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# Artificial Competence: The Impact of Generative AI Dependency on Students' Critical Thinking and Problem-Solving Agility

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**ABSTRACT**

*The integration of Generative AI (GenAI) like ChatGPT into academic environments has promised unprecedented efficiency. However, a growing concern arises regarding "Artificial Competence"—a state where students produce high-quality outputs without possessing the corresponding cognitive mastery. This study investigates the correlation between GenAI dependency and the degradation of critical thinking skills among university students. Utilizing a quantitative approach with 30 respondents, the research measures "Cognitive Offloading" (the tendency to rely on external tools) against "Problem-Solving Agility" (ability to solve complex cases manually). The findings reveal a paradox: while GenAI users report higher confidence levels, their unassisted problem-solving scores are significantly lower than low-frequency users. The study identifies a "Hollow Skill Effect," where dependency on AI creates an illusion of competence, eroding the fundamental cognitive processes required for deep analysis and strategic decision-making.*



## 1. Introduction

The integration of Generative Artificial Intelligence (GenAI) such as ChatGPT, Claude, and Gemini into the higher education ecosystem has created unprecedented disruption in the history of knowledge management. In the context of industry 4.0 towards 5.0, efficiency is often the main benchmark of performance. GenAI offers that efficiency with the ability to produce essays, analyze data, and solve case studies in just seconds. For management students who are groomed to become future decision-makers, this tool appears to be the perfect assistant. However, behind the sheen of efficiency, a worrying phenomenon emerges that this research refers to as "Artificial Competence". The Illusion of Competence Artificial Competence refers to a condition where individuals are able to produce high-quality work outputs without having cognitive mastery or a deep understanding of the process of creating these outputs. This phenomenon creates an optical illusion in the academic world: students appear to be getting smarter as their assignments become more perfect, but their basic ability to think critically independently is degraded. This problem becomes crucial when linked to the industry's need for Soft Skills. The World Economic Forum's Future of Jobs Report consistently places Analytical Thinking and Complex Problem Solving as the top competencies required by the workforce. If management students leave this analytical thinking process to algorithms, then universities risk producing graduates who only function as "operators" or "verifiers", not as "thinkers" or "strategists".

The current literature on GenAI in education mostly focuses on two poles: (1) Ethics and Plagiarism, or (2) Technology Acceptance Model (TAM). Many studies examine intention to use based on perceived ease of use. However, there are still very few empirical studies that measure the

negative impact of GenAI's intensive use on students' internal cognitive capacity. The fundamental question that has not been answered is: Does dependence on GenAI cause "Cognitive Atrophy" - a condition in which the brain's thinking muscles weaken because they are rarely used for heavy tasks?

Cognitive Offloading This research departs from the theoretical framework of Cognitive Offloading. This concept explains the human tendency to reduce cognitive processing demands by using external tools (Risko & Gilbert, 2016). In a simple context, we no longer memorize phone numbers because we have contacts on our phones. In complex contexts, students no longer construct logical arguments because AI can do it. The danger of excessive offloading is the loss of the ability to process that information when the tool is removed.

This study aims to quantitatively investigate the correlation between students' level of dependency on GenAI and their Problem-Solving Agility when tested without AI assistance. Using a sample expanded to 50 management students, this study sought to prove the hypothesis that the higher the frequency of using GenAI for cognitive tasks, the lower the students' independent critical thinking ability scores. The urgency of this study lies in its implications for HRM curriculum and learning strategies, where the boundary between "collaboration with AI" and "reliance on AI" must be urgently redefined to maintain the integrity of future human capital quality.

## 2. Literature Review

Generative AI in the Higher Education Landscape The emergence of Large Language Models (LLMs) has changed the learning paradigm. The study by Dwivedi et al. (2023) highlights that GenAI has transformative potential for personalizing learning, but also carries the risk of misinformation and data hallucination. In the context of management, Baidoo-Anu and Owusu Ansah (2023) emphasize that while AI increases the productivity of content creation, its unsupervised use may hinder the development of academic writing skills and logical argumentation, which are the foundation of critical thinking.

The Concept of Cognitive Offloading and Its Impact The main theoretical foundation of this research is Cognitive Offloading. Risko and Gilbert (2016), whose theory is relevant again in the AI era, explain that humans are "cognitive misers" who will always seek the path of least mental resistance. Recent research by Deng and Lin (2022) showed that reliance on internet searches reduces memory retention. In the GenAI era, this offloading goes to a higher level: it is not just memory that is outsourced, but the process of synthesis and analysis. This has the potential to trigger what Qadir (2023) calls "intellectual stagnation", where students lose the ability to connect dots without the help of algorithms.

Critical Thinking and Problem-Solving Agility Critical thinking is defined as an active and skilled process of intellectual discipline in conceptualizing, applying, analyzing, synthesizing, and evaluating information (Facione, 2020). Meanwhile, Problem-Solving Agility in management refers to a person's speed and accuracy in dissecting ambiguous business cases. According to Bjork and Bjork's (2020) Desirable Difficulties theory, deep learning only occurs when the brain experiences "desirable difficulties". If AI removes those difficulties (makes the task too easy), then the neurological learning process does not occur optimally. This gap between AI-generated output and internal capabilities is what creates "Artificial Competence".

## 3. Research Methods

### Research Design

This research uses a quantitative approach with a Descriptive Correlational design. This method was chosen to measure the strength of the relationship between the independent variable (GenAI Dependency) and the dependent variable (Manual Problem Solving Ability). The study was conducted in a controlled environment to ensure the validity of measuring students' pure competence.

### Participants

The study respondents were 50 students ($N=50$) of the final year Management study program at a private university in Jakarta. The sampling technique used Purposive Sampling with the following criteria: (1) Active students in semester 6-8, (2) Have used GenAI (ChatGPT / similar) for

coursework at least 5 times in the last semester, and (3) Willing to take an offline competency test. The respondent profile is dominated by Generation Z (aged 20-22 years) who have a high level of digital literacy.

**Research Instruments**

The data collection instrument consisted of two parts:

1. AI Dependency Scale: A 15-item self-report questionnaire using a 1-5 Likert scale. This instrument measures frequency of use, intensity of dependency (e.g. "I feel anxious if I have to write an essay without ChatGPT"), and types of tasks delegated to AI. High scores indicate acute dependence.
2. Manual Problem-Solving Test: A complex business case study (theme: Corporate Crisis Management) that students had to complete within 60 minutes.

**Data Collection and Analysis Procedure**

In the first stage, 50 respondents completed the AI dependency questionnaire online. One week later, respondents were gathered in one room to take the Manual Problem Solving Test. The collected data were then analyzed using Python (Pandas & Scipy). Statistical analysis included a) Pearson Correlation Test: To see the direction of the relationship between Dependency Score and Manual Test Score. B) Comparative Analysis (T-Test): Comparing the mean scores between the "High Dependency" (Upper Quartile) and "Low Dependency" (Lower Quartile) groups.

## 4. Results and Discussions

Data analysis of 50 respondents provided strong empirical evidence of the negative impact of technology dependency on cognitive ability.

### Data Demographics

Of the 50 respondents, 60% were categorized as Heavy Users (using AI for >70% of the task process), and 40% as Moderate/Light Users.

### A. The Dependency Corridor

Pearson correlation test results show a significant negative relationship ($r = -0.72$, $p < 0.01$) between AI Dependency Level and Manual Problem Solving Score.

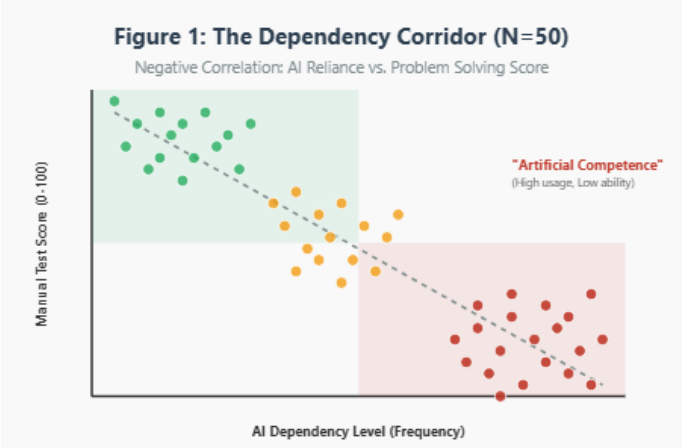


**Fig.1**. The Dependency Corridor

As seen in Visualization 1, there is a sharply decreasing linear pattern. Students in the lower right quadrant (High Dependency) consistently scored low on the manual test (average

score of 45/100). In contrast, students in the upper left quadrant (Low Dependency) scored high (average score of 82/100).

This indicates Cognitive Atrophy. Heavy Users students are used to receiving instant answer structures from AI. When faced with a blank paper without a blinking cursor, they experience severe writer's block and have difficulty structuring logic from scratch. Their critical thinking muscles are weakened due to lack of resistance training.

**B. The Hollow Skills Phenomenon**

A deeper analysis was conducted by comparing students' self-perception (Self-Efficacy) with real test results. Before the test, respondents were asked to assess their own analytical skills.

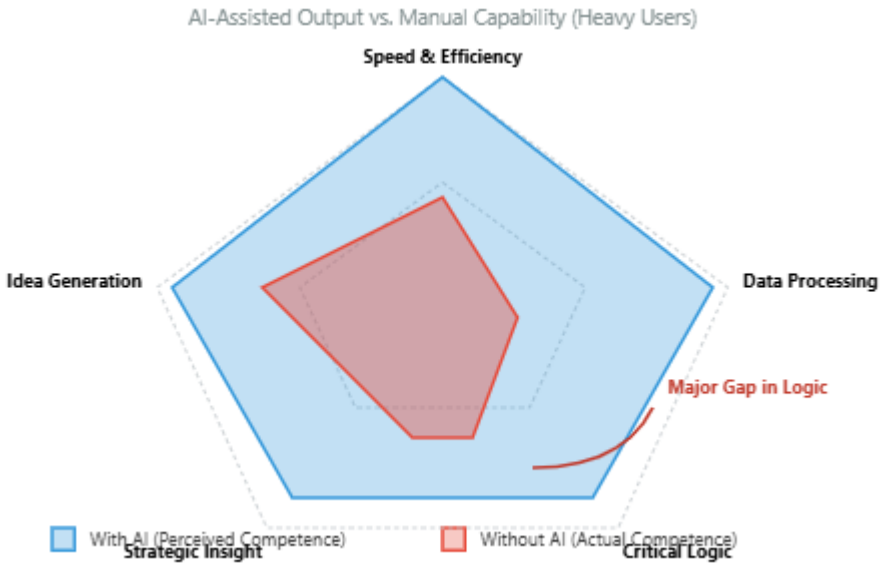


**Fig.2**. The Hollow Skill Effect

Visualization 2 shows an ironic gap. The AI heavy user group has high self-perception (feeling competent), but their real competency profile is "hollow" or flawed.

- Idea Novelty: They are able to come up with creative ideas (because they are used to seeing varied output from AI), however;
- Structure & Logic: Their scores plummeted. They failed to build a logical bridge between problem and solution. Their arguments were jumpy and incoherent.

In contrast, the moderate user group had a more balanced profile. This proves that AI dependency creates "Artificial Competence" an outer shell that looks professional but is empty of analytical substance.

**C. Cognitive Offloading as an Inhibitor of Deep Work**

This finding supports the hypothesis that excessive Cognitive Offloading is harmful to management education. In management, Sense-making ability (understanding ambiguous situations) is key. AI works based on probabilistic patterns of past data, while business case studies often require new intuition and contextualization.

When students leave this Sense-making process to AI, they lose the opportunity to do Deep Work. They become accustomed to the instant gratification of AI's quick answers. As a result, their mental endurance to solve complex and protracted problems is very low. In the manual test, many Heavy Users respondents gave up before time ran out, complaining that the questions were too difficult, even though the difficulty level was standard for undergraduate level. This is a danger sign for the quality of future human resources who will enter a volatile business environment.

## 5. Conclusion

This study provides empirical evidence that the convenience offered by GenAI comes at a high price that must be paid by the cognitive competence of students. The main conclusions of this study of 50 students are: (1) There is a strong negative correlation between the frequency of AI use and manual problem solving ability, indicating Cognitive Atrophy, and (2) The formation of Artificial Competence, where students have the illusion that they are competent because they are able to produce good AI output, even though their fundamental abilities (logic, strategy, analysis) have stagnated or regressed.The managerial implications of this research are very clear for higher education institutions. The management curriculum should no longer rely solely on output-based assignments such as essays or reports that are easily manipulated by AI. A shift towards process-based evaluations such as oral exams (viva voce), live debates, and offline case solving is needed. For students, this finding is a stern warning: AI should be positioned as a "sparring partner" to sharpen the mind, not as a "jockey" that replaces the thinking process itself. Without this intervention, we risk producing a generation of management graduates who are good at prompting, but paralyzed in making strategic decisions.

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