, and AI limitations such as hallucinations and bias. However, the University of Gdańsk focuses mainly on general principles for responsible AI use, whereas Gdańsk University of Technology adopts a more structured approach, including levels of AI involvement and formal disclosure requirements. These differences shape the role of academic staff: responsibility remains more diffuse at the University of Gdańsk, while at Gdańsk University of Technology instructors actively define and communicate acceptable AI use to students.

This analysis operationalized the institutional governance dimension by identifying formal AI governance elements, including strategies, regulations, and guidelines for AI use in teaching and research, and provided a reference point for comparing universities' declared approaches with students' perceptions. The second stage involved a student survey based on the research model, covering four areas: perception of the institutional framework, AI-related educational experiences, student attitudes and competencies, and future AI use in professional practice. Individual variables were measured using a five-point Likert scale.

For quantitative analysis, aggregated indicators were created for each of the four areas by averaging the responses to the corresponding questions. The data were analysed using descriptive statistics and Spearman's rank correlation coefficients to examine the relationships between the model's constructs. The use of Spearman's coefficient was due to the ordinal nature of the data and the small sample size. To deepen the interpretation of the results, responses to open-ended questions were analysed. This aspect of the qualitative analysis was treated as an additional interpretative framework for the results of the quantitative research. This was considered important in the context of justifying the variation in the statistical measures used – this method of analysis was intended to play a particular role should significant discrepancies be observed between the assumed and obtained values and the significance of the correlation coefficients for individual pairs of modules in the model. Content analysis was used to analyse the responses to open-ended questions, in accordance with the approach proposed by Hsieh and Shannon (2005).

4. Results

In the first step, we analysed the mean values for the four main constructs of the model: institutional governance (Governance), educational experiences (Education), student internalization (Internalization), and societal diffusion (Diffusion), which are summarised in Table 1.

Table 1: Descriptive statistics of the studied constructs

Construct	Mean
Institutional governance	3.17
Educational experiences	2.90
Student internalization	4.15
Societal diffusion	3.40

Source: Authors

The results indicate clear differentiation between the model components. The Internalization construct achieved the highest value (M = 4.15), while the Education construct achieved the lowest (M = 2.90). This indicates that students demonstrate a relatively high level of risk awareness and the ability to critically evaluate technologies, despite limited support from the formal teaching process. In the next step, the relationships between the individual model constructs were analysed (Table 2).

Table 2: Correlations between constructs (Spearman r_s)

Correlations	r_s	p-value
Governance – Education	0.58	$p < 0.001$
Education – Internalization	0.24	$p = 0.128$
Internalization – Diffusion	0.56	$p < 0.001$
Governance – Diffusion	0.46	$p = 0.002$

Source: Authors

Correlation analysis revealed a significant positive relationship between **Governance and Education** ($r_s = 0.58$; $p < 0.001$), suggesting that universities with more developed AI regulations and strategies are more likely to incorporate AI-related content into their teaching and learning. However, as the open-ended comments from the students surveyed indicate, perceptions of these regulations vary. The relationship between **Education and Internalization** was weak and statistically insignificant ($r_s = 0.24$; $p = 0.128$), indicating a limited connection between formal education and the development of student attitudes and competencies. The disparity in perceptions of AI regulations mentioned earlier is reflected here in the 'disconnect' between the experience of using AI and teaching practice, and in the identification of other sources for developing competence in this area (independent activity, exposure to AI at work, and learning about AI through peers). However, a moderate positive relationship was observed between **Internalization and Diffusion** ($r_s = 0.56$; $p < 0.001$), indicating that students' developed attitudes translate into their declared future behaviours regarding responsible use of AI. It is worth noting, however, that in their comments the students are currently merely expressing certain intentions regarding their future behaviour – the study in question is, by its very nature, unable to account for their actual behaviour (and so the results relate not so much to a specific diffusion as to the students' views on the attitudes they plan to adopt in the future regarding the use of AI). The significant correlation between **Governance and Diffusion** ($r_s = 0.46$; $p = 0.002$) suggests that the university's influence on students' future professional behaviour may be both indirect and partially direct. It can be cautiously assumed that awareness of the existence of a set of standards governing the use of AI at the university has shaped, in some of the study participants, the part of the cognitive system responsible for thinking about AI and using this technology.

The internal consistency of the scales used was assessed using Cronbach's alpha coefficient. The obtained values indicate good and acceptable measurement reliability for institutional governance ($\alpha = 0.88$), educational experiences ($\alpha = 0.78$), student internalization ($\alpha = 0.70$), and societal diffusion ($\alpha = 0.77$). Based on the quantitative results, an expanded model was proposed, encompassing three gaps between successive stages of the process. Figure 2 presents an expanded model of university influence on responsible use of AI, taking into account the three gaps identified in the empirical analysis. The gaps reflect the weakening of the links between successive levels of the model.

Figure 2: Expanded model of university influence on responsible use of AI with three structural gaps (Source: Authors)

The first gap, the policy-practice gap, refers to the discrepancy between formal strategies, regulations, and guidelines regarding AI and their actual implementation in the teaching and learning process. The findings suggest that despite the presence of solutions at the institutional level, their visibility and application in educational practice remain limited. Consequently, the institutional level does not fully translate into student experiences. The second gap, the practice-internalization gap, refers to the weak link between educational experiences and the development of student competencies and attitudes. Even when AI-related topics appear in the teaching process, they are often fragmented and non-systemic, limiting their impact on the deep internalization of responsible practices. The third gap – the internalization–diffusion gap – refers to the incomplete translation of students' developed competencies and attitudes into their future professional activities. This relationship is largely declarative and not clearly confirmed in the qualitative data, indicating a significant area of uncertainty and the need for further research on the actual diffusion of responsible AI practices.

The qualitative results provided a better understanding of the mechanisms behind the observed relationships and confirmed the conclusions drawn from the quantitative analysis (the most essential links between the qualitative and quantitative paths are highlighted in the section discussing the results of the correlation analysis). The qualitative analysis identified three main thematic categories: (1) limited visibility and knowledge of the institutional framework, (2) the fragmented nature of educational experiences, and (3) the development of students' competencies and attitudes largely outside the formal education system. In their responses regarding the institutional framework, many students indicated a lack of knowledge of formal rules for the use of AI or their limited visibility. Responses such as “I don't know of any rules” or “I haven't encountered guidelines” indicate a gap between formal regulations and students' perceptions of them, which directly corresponds to the identified policy-practice gap.

In terms of educational experiences, students often described their exposure to AI as incidental and dependent on individual instructors. References were made to isolated classes or brief mentions, confirming the fragmented nature of education in this area and explaining the weak relationship between education and internalization. Responses regarding student attitudes indicated a relatively high level of intuitive awareness, including avoiding thoughtless copying and being aware of risks. However, it is worth noting that these responses rarely referred to formal ethical frameworks, suggesting that these competencies are largely developed outside the education system. In their responses regarding future professional practice, students emphasized the need for responsible use of AI and the role of graduates in promoting ethical standards. At the same time, the lack of a clear link between these competencies and their academic experience confirms the existence of a gap between education and learning outcomes. Qualitative results therefore provide an important complement to quantitative analysis and allow for a more comprehensive understanding of the identified structural gaps.

5. Conclusions and Discussion

The study results indicate a significant tension between the institutional and educational levels, and the level of internalization of competencies by students. A growing number of higher education institutions are introducing formal policies and guidelines for the use of AI, however, institutional approaches remain uneven, and in many

cases these policies are still evolving (HEPI, 2025). At the same time, the level of AI use by students significantly exceeds the level of formal institutional preparation, further exacerbating the observed tensions in the model. This variation in the strength of the relationships between the different levels of the model suggests that the influence of higher education institutions on the responsible use of artificial intelligence is neither uniform nor fully coordinated. The individual levels – institutional, pedagogical and related to the internalisation of competences – remain only partially interconnected. This may stem from the early stage of AI technology adoption in higher education, where formal regulations, teaching practices and student learning processes are developing in parallel but are not yet fully synchronised.

While the presence of institutional solutions is associated with greater educational content, the relationship between education and internalization of competencies remains relatively weak. This may suggest a decoupling effect between the formal educational process and the actual development of student competencies, suggesting that the development of these competencies occurs partially independently of the actions undertaken by universities. This interpretation is supported by the qualitative findings. Students frequently pointed out that their exposure to issues related to artificial intelligence during their studies was sporadic and depended on the individual decisions of lecturers rather than on a coherent curriculum framework. At the same time, many respondents emphasised that they developed AI-related skills primarily outside the formal educational process – through independent experimentation, exchanging experiences with peers, or observing market practices. This indicates that the internalisation of AI-related competences takes place within many parallel learning environments, which makes it difficult to capture the impact of formal education using simple statistical correlations. However, it can be stated with certainty that the formal educational process currently plays a rather limited role in the responsible use of artificial intelligence within universities.

The obtained results partially align with the existing literature, which emphasizes the growing role of universities in shaping competencies related to the use of AI and the importance of education in developing attitudes toward responsible use of technology. The study results indicate that the relationship between educational experiences and internalization of student attitudes is weaker than these assumptions might suggest. This means that while the literature emphasizes the importance of formal education as an important mechanism for shaping competencies, the obtained results suggest a more complex nature of this process. In particular, they point to the possible role of non-institutional and informal sources of learning in developing competencies related to the responsible use of AI. The qualitative findings not only confirm the relationships described, but also help to identify the mechanisms underlying their varying strength, highlighting discrepancies between formal expectations and students' actual experiences.

In this context, the article contributes to the literature by expanding on existing approaches to AI governance in higher education. The proposed three-tiered gap model allows for a better understanding of the mismatches between the institutional level, teaching practice, and learning outcomes, indicating that the relationships between these levels are not entirely linear. The research shows that universities are undergoing a transformation process in the area of responsible AI use. Despite the development of institutional initiatives, their impact on the teaching process and learning outcomes remains limited. At the same time, universities remain a key environment in which competencies can be structured and developed. The results suggest that current approaches require a shift in emphasis from regulations and curricular content toward designing learning experiences that support reflection.

The study is exploratory in nature, which is associated with certain limitations. First, the purposive sampling used and its limited size prevent generalization of the results to the student population. Importantly, all the constructs analysed are based on students' self-reports, which may lead to perceptual consistency and an overestimation of the strength of certain relationships. In particular, the level of diffusion was captured through statements regarding future behaviour rather than observed professional practice, which limits the ability to unequivocally assess the actual transfer of competences outside the academic environment. Secondly, the study relies on respondents' self-reports, which may involve the risk of subjective assessment of their own competencies and experiences. Thirdly, the cross-sectional nature of the study does not allow for the capture of changes over time (e.g. in terms of capturing the dynamic process of internalising competences) or the drawing of clear conclusions about cause-and-effect relationships. This may partly explain the weakness of some of the observed correlations.

Ethics Declaration: Ethical clearance was not required for the research.

AI Declaration: AI (ChatGPT) was utilized to assist in refining grammar, enhancing language clarity, and improving overall readability. Authors confirm that AI tools did not contribute to generating the research data,

analysis, or core intellectual content presented herein. The final responsibility for the content and its accuracy rests solely with the author.

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