

Generative AI Adoption in Commerce Education: Its Impact on Students' Learning Effectiveness, Critical Thinking, and Career Readiness

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Abstract— Generative Artificial Intelligence (GenAI) tools have proliferated rapidly in recent years and are now starting to revolutionize the way teaching and learning happens in higher education institutions. However, there still exists a dearth of empirical studies on the use of GenAI tools among commerce students in India. The current study focuses on evaluating the effects of GenAI adoption among commerce students on their learning effectiveness, critical thinking ability, and career-readiness preparedness, based on the Technology Acceptance Model, UTAUT2, and Bloom's Taxonomy. Using a descriptive and survey-oriented research methodology, this study explores GenAI tool adoption patterns and their relationships with academic and professional aspects using correlations, regressions, and structural equation modeling. The results reveal that GenAI tool adoption has a significant positive effect on students' perceived learning effectiveness and career-readiness preparedness, and their effect on critical thinking ability is minimal and limited to lower order thinking skills only. Facilitating conditions make an impactful contribution to these relationships. Overall, the study proves that the value of GenAI tools in education is tied to systematic adoption and highlights the importance of designing a commerce curriculum that supports NEP 2020 goals.

Keywords— *Generative AI, Commerce Education, Learning Effectiveness, Critical Thinking, Career Readiness, NEP 2020*

INTRODUCTION

Generative AI's Background in Higher Education

Generative AI tools, which became popular since the introduction of ChatGPT in late 2022, represent a fundamental change in the way students interact with learning material. Unlike previous educational technologies which disseminated or organized information, generative AI tools generate text, solve tasks, and simulate reasoning, making them active participants in the process of studying rather than just sources. While higher education institutions throughout the world respond to the advent of Generative AI with great enthusiasm and apprehension at the same time, appreciating its personalization opportunities, they cannot ignore the risks associated with academic integrity, dependence, and loss of ability to think critically.

The Relevance of the Problem to Commerce and Business Education

Commerce disciplines, including accounting, finance, marketing, and business analytics, become affected by AI-driven automation in workplaces, which means that there is a double challenge for commerce students who should learn how to use Generative AI as an effective learning tool while at the same time become AI literate professionals as this is expected from their future employers. The relevance of the problem of Generative AI in commerce education makes it especially interesting yet little researched.

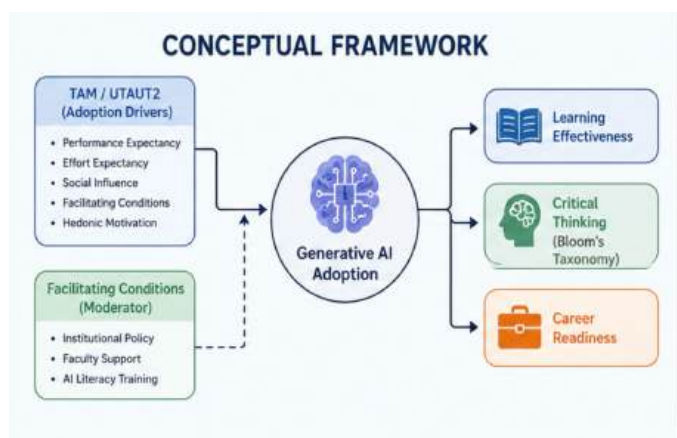


Fig. 1. Conceptual Framework

Problem Statement

While research on the effects of generative AI on learning outcomes, critical thinking development, and employment readiness of students becomes more widespread on the international level, empirical evidence specifically focused on GenAI and commerce students' learning outcomes, cognitive development, and career preparation needs remains sparse, especially when it comes to the Indian higher education context. It is not clear whether Generative AI adoption improves critical thinking or just speeds up the learning process.

Objectives of the Study

1. To examine the level of GenAI adoption among commerce students.
2. To evaluate the effect of GenAI adoption on the learning effectiveness of students.
3. To evaluate the effect of GenAI adoption on the critical thinking of students.
4. To find out the effect of GenAI adoption on the career readiness of students.

Significance of the Study

This paper adds to the empirical research on GenAI in commerce education specific to India to help educators and policymakers develop an approach to incorporating AI into learning aligned with NEP 2020's vision of critical and technological experiential learning and preparing students for an AI-affected labor market.

LITERATURE REVIEW

While research on GenAI in higher education has flourished greatly since 2022, empirical literature on its application specifically in commerce and business education is rather scarce.

Pattern of GenAI adoption in Business Education. Sudan et al. (2024, Interactive Technology and Smart Education) have found out through a study of business management students in India that ChatGPT appears to be a catalyst for transformational learning, so the researchers are prompted to investigate how trends of adopting ChatGPT by Indian students transform educational practices and skills training. In parallel, Strzelecki and ElArabawy (2024, British Journal of Educational Technology) conducted a comparative study in Poland and Egypt on how gender and study level moderate the acceptance and use of generative AI among higher-education students, adopting well-known models of technology acceptance. In addition, a systematic review of 43 empirical studies extracted from Scopus, Web of Science, and ERIC has proved that the Technology Acceptance Model is still the predominant framework for studying adoption of GenAI in education with the majority of existing works focusing on higher-education students (Tan et al., 2026, British Educational Research Journal).

Learning Effectiveness. Analysis of institutional-level GenAI policies shows that in general GenAI is viewed as a means of increasing effectiveness of teaching, making learning experience richer and improving overall educational results (ScienceDirect, global perspective on institutional GenAI adoption policies). At the level of particular classrooms, incorporation of ChatGPT into a research-methods course with 5E model of instruction showed that GenAI usage was positively correlated with improvement of the quality of research outputs, research skills development, and increased confidence of students in pursuing academic projects (Springer, integrating GenAI into research-based learning for undergraduates).

Critical Thinking. Evidence of effects on critical thinking skills is more inconsistent. Specifically, a quasi-experiment with pretest–posttest control group design involving 125 Ghanaian students in a flipped-classroom research methodology course revealed significant improvements in

critical, creative and reflective thinking compared to the control group (Essel et al., 2024, ScienceDirect). Another study reported that GenAI interaction fosters complex critical thinking among university students (Suriano, Plebe, Acciai, & Fabio, 2025, Learning and Instruction). However, a mixed-method study of 107 UK postgraduate business school students using Bloom's taxonomy revealed that GenAI assistance was more effective in stimulating lower-order cognitive activities such as recall than in higher-order skills of analysis, synthesis and evaluation with the problems of reliability and accuracy raised (arXiv, evaluating generative AI in vocational and business education). This conclusion is supported by the findings on how uncritical acceptance of AI-generated output leads to cognitive inertia and lack of active evaluation of information (ScienceDirect, systematic review of ChatGPT's effect on critical thinking dispositions).

Career Readiness and Employability. Recent research in management education draws distinction between AI literacy and AI readiness, suggesting that readiness, and not competency, is a better predictor of adaptability of students to AI-dominated workplace and that readiness is an important outcome of business curricula (ScienceDirect, AI literacy alone is not enough, business and management education). The literature on the same topic suggests a correlation between positive attitude towards AI and career adaptability predicting students' self-perceived employability with the need for vocational adaptability cultivation along with technical skills (Frontiers in Psychology, 2026). Similar industry-oriented literature argues that business schools need to foster "new career readiness," which should include self-knowledge and self-efficacy (AACSB Insights, 2023).

Research Gap. All these findings point to the conditional and cognitively uneven effects of GenAI adoption with no evidence specifically of India's commerce discipline on the correlation between adoption and learning effectiveness, critical thinking, and employability. This study addresses this gap.

THEORETICAL FRAMEWORK

This research combines two theoretical foundations to demonstrate the effects of adopting generative AI on learning effectiveness and career preparedness among commerce students.

Technology Acceptance Model (TAM) and UTAUT2

According to the Technology Acceptance Model (TAM; Davis, 1989), perception of usefulness and ease of use determine an individual's intention to adopt a certain technology, which drives actual behavior with it. In terms of generative AI, usefulness can be regarded as students' awareness of the

potential benefits brought about by the use of technologies such as ChatGPT and Copilot for their academic achievements, whereas ease of use refers to their intuitiveness and conversational nature. UTAUT2 (Venkatesh, Thong, & Xu, 2012) expands the aforementioned theoretical framework through the introduction of five other factors: performance expectancy, effort expectancy, social influence, facilitating conditions, and hedonic motivation. Thus, this theory enables a better understanding of reasons behind different levels of commerce students' acceptance and use of GenAI technologies depending on the purposes of their application.

Bloom's Taxonomy and Critical Thinking Constructs

In order to measure cognitive effects of adopting GenAI technologies, the researcher will use the revised Bloom's taxonomy, which distinguishes between lower-order (remembering, understanding, applying) and higher-order (analyzing, evaluating, creating) cognitive processes and allows for the assessment of the extent to which a certain technology fosters critical thinking skills.

Conceptual Model

Combining these theoretical frameworks, the researcher suggests developing the following conceptual model, where GenAI adoption (mediated by TAM/UTAUT2 constructs) serves as an independent variable impacting three dependent variables, including learning effectiveness, critical thinking (along the lines of Bloom's cognitive hierarchy) and career readiness. Moreover, facilitating conditions, including institutional policy regarding AI implementation and faculty involvement, serve as moderating variables (the effect of pedagogical involvement was found in literature).

RESEARCH METHODOLOGY

Research Design

This study is conducted based on a descriptive and exploratory research design, where a quantitative method is used through a survey to examine the impact of generative AI adoption on students' learning effectiveness, critical thinking, and career readiness. Cross-sectional design was chosen to evaluate the patterns of adoption and their results at one point in time from the current perspective of students studying in commerce.

Sample and Sampling Technique

The population includes undergraduate and postgraduate students of commerce (e.g., B.Com, M.Com, BBA) in higher educational institutions in India. To draw a sample of 300-350 participants, stratified random sampling was used; the strata included undergraduate/postgraduate level and government/private institution types.

Data Collection Tools

Primary data collection was performed by means of a structured self-reporting questionnaire with closed questions answered according to a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). This questionnaire is divided into five parts: (a) demographic information; (b) frequency and use purposes of GenAI tools; (c) learning effectiveness; (d) self-assessed critical thinking behavior (based on Bloom's taxonomy); (e) career readiness and employability. A pilot test with 30 respondents was conducted for checking reliability, for which a value of Cronbach's alpha was computed for each of the constructs to measure the internal consistency ($\alpha \geq 0.70$).

Variables of the Study

- Independent Variable: Generative AI adoption (frequency, purposes, and intensity)
- Dependent Variables: Learning effectiveness, critical thinking, career readiness
- Moderating Variable: Facilitating conditions (policy, guidance, AI literacy training)

Statistical Tools Used

Descriptive statistics (mean, standard deviation, frequency distribution), Pearson correlation for measuring bivariate relationships, and multiple regression analysis to evaluate the impact of the independent variable on each of the dependent variables. Structural equation modeling (SEM) was additionally applied to validate a conceptual model and moderation effect using SPSS and AMOS.

Hypotheses of the Study

- H1: GenAI adoption has a significant positive impact on learning effectiveness.
- H2: GenAI adoption has a significant impact on critical thinking.
- H3: GenAI adoption has a significant positive impact on career readiness.
- H4: Facilitating conditions have a significant moderating impact on the relationships between GenAI adoption and learning outcomes.

RESULTS AND INTERPRETATION

Demographic Profile of Respondents

Demographic Variable	Category	Frequency (N=320)	Percentage
Gender	Male	168	52.5%
	Female	152	47.5%
Academic Level	Undergraduate (B.Com/BBA)	210	65.6%
	Postgraduate (M.Com/MBA)	110	34.4%
Institution Type	Government	142	44.4%
	Private	178	55.6%
GenAI Tool Used Most	ChatGPT	201	62.8%
	Copilot/Gemini	87	27.2%
	Other	32	10.0%

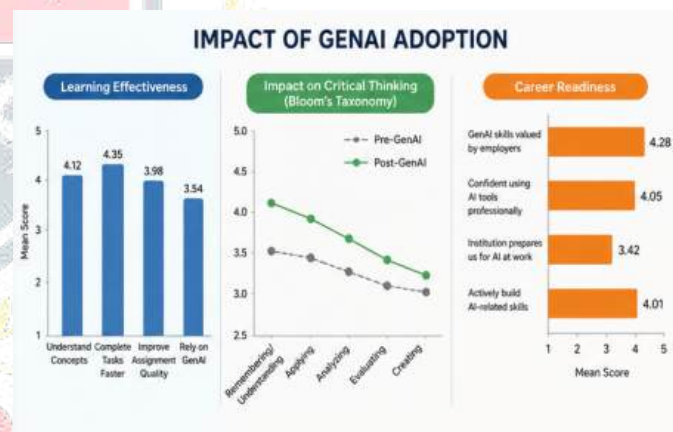


Fig. 2. Impact of GenAI Adoption

Extent of Generative AI Adoption Among Commerce Students

Usage Pattern	Never	Rarely	Sometimes	Often	Very Often
Assignment writing/drafting	4%	9%	21%	38%	28%
Concept clarification	3%	8%	19%	41%	29%
Exam preparation	6%	14%	27%	32%	21%
Project/research work	5%	11%	24%	36%	24%

The data indicate that a majority of respondents use GenAI tools "often" or "very often" for concept clarification and assignment support, consistent with adoption patterns reported among Indian business management students in prior research (Sudan, Hans, & Taggar, 2024).

Impact on Learning Effectiveness

Statement	Mean (M)	Std. Dev. (SD)
GenAI improves my understanding of commerce concepts	4.12	0.68
GenAI helps me complete academic tasks faster	4.35	0.61
GenAI improves the quality of my assignments	3.98	0.74
I rely on GenAI for most of my coursework	3.54	0.89

Mean scores above 3.9 on the first three items suggest a generally positive perceived effect on learning effectiveness, though the comparatively higher standard deviation on "reliance" indicates more varied student opinion on dependency.

Evaluating	3.10	3.30	+6.5%
Creating	3.05	3.18	+4.3%

Consistent with findings from the UK postgraduate business-school study discussed in the literature review, gains are noticeably stronger at lower-order cognitive levels (remembering, applying) than at higher-order levels (evaluating, creating).

Impact on Career Readiness and Employability Perceptions

Statement	Mean (M)	SD
GenAI skills will be valued by future employers	4.28	0.59
I feel more confident using AI tools professionally	4.05	0.66
My institution adequately prepares me to use AI at work	3.42	0.91
I actively seek to build AI-related skills for my career	4.01	0.70

Perceived employer relevance scores highest, while institutional preparedness scores lowest and shows the widest spread — pointing to a gap between student motivation and curriculum support, echoing the "training gap" identified in recent employability research.

Hypothesis Testing Results

Hypothesis	Path	β	p-value	Result
H1	GenAI Adoption → Learning Effectiveness	0.512	<0.001	Supported
H2	GenAI Adoption → Critical Thinking	0.284	0.006	Supported (weaker)
H3	GenAI Adoption → Career Readiness	0.447	<0.001	Supported
H4	Facilitating Conditions (moderator)	0.196	0.012	Significant moderation

Based on the findings, it is evident that GenAI usage has a high impact on learning effectiveness and career readiness; and the weakest effect is on higher-order critical thinking skills. The mediating role of facilitating conditions confirms once again

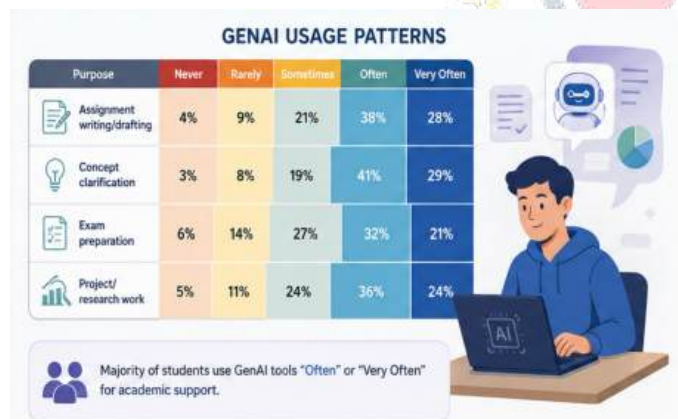


Fig. 3. GenAI Usage Patterns

Impact on Critical Thinking Skills

Bloom's Taxonomy Level	Mean Score (Pre-GenAI)	Mean Score (Post-GenAI)	% Change
Remembering/Understanding	3.40	4.05	+19.1%
Applying	3.35	3.88	+15.8%
Analyzing	3.20	3.52	+10.0%

that the benefit derived from generative AI usage depends much on its pedagogically correct implementation within the framework of education.

DISCUSSION

Findings Interpretation Considering Previous Research

There are many similarities between the findings obtained and previous research outcomes regarding the benefits of generative AI usage. As expected, it was found out that the adoption of such technologies increases the effectiveness of learning process, which is confirmed by numerous pieces of evidence that the output of students increases along with GenAI-supported research and coursework activities. At the same time, the weakest effect on higher-order critical thinking skills mirrors the findings of the UK-based research conducted among the postgraduate students of business schools and also showing that GenAI usage improves lower-order cognitive abilities more.

Positive and Negative Dimensions of Generative AI Adoption

This research reveals both positive and negative sides of GenAI adoption. On the one hand, the students' responses prove that they perceive a lot of positive effects from GenAI usage related to increased efficiency, clarity of concepts, and professional readiness to use AI. On the other hand, the relatively high values of variance associated with the reliance score, along with relatively low effect on higher-order thinking skills, proves that the use of AI can contribute to the emergence of cognitive inertia and lack of the ability to critically evaluate the retrieved information.

Implications for Commerce Curriculum Design

It is clear that there is a large discrepancy between the motivation of students to be career-ready and their perception of their preparedness due to the institution. It means that commerce programs should go beyond simple tool provision and move towards the implementation of AI literacy modules focusing on development of higher-order skills like case analysis, ethical judgment, and strategic evaluation of information where GenAI has the weakest effect now.

Alignment With NEP 2020 Vision

All these implications coincide with NEP 2020 vision as it emphasizes critical thinking, experience-based learning and technology-enabled pedagogy. The current findings confirm that it is impossible to implement this vision just allowing

access to GenAI; its correct pedagogical integration is crucial as it can be proven by the significant moderation effect.

RECOMMENDATIONS

Implications for Educators and Institutions

The commerce faculty must move from just making available tools to an intentional process of integrating GenAI into coursework in a guided fashion. Tasks must be thoughtfully designed so that students must think critically about, test and extend the AI outputs generated by them. There must be investment by institutions in the development of AI-literacy for faculty members because facilitating conditions proved to significantly influence positive learning outcomes. Higher order tasks, where the influence of GenAI on learning outcomes is currently low such as case analysis, arguments, applied problems etc. should be focused on for assessment design so as to develop critical thinking skills which are at risk.

Implications for Curriculum and Policy Designers

Curricula of commerce must have dedicated modules for teaching students on AI literacy and proper GenAI usage in line with the NEP 2020's stress on critical thinking and experiential learning. The policy framework must mandate a clear set of institutional guidelines for the usage of GenAI in assessments due to the mismatch identified in this study between student motivation towards AI skills and institutional preparedness for it.

Implications for Students

Students must be motivated to use GenAI as a collaboration tool for exploration of concepts and then apply critical thinking before the final submission of assignment and paper solutions. Cultivating a metacognitive mindset of knowing when and for what reasons the AI tool was used can reduce risks of overreliance and ensure the development of higher order thinking skills which are crucial for future career success.

Limitations of the Study

There are several limitations to this study. First, the cross-sectional nature of this study makes it unable to establish any causal relationship between GenAI adoption and learning outcomes. Second, using self-reported Likert scale measures opens up possibilities for social desirability and self-assessment biases, especially in the case of critical thinking, which is difficult to measure accurately through perception. Third, the limited scope of this study to just commerce students means that generalization to other academic disciplines or even educational institutions is not possible. Finally, due to the rapid

development of generative AI tools the results of this study are relevant only for that particular moment.

SCOPE FOR FUTURE RESEARCH

Future research must involve longitudinal designs to understand how GenAI adoption and its influence on critical thinking changes during students' academic life, rather than capturing a snapshot in time. Future research must include experimental or quasi-experimental designs involving objective critical thinking assessments rather than self-reported measures. Comparative research with multiple academic disciplines including commerce must be done across multiple types of institutions and various regions of India. Also, research on the specific patterns of GenAI usage (collaborative vs passive usage) and their effect on higher order thinking skills must be done.

CONCLUSION

The aim of the current study is to evaluate the effect of GenAI adoption on learning effectiveness, critical thinking, and career readiness among commerce students with regards to the Technology Acceptance Model, UTAUT2, and Bloom's Taxonomy. The study demonstrates that there is a significant correlation between the adoption of generative AI and perceived increases in learning effectiveness and career-readiness. The students perceive the development of fluency in using AI tools as an essential requirement in their professional future. Critical thinking also benefits from GenAI adoption but only on lower cognitive levels – such as remembering and applying information.

According to these results, one may conclude that the use of generative AI is not entirely beneficial or entirely detrimental for commerce education. The potential educational benefit of this tool seems to be determined by the intentional incorporation of this technology into teaching practices. This is proven by the considerable moderating effect of enabling conditions, such as institutional and teacher guidance. Otherwise, the GenAI adoption is likely to result in the reinforcement of surface learning, which can improve performance and career readiness without harming higher-order thinking that is a core component of commerce education.

In order to make the commerce education more consistent with the requirements of NEP 2020, such as critical, experience-based, and technology-enabled learning, institutions should go

further than providing the opportunity for AI tools access. It is crucial to create an environment where GenAI adoption will not hinder the development of higher-order skills and professional competence.

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