

Ethical Risks and Influence Mechanisms of Generative AI Intervention in Undergraduate Thesis Supervision: A Quantitative Analysis Based on Academic Integrity and Technology Adoption Perspectives

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Abstract: Generative artificial intelligence is rapidly entering various stages of undergraduate thesis writing, including topic selection, literature review, research design, data processing, text polishing, and thesis defense preparation. Unlike regular coursework, the undergraduate thesis carries attributes of degree conferral, academic training, and supervisor responsibility. Therefore, AI intervention is not merely a matter of efficiency tools but involves ethical issues such as authorship, originality, academic integrity, data privacy, boundaries of supervisor guidance, and university governance rules. Drawing on existing quantitative research frameworks on the relationship between ChatGPT academic use and academic integrity^[1], this study focuses on the theme "Ethical Risks and Influence Mechanisms of Generative AI Intervention in Undergraduate Thesis Supervision" and constructs a structural model comprising perceived time-saving, thesis pressure, peer usage norms, supervisor clarity of AI guidance, academic integrity awareness, plagiarism risk perception, AI usage intensity, uncritical AI dependence, and responsible AI use. To demonstrate research design and paper writing style, this study sets up 386 undergraduate questionnaires as illustrative simulation samples and employs PLS-SEM for measurement model, structural path, and moderation effect testing. Results show that perceived time-saving, thesis pressure, and peer norms significantly increase AI usage intensity; AI usage intensity further increases the risk of uncritical dependence; academic integrity awareness, plagiarism risk perception, and supervisor clarity of AI guidance significantly reduce uncritical dependence; moreover, both academic integrity awareness and supervisor clarity of AI guidance weaken the positive effect of AI usage intensity on uncritical dependence. The findings suggest that universities should not respond to AI writing solely through "prohibition" or "detection," but should incorporate AI use disclosure, fact-checking, process-oriented supervision, phased documentation, and supervisor-student shared responsibility mechanisms into undergraduate thesis management.

Keywords: Generative artificial intelligence; Undergraduate thesis; Thesis supervision; Academic integrity; AI ethics; Technology adoption; PLS-SEM

0. Introduction

With the spread of generative artificial intelligence tools such as ChatGPT, students are changing how they write, conduct research, obtain feedback and evaluate learning in college. Based on the current research results, artificial intelligence language models can assist with some school-related work, such as generating ideas, summarizing articles and writing papers^[2]; at the same time, there are problems such as AI-assisted cheating, plagiarism, false citations and unclear authorship^[3]. For undergraduate theses, there is special institutional sensitivity: the undergraduate thesis is an essential indicator of the quality of undergraduate education and the conferring of degrees, and the supervisor's guidance serves the purpose of training students in academic norms and ensuring the quality of the thesis. When students use artificial intelligence to create the rationale for their research, literature reviews, research hypotheses and conclusions, is the teacher supervising them or just looking over what the computer has generated? How should the boundary be set for student use of AI in polishing, translation, structural optimization, direct generation of core paragraphs, etc.? Based on the above questions, it can be concluded that the use of generative AI

in undergraduate theses is no longer merely a problem of technology application, but has evolved into an issue related to academic ethics and educational governance.

So far, the three main directions of research have been: First, how can ChatGPT be used to assist students' learning, such as to improve their writing speed, obtain timely feedback, correct language errors, etc.^[2] Second, there are concerns about academic integrity, that is to say, whether students will submit works produced by artificial intelligence under their own names, or whether facts, data and references from AI generation will be used without verification.^[3] Third, universities are developing policies on the application of artificial intelligence in education to solve issues such as whether to permit its use, how to report cases of using artificial intelligence, how to modify assessment methods, and how to promote students' AI literacy. [4–6] Although the above studies have given us a general idea of how artificial intelligence is used in education, relatively few quantitative studies have been conducted on the institutional environment for "undergraduate thesis supervision". Undergraduate theses are not typical homework; they have a long process, require the guidance of supervisors, and you will be responsible for the results. Therefore, its ethical risk mechanisms may be different from those in the regular course papers.

The main problem of this paper is: What factors influence the use of generative artificial intelligence by college students in their graduation design? How Does the Degree of AI Use Convert to Uncritical Dependence on AI? Can a sense of academic integrity and clearer direction from teachers in the use of artificial intelligence help solve this problem? Based on the above problems, this paper employs the technology adoption model, social influence theory and research on academic integrity to build a quantitative analysis model, and will introduce the questionnaire design, variable measurement and structural equation analysis steps. First, this paper expands on the research of generative artificial intelligence from the general environment of course learning to that of undergraduate thesis supervision; Second, it adds a factor of "supervisor clarity of AI guidance" to the model to emphasize the institutional role of supervisors in the ethical governance of AI; Third, it introduces "uncritical AI dependence" as a serious ethical risk factor and distinguishes between reasonable assistance and substitute writing; Finally, it provides an interchangeable analytical framework for future actual survey research and SSCI-style paper writing.

1. Literature Review and Theoretical Foundations

1.1 Generative AI and Academic Integrity in Higher Education

The Educational Application of Generative AI has two sides. On the one hand, it can reduce the costs of access to explanations, feedback and language support for learners, thus promoting the writing of ideas, organisation of literature, code assistance and language refinement^{[2][6]}. At the same time, AI-generated content is very smooth and low-cost to produce, but it does not have a clear source; thus, traditional plagiarism detection and academic integrity education are facing new problems^[3]. According to the guiding document released by UNESCO on Generative AI in Education and Research, a governance system should be established based on data privacy, transparency, fairness, human agency, etc., and be suitable for children^[4]. Universities need to know that AI exists, but more importantly, they must have clear divisions of responsibility and rules for using it for students, teachers and staff^[5]. Research on the cooperation of generative artificial intelligence in interdisciplinary professional education has also shown that universities need to coordinate their strengths in technology, goals for the courses and professional ethics^[7].

1.2 Distinctive Ethical System of Undergraduate Thesis Supervision

Undergraduate thesis supervision is different from that in regular courses in some respects. First of all, there is a degree qualification function to the undergraduate thesis; it tests whether students have achieved the programme learning outcomes. Second, there is a continuous supervision by the supervisor of the undergraduate thesis, and the supervisor may alter the topic selection,

framework, materials and methods, etc. Thirdly, the undergraduate thesis is expected to have clear results and the students themselves will be responsible for them. With the development of generative artificial intelligence (AI), the traditional structure of responsibility for students, teachers and schools has begun to be reorganized into a new kind of "student-teacher-school-AI system-platform data", and many ethical problems have arisen, such as false authorship, cognitive substitution, factual hallucination, data leakage, weakened supervisory responsibility and distorted evaluations.

1.3 Technology Adoption, Academic Integrity, and AI Ethical Risks

Technology adoption research generally holds that perceived usefulness, time-saving, social influence, and stressful situations affect individuals' willingness to adopt new technologies^{[8][9]}. Existing research on ChatGPT academic use has found that time-saving, electronic word-of-mouth, academic self-efficacy, self-esteem, and stress positively influence ChatGPT use, while academic integrity negatively affects use behavior and exerts a moderating effect^[1]. Translating this to the undergraduate thesis supervision context, saving time, alleviating thesis pressure, and peer usage norms may drive students to use AI more extensively; however, academic integrity awareness, plagiarism risk perception, and clear supervisor guidance may lead students to distinguish between "assistive use" and "substitutive dependence." Therefore, this study integrates technology adoption variables and ethical governance variables into a single model.

2. Research Model and Hypotheses

The analytical logic of this study is as follows: perceived time-saving, thesis pressure, and peer usage norms affect generative AI usage intensity; AI usage intensity may further lead to uncritical AI dependence; academic integrity awareness, plagiarism risk perception, and supervisor clarity of AI guidance directly inhibit uncritical dependence; simultaneously, academic integrity awareness and supervisor clarity of AI guidance buffer the relationship between AI usage intensity and uncritical dependence. The research hypotheses are as follows.

Table 1 Research Hypotheses

Hypothesis	Content
H1	Perceived time-saving positively influences students' intensity of generative AI use in undergraduate thesis guidance.
H2	Undergraduate thesis pressure positively influences students' intensity of generative AI use in undergraduate thesis guidance.
H3	Peer norms positively influence students' intensity of generative AI use in undergraduate thesis guidance.
H4	Supervisor's AI guidance clarity positively influences students' responsible AI use.
H5	Academic integrity awareness negatively influences students' uncritical AI reliance.
H6	Plagiarism risk perception negatively influences students' uncritical AI reliance.
H7	Generative AI use intensity positively influences uncritical AI reliance.
H8	Supervisor's AI guidance clarity negatively influences uncritical AI reliance.
H9	Academic integrity awareness weakens the positive effect of generative AI use intensity on uncritical AI reliance.
H10	Supervisor's AI guidance clarity weakens the positive effect of generative AI use intensity on uncritical AI reliance.

3. Research Methods

3.1 Sample and Procedure

This study adopts a quantitative research design combining questionnaire survey and structural equation modeling. For formal research, questionnaires could be distributed to third- and fourth-

year undergraduates who are currently or have recently completed their undergraduate thesis writing, covering disciplines such as humanities and social sciences, science and engineering, agriculture and medicine, economics, management, law, and education. The first page of the questionnaire should include informed consent information, explaining the research purpose, anonymity, data use, and right to withdraw, and avoid collecting personally identifiable information such as name, student ID, or contact information^[4].

To demonstrate the paper writing and statistical presentation style, this study sets 386 valid questionnaires as illustrative simulation samples. These samples are used solely to illustrate the model testing process and cannot be submitted as actual research findings. Before formal submission, researchers should recollect data in accordance with institutional ethics review requirements and report sampling method, collection period, invalid sample exclusion criteria, and common method bias testing.

Table 2 Illustrative Sample Structure (n=386)

Variable	Category	Frequency	Percentage
Gender	Male	151	39.1%
Gender	Female	235	60.9%
Grade	Junior	108	28.0%
Grade	Senior	278	72.0%
Discipline	Humanities & Social Sciences	167	43.3%
Discipline	Science, Engineering, Agriculture & Medicine	126	32.6%
Discipline	Economics, Management, Law & Education	93	24.1%
Received AI ethics training	Yes	142	36.8%
Received AI ethics training	No	244	63.2%

3.2 Variable Measurement

All latent variables are measured using a five-point Likert scale, where 1 = "strongly disagree" and 5 = "strongly agree." Questionnaire items can be adapted from existing validated scales^{[1][8][9]}, and adapted to the thesis supervision context through expert review and pretesting.

Table 3 Constructs and Measurement Design

Construct	Abbreviation	Meaning of Measurement	Number of Items	Source/Basis
Perceived time-saving	TS	AI helps quickly find materials, generate outlines, polish language, organize references	4	Bin-Nashwan et al. [1]; TAM [8]
Thesis pressure	TP	Pressure from topic selection, literature review, data processing, writing progress, and defense	4	Pressure and academic use [1]
Peer norms	PN	Whether classmates commonly use AI, share prompts and writing solutions	3	Social influence / UTAUT [8]
Supervisor's AI guidance clarity	SGC	Whether supervisor clearly defines permitted scope, citation requirements, disclosure methods, and prohibited behaviors	5	AI education policy and governance [4][5]
Academic integrity awareness	AIA	Student's agreement with author responsibility, originality, citation norms, and AI disclosure obligations	5	Academic integrity research [1][3]

Plagiarism risk perception	PRP	Student's perception of risks such as AI text similarity, fake citations, ghostwriting, and detection uncertainty	4	Ethics of AI-assisted writing [3]
Generative AI use intensity	GAI	Frequency of use in topic selection, literature review, framework, writing, polishing, and defense preparation	6	Adapted from [1] [6]
Uncritical AI reliance	UAR	Accepting AI output without verification, using AI-generated text as core content of thesis, weakening independent judgment	5	Constructed for this study [3][4] [5]
Responsible AI use	RAU	Fact-checking, labeling AI assistance, retaining personal judgment, following supervisor and university norms	5	Constructed for this study [4][5]

3.3 Data Analysis Methods

This study illustratively employs PLS-SEM for data analysis^[10]. The reasons for choosing PLS-SEM are: first, the study simultaneously includes multiple latent variables, direct effects, and moderation effects; second, the research purpose is oriented toward explaining and predicting generative AI use and ethical risks; third, PLS-SEM has relatively flexible assumptions regarding sample distribution, making it suitable for educational technology adoption questionnaire research^[10]. Data analysis steps include descriptive statistics, reliability testing, convergent validity testing, discriminant validity testing, collinearity testing, path coefficient estimation, bootstrap significance testing, and moderation effect testing.

4. Results

4.1 Measurement Model Testing

Illustrative analysis results show that Cronbach's α , composite reliability, and average variance extracted for each construct meet recommended thresholds, indicating good internal consistency and convergent validity^[10].

Table 4 Reliability and Convergent Validity Testing (Illustrative Results)

Construct	Cronbach's α	CR	AVE	Square root of AVE
TS	0.87	0.88	0.73	0.854
TP	0.84	0.86	0.68	0.825
PN	0.82	0.83	0.70	0.837
SGC	0.91	0.92	0.74	0.860
AIA	0.90	0.91	0.72	0.849
PRP	0.86	0.87	0.69	0.831
GAI	0.89	0.90	0.61	0.781
UAR	0.88	0.89	0.64	0.800
RAU	0.90	0.91	0.71	0.843

Table 5 Summary of Model Quality Testing

Test Item	Result Description
Measurement model	All standardized factor loadings ranged from 0.711 to 0.884; Cronbach's $\alpha > 0.82$; AVE > 0.60 .
Discriminant validity	Fornell-Larcker criterion and HTMT both met recommended thresholds, indicating distinguishability among constructs.
Structural model	R^2 of GAI = 0.421, R^2 of UAR = 0.536, R^2 of RAU = 0.327; moderate explanatory power.
Collinearity	All VIF values ranged from 1.18 to 2.47; no serious multicollinearity detected.

4.2 Structural Path Testing

Path testing results show that perceived time-saving, thesis pressure, and peer usage norms all significantly and positively affect generative AI usage intensity, indicating that students under time constraints, task pressure, and peer influence are more inclined to incorporate AI into their thesis writing process. Generative AI usage intensity significantly and positively affects uncritical AI dependence, suggesting that high-frequency use without normative constraints may shift from tool-assisted to substitutive dependence. Academic integrity awareness, plagiarism risk perception, and supervisor clarity of AI guidance significantly reduce uncritical AI dependence, indicating that ethical awareness and institutionalized guidance can play risk-inhibiting roles.

Table 6 Structural Path and Moderation Effect Results (Illustrative Results)

Hypothesis	Path	β	t-value	p-value	Conclusion
H1	TS $\rightarrow$ GAI	0.284	5.21	<0.001	Supported
H2	TP $\rightarrow$ GAI	0.226	4.18	<0.001	Supported
H3	PN $\rightarrow$ GAI	0.169	3.02	0.003	Supported
H4	SGC $\rightarrow$ RAU	0.391	7.46	<0.001	Supported
H5	AIA $\rightarrow$ UAR	-0.318	6.01	<0.001	Supported
H6	PRP $\rightarrow$ UAR	-0.172	3.36	0.001	Supported
H7	GAI $\rightarrow$ UAR	0.354	6.69	<0.001	Supported
H8	SGC $\rightarrow$ UAR	-0.247	4.79	<0.001	Supported
H9	GAI $\times$ AIA $\rightarrow$ UAR	-0.126	2.58	0.010	Supported
H10	GAI $\times$ SGC $\rightarrow$ UAR	-0.101	2.11	0.035	Supported

4.3 Moderation Effect Analysis

Moderation effect results show that both academic integrity awareness and supervisor clarity of AI guidance significantly weaken the positive effect of generative AI usage intensity on uncritical AI dependence. In other words, among students with higher academic integrity awareness and clearer supervisor rules, even with higher AI usage frequency, AI use is more likely to manifest as responsible use such as material organization, language optimization, idea inspiration, and fact-checking, rather than directly substituting AI output for personal research and writing. This finding has important implications for undergraduate thesis governance: universities should not simply equate AI use with cheating, but should establish a tiered normative system encompassing "permitted scope – prohibited scope – disclosure requirements – verification responsibilities – supervisor process guidance."

5. Discussion

Firstly, the main reason for using generative AI in the supervision of undergraduate dissertations is to improve efficiency. Saving time has the greatest effect on students' use of artificial intelligence; thus, they believe that it can be used to help solve problems in their studies, such as finding materials and constructing systems. The positive effect of thesis pressure also indicates that when students are near their submission deadline or lack writing ability and are unfamiliar with research methods, they are more likely to use artificial intelligence to complete some parts of their theses quickly.

Second, the use of artificial intelligence itself is not an ethical issue; rather, the problem is whether people rely on it blindly. Low-risk use includes help with brainstorming, refining language, comparing research designs, and preparing for defence Q&A. High-risk use refers to having AI generate the main content directly, creating fictitious references, avoiding data analysis, not obtaining supervisor permission, or failing to disclose AI use. To avoid the stigma that will be attached to all applications of artificial intelligence and to indicate genuine problems that require governance, "uncritical dependence on AI" will be used as the operational definition of the ethical risk variable in this paper.

Thirdly, the purpose of the AI guide should be dual. On the one hand, it can promote the responsible use of artificial intelligence; at the same time, students will learn when to use AI, how to record the prompts and results of AI, how to mark AI assistance, and how to verify facts and citations. At the same time, it can reduce passive learning and reduce the dependency of students on artificial intelligence. Therefore, thesis AI governance should not only be carried out through the general regulations of universities but also implemented during the examination process.

Fourth, academic integrity education needs to change from "prohibiting plagiarism" to "human-AI collaborative responsibility". Traditionally, integrity education has focused on not copying others' work, but with the advent of generative AI, there is a problem of non-traceable human authorship and the inability of AI to bear academic responsibility^{[3][4]}. Therefore, students need to know that AI can help with writing but cannot take responsibility for research and judgment; it can provide some suggestions, but not evidence; it can rewrite language but cannot exempt the author from accountability for accuracy, originality, and citation rules.

6. Conclusion and Recommendations

This paper has conducted a quantitative analysis of the ethical risks of generative AI in undergraduate thesis supervision. As shown in the above illustration, the reasons for students' use of artificial intelligence are technical efficiency, thesis pressure and peer norms; to reduce uncritical dependence on AI, academic integrity awareness, perception of plagiarism risk and clarity of supervisor guidance on AI need to be strengthened. Based on the above results, the following improvements to the governance of artificial intelligence in undergraduate thesis writing are proposed: First, a tiered standard for the use of artificial intelligence in undergraduate theses should be set to differentiate between permitted, restricted and prohibited situations; Second, an artificial intelligence use disclosure system should be introduced to require students to report the tools they have used, the stages of use, types of prompts, manual verification methods, etc.; Third, a supervisor process guidance system needs to be added to the governance chain, and supervisors should continuously monitor how much artificial intelligence is used at all times in the process of proposal submission, mid-term assessment, draft revision and finalisation; Fourth, artificial intelligence ethics literacy should be integrated into thesis writing courses or academic norms training; Fifth, the excessive application of artificial intelligence detection tools should be restrained, and instead, the degree to which students' own work has been created should be evaluated through oral defence, process materials, research logs and version history.

The shortcomings of this paper. First, the current data are illustrative simulation results and cannot be directly used as the main content of the report. Second, the model focuses on the students' views and has not yet included the opinions of supervisors, academic administrators, etc. Thirdly, the tolerance and kind of risk for AI assistance in different subjects are not the same, so multi-group comparisons can be conducted in the future. Recently, with the development of generative artificial intelligence tools, there have been many changes; we need to pay attention to these changes in the models that will affect thesis management in the future.

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