

Midocean University
College of Management
Master/ Artificial intelligence



**" The Impact of Artificial Intelligence Usage on Academic
Performance among University Students in Saudi Arabia "**

Prepared by:

Adnan Mohammed Abumalih

Supervised by:

Dr. Mohammed Anbar

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Abstract

In the context of rapid transformations occurring in the higher education sector due to advancements in artificial intelligence (AI) technologies, fundamental questions have arisen regarding the nature of these technologies' impact on educational outcomes, particularly students' academic performance. From this perspective, this study aims to provide an in-depth scientific analysis of the relationship between the use of AI tools and the academic achievement of university students in the Kingdom of Saudi Arabia, employing a research approach that combines interpretive analysis with quantitative measurement. The study utilizes a mixed-methods approach, enabling the exploration of the phenomenon from multiple angles. It begins with a critical review of relevant literature to establish theoretical frameworks, followed by a qualitative study to understand students' patterns of AI use, their motivations, and their perceptions of it. Finally, a quantitative study seeks to measure the nature of the relationship between the degree of AI tool use and academic performance indicators. The study is based on the central premise that the impact of AI is not determined by its mere existence, but rather by how it is employed within the educational context. This study is significant because it addresses a contemporary topic characterized by complexity and the interplay between technical and educational dimensions. Its findings are expected to shed light on the true roles that artificial intelligence plays in supporting learning, or, if misused, negatively impacting it. Furthermore, it aims to contribute scientifically to filling an existing research gap in the Saudi educational landscape, while also offering practical recommendations that can assist policymakers and educational institutions in guiding the use of artificial intelligence towards achieving more effective and sustainable learning.

Keywords: Artificial Intelligence, Academic Performance, University Students, Saudi Arabia, Higher Education, AI Tools, Learning Outcomes, Educational Technology.

Introduction

Higher education institutions have undergone profound structural transformations in recent decades as a result of the rapid advancement of digital technologies. Learning is no longer confined to traditional, rote-learning frameworks but is now based on interaction, exploration, and personalization. At the heart of these transformations, artificial intelligence (AI) has emerged as a major driver that has reshaped the nature of the educational process, not only in terms of the tools used but also in terms of the philosophy of learning itself.

AI has provided unprecedented possibilities for developing learning environments capable of adapting to the individual needs of learners by analyzing learning patterns, delivering personalized content, and providing immediate feedback. This qualitative shift has not only contributed to improving the efficiency of the educational process but has also opened new horizons for understanding how learning occurs and how it can be supported in more precise and effective ways. However, this technological advancement simultaneously raises a number of epistemological and pedagogical issues, particularly regarding its actual impact on students' academic performance. (Singh et al., 2026)

In the university context, the use of AI tools has become a daily reality for students, whether in preparing research papers, completing assignments, or even understanding complex concepts. However, this use is not without its variations, ranging from conscious application that enhances learning to excessive use that may lead to a kind of cognitive dependency that weakens critical thinking skills and academic independence. Hence, the central question arises: Does artificial intelligence actually contribute to improving academic performance, or does it reshape it in ways that may have a dual impact?

In Saudi Arabia, this question arises within an educational environment witnessing a significant expansion in the adoption of modern technologies. This necessitates in-

depth scientific studies that explore the nature of this impact within the specific cultural and educational context. It cannot be assumed that the results of global studies are directly applicable, given the differences in influencing factors, such as digital infrastructure, the level of technological awareness, and the teaching methods employed.

Therefore, this study aims to provide a comprehensive analytical understanding of the relationship between the use of artificial intelligence and the academic performance of university students. This is achieved by deconstructing this relationship into its various dimensions and exploring it from a scientific perspective that combines theoretical analysis with empirical testing. Thus, the study is not limited to measuring the impact, but extends to interpreting it and understanding its mechanisms, which contributes to building scientific knowledge that can be used in developing educational practices.

Background

The Evolution of Artificial Intelligence

Artificial intelligence (AI) has evolved remarkably from its initial conceptual foundations into a powerful and practical technology that supports many aspects of modern life. Beginning with theoretical explorations of machine intelligence in the mid-20th century, AI's development has experienced periods of both optimism and stagnation, often described as cycles of progress and "stasis" in the field. However, in recent years, AI has witnessed unprecedented growth, driven by significant improvements in computing power, the expansion of available data, and advances in machine learning techniques, particularly deep learning. These developments have enabled AI systems to perform complex tasks with high precision, including natural language processing, image recognition, and predictive analytics, making AI a key driver of contemporary technological innovation.(Sobaih & Hasanein, 2024).

AI in Higher Education

The adoption of AI in higher education has introduced notable changes in both teaching practices and institutional operations. Universities are increasingly leveraging AI-based applications to support personalized learning, automate evaluation processes, and provide real-time feedback to students. These tools contribute to enhancing learning efficiency and student engagement by adapting educational content to individual learning needs and preferences (Alotaibi, 2023). Furthermore, AI enables educators to analyze student performance data more effectively, allowing for data-driven decision-making and targeted academic support.

Despite these advantages, the integration of AI in educational contexts is not without challenges. Concerns related to ethical considerations, data privacy, and the potential misuse of AI technologies remain critical issues that require careful attention. Additionally, ensuring equitable access to AI tools and maintaining academic integrity are essential factors for the successful and responsible implementation of these technologies (Al-Shahrani et al., 2025; Jwair, 2025). Consequently, while AI offers promising opportunities to enhance higher education, its adoption must be guided by well-defined policies and institutional frameworks.

AI Usage in Saudi Arabian Universities

In Saudi Arabia, the integration of AI into higher education is closely aligned with the strategic objectives of Vision 2030, which emphasizes innovation, digital transformation, and the development of human capital. Universities across the Kingdom are actively adopting AI technologies to modernize educational systems and improve learning outcomes. This shift reflects a broader national effort to equip students with the skills required to thrive in an increasingly AI-driven global economy (Aldawsari, 2024).

Empirical evidence suggests that students in Saudi universities generally demonstrate a positive attitude toward the use of AI in their academic activities,

recognizing its role in enhancing learning efficiency and accessibility (Alhammadi, 2025). For example, recent studies have examined the use of AI tools in language learning contexts, revealing their effectiveness in supporting students' writing performance and overall academic development (Alkhateeb et al., 2025). At the same time, research on generative AI highlights a balanced perspective among students, who acknowledge both its educational benefits and the associated concerns related to reliability and academic integrity (Bamasoud, 2025).

Moreover, there is an increasing focus on assessing students' readiness to engage with AI technologies across different academic disciplines, particularly in fields such as medical and health sciences. This reflects a proactive approach to ensuring that graduates possess the competencies necessary to operate effectively in technologically advanced environments (Elshaikh et al., 2025). Overall, the growing integration of AI within Saudi universities underscores the country's commitment to leveraging advanced technologies to enhance educational quality and prepare a future-ready workforce.

Problem Statement

The rapid adoption of Artificial Intelligence (AI) technologies in higher education has opened new opportunities for enhancing learning experiences and academic performance. AI tools, including adaptive learning systems, intelligent tutoring, and generative AI applications, offer personalized learning, real-time feedback, and data-driven insights that can support student achievement (Chen, Chen, & Lin, 2020; Holmes, Bialik, & Fadel, 2019). Globally, studies indicate that AI can improve academic outcomes, particularly for students who require tailored learning support (Susnjak, Bakhshov, & Mathrani, 2025). However, evidence regarding the actual impact of AI on academic performance remains inconsistent. While some studies report positive effects, others highlight risks such as over-reliance, reduced critical thinking, and challenges in ethical use (Sajja, Sermet, Fodale, & Demir, 2025).

In the Saudi Arabian context, research on AI in higher education has primarily focused on students' perceptions, awareness, and adoption of AI tools (Almarsaad, Alajlan, & Alebaikan, 2024; Alharbi et al., 2024). Although these studies show high engagement and favorable attitudes toward AI, they rarely measure its direct impact on academic performance. Moreover, there is limited differentiation between types of AI applications, and few studies consider moderating factors such as digital literacy, motivation, or self-regulated learning that may influence the effectiveness of AI tools (Alotaibi et al., 2025; Alshammari et al., 2024).

As a result, a significant research gap exists: the relationship between AI use and the actual academic outcomes of Saudi university students is not sufficiently understood. There is an urgent need for empirical research that not only examines the prevalence and types of AI tools used, but also explores how these technologies interact with student-related factors and impact their performance. Bridging this gap will provide evidence-based insights that will enable educators, policymakers, and educational institutions to effectively integrate AI to enhance student learning and achievement in Saudi higher education.

Research Objectives

This study stems from a scientific endeavor to understand the complex and intertwined relationship between the use of artificial intelligence technologies and the academic performance of university students. It goes beyond superficial description to a deep analysis that reveals the nature and mechanisms of this relationship. Therefore, the study's objectives are not limited to measuring the direct impact, but extend to deconstructing the dimensions of the phenomenon and exploring its various determinants and contexts.

Main Objective:

The main objective of this study is to analyze the impact of artificial intelligence (AI) use on the academic performance of university students in the Kingdom of Saudi

Arabia. This will be achieved by examining the nature and levels of AI use and its implications for learning outcomes.

Sub-Objectives:

- To analyze AI use patterns among university students, including the nature of the tools used, their purposes, and the level of reliance on them in completing academic tasks.
- To measure the prevalence of AI use in various educational activities, such as research, assignments, and comprehension support, while identifying potential differences across academic disciplines.
- To examine the relationship between the level of AI use and academic performance by analyzing quantitative indicators such as GPA, alongside qualitative indicators related to the quality of learning.
- To explore students' perceptions and attitudes toward AI use, including their awareness of its benefits and challenges, and its impact on their educational experience.
- To analyze the positive and negative effects of AI use, focusing on aspects related to developing critical thinking skills, independent learning, and analytical abilities. Identifying mediating factors that may influence the relationship between AI use and academic performance, such as the level of technological awareness, the nature of the specialization, and the educational employment model.
- Providing scientific and applied recommendations that contribute to guiding the use of AI in higher education toward achieving optimal educational outcomes, while mitigating its potential negative impacts.

Literature Review

The integration of Artificial Intelligence (AI) in higher education has emerged as a transformative force, reshaping teaching methodologies, learning experiences, and assessment practices. As a researcher, I find that the existing body of literature reflects

both optimism regarding AI's potential and concern about its implications for students' academic performance. However, a critical synthesis of prior studies reveals significant gaps, inconsistencies, and contextual limitations—particularly within the Saudi Arabian higher education landscape.

From a global perspective, AI has been widely recognized as a tool capable of enhancing personalized learning and improving academic outcomes. Chen, Chen, and Lin (2020) argue that AI-driven educational systems, such as adaptive learning platforms, enable the customization of instructional content according to individual learner needs, thereby improving learning efficiency and academic achievement. Their review highlights that AI facilitates real-time feedback, predictive analytics, and intelligent tutoring, all of which contribute to improved learning performance. Similarly, empirical evidence from recent experimental and quasi-experimental studies indicates that AI-supported interventions can positively influence students' academic trajectories by reducing failure rates and enhancing cumulative grades, particularly among at-risk students (Susnjak et al., 2025).

Despite these promising findings, the literature also presents a more complex and sometimes contradictory picture. While AI tools are associated with improved accessibility and efficiency in learning, scholars have raised concerns about their potential negative effects on higher-order cognitive skills. Research examining AI-powered learning assistants suggests that although students perceive these tools as useful for completing assignments and understanding concepts, there are significant concerns related to over-reliance, reduced critical thinking, and ethical ambiguity in their use (Sajja et al., 2025). This duality positions AI as a “double-edged sword,” where its benefits are contingent upon how it is integrated and utilized within the learning process.

Within the Saudi Arabian context, research on AI in higher education is rapidly evolving but remains relatively fragmented. A growing number of studies have explored students' perceptions, awareness, and acceptance of AI technologies. For

instance, Almassaad, Alajlan, and Alebaikan (2024) found that Saudi university students demonstrate high levels of awareness and positive attitudes toward generative AI tools, recognizing their role in improving understanding, enhancing skills, and facilitating learning outcomes. Similarly, large-scale survey-based research involving students from multiple Saudi universities indicates that learners perceive AI tools as valuable for improving academic performance and completing assignments more efficiently (Alharbi et al., 2024).

However, these perception-based studies do not necessarily translate into evidence of actual academic improvement. More recent empirical investigations have attempted to bridge this gap. For example, a study examining AI tool usage in the Ha'il region of Saudi Arabia found a significant relationship between AI-enabled student engagement and academic performance, mediated by psychological factors such as motivation and self-efficacy (Alotaibi et al., 2025). This finding suggests that AI does not directly influence academic outcomes in isolation but operates through complex behavioral and cognitive mechanisms.

In a similar vein, research focusing specifically on generative AI tools such as ChatGPT within Saudi universities indicates that students' academic performance is influenced by how effectively these tools align with their learning tasks and technological competencies. A recent study employing the Technology-to-Performance Chain framework demonstrated that the effectiveness of AI tools depends on the fit between technology capabilities and user needs, rather than mere usage frequency (Alshammari et al., 2024). This reinforces the argument that AI usage alone is not a sufficient predictor of academic success.

Moreover, studies examining AI-based assessment systems in Saudi universities highlight both opportunities and challenges. Alenezi and Alenezi (2025) found that AI-powered formative assessment can enhance students' writing performance and engagement by providing immediate and personalized feedback. However, their findings also reveal limitations related to cultural adaptation, language processing

accuracy, and unequal access to digital infrastructure across institutions. These results underscore the importance of contextual factors in determining the effectiveness of AI in education.

Another important strand of literature focuses on the broader institutional and pedagogical implications of AI adoption. Research conducted across Saudi higher education institutions indicates that AI integration is positively associated with student engagement, academic performance, and retention rates ($\beta = 0.25$, $p < 0.01$), suggesting a statistically significant but moderate effect (Alharbi et al., 2025). However, this relationship is not uniform and may vary depending on institutional readiness, faculty support, and students' digital competencies.

Despite these contributions, several critical gaps remain evident. First, many studies in the Saudi context rely heavily on cross-sectional survey designs, limiting their ability to establish causal relationships between AI usage and academic performance. Second, there is insufficient differentiation between types of AI technologies, with most studies treating AI as a homogeneous construct rather than examining the distinct effects of tools such as generative AI, adaptive learning systems, and predictive analytics. Third, there is a lack of longitudinal and mixed-methods research that captures both quantitative outcomes and qualitative experiences of students.

Furthermore, the existing literature often overlooks key moderating variables such as self-regulated learning, ethical awareness, and digital literacy, which may significantly influence how students interact with AI tools and how these interactions affect academic performance. As highlighted in recent international research, the effectiveness of AI in education is deeply embedded in the socio-technical context, where human, technological, and institutional factors interact dynamically (Sajja et al., 2025).

In synthesizing the literature, it becomes evident that while AI holds substantial promise for enhancing academic performance, its impact is neither straightforward nor universally positive. The relationship between AI usage and academic achievement is

complex, context-dependent, and mediated by multiple factors. In the Saudi Arabian context, although awareness and adoption of AI technologies are high, there remains a lack of comprehensive empirical evidence that directly links AI usage to measurable academic outcomes.

This review highlights the urgent need for a more rigorous and comprehensive contextual study that goes beyond perception-based analyses and examines the actual impact of AI use on university students' academic performance. Such a study should consider different types of AI tools, integrate relevant mediating variables, and employ robust methodological approaches to provide a deeper understanding of this evolving phenomenon.

Research Methodology

This study is based on an integrated methodological design that seeks to understand the phenomenon of artificial intelligence (AI) use in higher education from a holistic perspective, combining in-depth analysis with precise quantitative measurement. Given the complex and interconnected nature of the research problem, encompassing behavioral, cognitive, and technological dimensions, a mixed-methods approach was adopted as the most suitable framework. This approach allows for exploring the phenomenon from multiple angles and enhances the reliability of the results through the integration of qualitative and quantitative data.

This design is based on the principle that understanding the true impact of AI cannot be achieved through numbers alone, nor through descriptive accounts alone. Rather, it requires a systematic integration of both approaches, where each contributes to explaining and supporting the other's findings.

The research is organized into a series of interconnected phases, beginning with a systematic review of the literature:

Phase 1: Literature Review

The first phase focuses on conducting a systematic and critical review of existing academic literature on artificial intelligence in education. This includes studies addressing the role of AI technologies in improving learning outcomes, their impact on academic performance, and student perceptions and usage patterns, with a particular focus on higher education institutions in Saudi Arabia. This phase aims to establish a solid theoretical foundation for the study, identify prevailing research trends, and highlight gaps that justify this research.

To ensure comprehensive coverage of relevant studies, academic sources were drawn from reputable databases such as Scopus, Web of Science, Google Scholar, and institutional library resources. The search process was guided by carefully selected keywords, including: artificial intelligence in education, academic performance, university students, Saudi Arabia, generative AI, and learning outcomes. The reviewed literature was thematically analyzed to extract key concepts, theoretical perspectives, and research methodologies.

The insights gained from this phase play a crucial role in shaping the overall research design. These factors, in particular, contribute to the development of data collection tools, guide the formulation of research questions and hypotheses, and ensure the study's alignment with current academic discourse. Furthermore, literature review is treated as an ongoing process, allowing research to incorporate recent developments and maintain its relevance throughout the study period.

Phase 2: Qualitative Research

The second phase of the study focuses on collecting rich qualitative data to gain a deeper understanding of how university students in Saudi Arabia experience and perceive the use of Artificial Intelligence (AI) in their academic activities. This phase aims to capture students' perspectives on the ways AI tools influence their learning

processes, study behaviors, and academic performance, going beyond what can be measured through quantitative methods alone.

To achieve this, two primary data collection methods will be employed:

✓ **Semi-structured Interviews:**

A purposive sample of approximately 20 to 30 university students will be selected from different universities and academic disciplines across Saudi Arabia. This sampling approach ensures the inclusion of participants with varied experiences in using AI tools. The interviews will be guided by a flexible set of questions that allow participants to reflect on their use of AI applications in their studies, including how these tools are incorporated into their daily learning practices. Particular attention will be given to perceived benefits, challenges, ethical concerns, and students' own evaluations of how AI affects their academic performance. Interviews will be conducted in either Arabic or English, depending on participants' preferences, and will be audio-recorded with their informed consent to ensure accuracy in data capture.

✓ **Focus Group Discussions:**

In addition to individual interviews, two to three focus group discussions will be conducted, each involving 6 to 8 students. These group settings are intended to encourage interaction and dialogue among participants, allowing for the exploration of shared experiences and collective viewpoints. Focus groups provide valuable insights into common patterns of AI usage, as well as differences in opinions regarding its role in higher education. They also help reveal underlying attitudes and concerns that may not emerge in one-on-one interviews, particularly in relation to academic integrity, dependency on technology, and fairness in learning environments.

✓ **Data Analysis:**

All qualitative data obtained from interviews and focus groups will be transcribed verbatim and analyzed using thematic analysis. This method involves a systematic process of coding the data, identifying recurring patterns, and organizing them into

meaningful themes that align with the research objectives. The analysis will be conducted iteratively, allowing for continuous refinement of themes as deeper insights emerge from the data. To enhance the rigor and organization of the analysis, qualitative data analysis software such as NVivo or ATLAS.ti may be utilized. This approach ensures a structured and transparent interpretation of participants' experiences, contributing to a more comprehensive understanding of the role of AI in shaping academic performance.

Phase 3: Quantitative Research (Rewritten Version)

Building on the findings of the qualitative phase, the third phase of this study employs a quantitative approach to examine the relationship between AI usage and academic performance in a more generalizable and statistically robust manner. This phase aims to validate and extend the qualitative insights by measuring patterns, trends, and associations across a larger population of university students in Saudi Arabia.

❖ Data Collection Method: Online Survey

A structured online questionnaire will be developed and distributed to students enrolled in various universities across the Kingdom. The survey instrument will be designed to capture several key dimensions relevant to the study. These include demographic characteristics (such as age, gender, field of study, and academic level), the frequency and types of AI tools used for academic purposes, and students' perceptions of the usefulness and ease of use of these technologies. In addition, the survey will assess students' attitudes toward AI in education and include indicators of academic performance, such as self-reported GPA, perceived understanding of course content, and ability to complete academic tasks effectively.

The questionnaire will primarily utilize Likert-scale items to measure attitudes and perceptions, alongside multiple-choice questions for factual information. A limited number of open-ended questions may also be included to capture brief qualitative insights that complement the numerical data.

❖ Sampling Strategy

To ensure that the sample reflects the diversity of the student population in Saudi higher education, a stratified random sampling technique will be employed. Participants will be selected from different universities, academic disciplines, and levels of study (undergraduate and postgraduate). This approach enhances the representativeness of the data and allows for meaningful subgroup comparisons. The target sample size is expected to range between 500 and 800 students, which is considered sufficient to achieve reliable statistical analysis and support generalizable findings.

❖ Data Analysis

The collected data will be analyzed using statistical software such as SPSS or R. The analysis will begin with descriptive statistics to summarize participants' characteristics and identify general patterns of AI usage. Measures such as means, standard deviations, and frequency distributions will be used to present an overview of the data.

To examine the relationship between AI usage and academic performance, inferential statistical techniques will be applied. These will include correlation analysis to assess the strength and direction of relationships, and multiple regression analysis to evaluate the predictive effect of AI usage on academic performance while controlling for relevant variables. Where appropriate, additional tests such as analysis of variance (ANOVA) may be conducted to explore differences across groups (e.g., by academic discipline or level of study). This analytical approach enables a rigorous examination of how AI usage contributes to variations in academic outcomes among university students in Saudi Arabia.

Phase 4: Data Analysis and Discussion

The final phase of the study focuses on a comprehensive analysis and integration of qualitative and quantitative findings, followed by a critical discussion of the results. This phase is essential for developing a coherent and in-depth understanding of how

the use of artificial intelligence impacts the academic performance of university students in Saudi Arabia.

■ **Integration of Findings**

At this stage, the results from both the qualitative and quantitative phases will be systematically integrated to provide a comprehensive explanation of the research problem. The qualitative results will offer detailed explanations and contextual insights that help clarify the patterns identified in the quantitative analysis. For example, the statistical relationships between AI use and academic performance can be better understood by examining students' experiences, motivations, and study practices revealed during interviews and focus groups. Conversely, the quantitative results will validate and generalize the themes identified qualitatively, ensuring that the conclusions are empirically grounded and contextually meaningful.

■ **Interpretation and Discussion**

The integrated findings will be interpreted in light of the previous studies reviewed in the first phase of the research. This will involve comparing the results with prior research to identify points of agreement, divergence, and contribution. The discussion will focus on the main research objectives and questions, providing clear, evidence-based explanations of how the use of artificial intelligence impacts academic performance. Furthermore, the analysis will consider the specific context of higher education in Saudi Arabia, particularly in light of Vision 2030, highlighting the broader implications for educational policy, institutional practices, and student development.

■ **Framework Development and Validation**

Based on the overall findings, the study will propose a conceptual framework or a set of practical guidelines to support the effective integration of artificial intelligence (AI) in higher education. This framework will identify the key factors influencing the successful use of AI tools, as well as strategies to enhance their positive impact on student learning while mitigating potential risks, such as over-reliance or ethical

concerns. To improve its applicability, the proposed framework could be reviewed by academic experts or tested through a limited pilot project, depending on feasibility within the study's timeframe. This step will ensure that the recommendations are both theoretically sound and practically relevant to stakeholders in Saudi universities.

Ethical Considerations

This study stems from a firm commitment to the ethical principles governing scientific research, recognizing the importance of protecting participants' rights, ensuring the integrity of the research process, and maintaining the reliability of the results. Since this study deals with human data related to learning behaviors and personal perceptions, ethical considerations are not merely a formality but an integral part of the methodological design itself.

- First, the principle of voluntary participation will be upheld. No student will be required to participate in the study; rather, participants will be included based on their free will, with a full explanation of the study's objectives and the nature of their expected participation. All participants will be provided with an informed consent form outlining their rights, including the right to withdraw at any stage of the research without any repercussions.
- Second, data confidentiality and participant privacy will be guaranteed. No directly identifiable information that could reveal participants' identities, such as names or university ID numbers, will be collected. All data will be treated as anonymous data and stored in a secure environment, with access restricted to research purposes only.
- Third, the study will adhere to the principle of non-maleficence, ensuring that research procedures do not cause any psychological or academic harm to participants. Research tools (such as questionnaires and interviews) will be designed in a culturally and socially sensitive manner, avoiding questions that may make participants uncomfortable or feel pressured.

- Fourth, the study will uphold the principle of scientific transparency, presenting results as they are, without distortion or selectivity to support preconceived hypotheses, while acknowledging all limitations that may affect the interpretation of the findings. All sources used will be properly documented according to academic standards, ensuring respect for intellectual property rights.
- Fifth, if necessary, approval will be obtained from the relevant academic authorities within the target universities before data collection begins, to ensure the study's compliance with institutional policies governing scientific research.
- Finally, these ethical considerations reflect the researcher's awareness that the value of scientific research is measured not only by its results but also by its adherence to standards that preserve human dignity and foster trust in the knowledge produced. Therefore, ethics are an integral part of the quality and credibility of this research.

Limitations

Despite the comprehensive methodological design adopted by this study, there are a number of inherent limitations that may affect the results and their interpretation. It is essential to acknowledge these limitations to ensure scientific transparency and enable the reader to understand the scope and limitations of the research.

- **Geographical and Institutional Limitations:** This study focuses solely on university students in Saudi Arabia. This means that the results may reflect the specificities of the local educational and cultural environment and may not be fully generalizable to other educational settings with differing technological infrastructure or teaching methods.
- **Sample Limitations:** Although stratified random sampling was employed to ensure diverse representation of academic disciplines and levels, the sample

size may remain limited compared to the total student population. This could affect the statistical validity of some detailed analyses.

- **Time Limitations:** The study is conducted within a specific timeframe. This means that students' use of AI tools and their academic performance may be influenced by seasonal or semester-related factors, such as exam pressure or graduation projects.
- **Methodological Limitations:** For the qualitative phase, interviews may involve subjective bias from participants, who may provide answers that reflect what they perceive as socially acceptable rather than actual reality. For the quantitative phase, measuring academic performance often relies on GPA and official data, a limited indicator that does not always reflect the quality of actual learning or deep cognitive skills.
- **Technological Limitations:** The field of artificial intelligence is characterized by continuous development, meaning that results associated with specific technologies at the time of the study may differ if the study is repeated shortly afterward due to the emergence of new tools or updates to existing ones.
- **Cultural and Behavioral Limitations:** Study results may be influenced by cultural or social factors, such as the nature of interaction with technology, the level of digital literacy, and students' attitudes toward self-learning, which may be difficult to completely isolate from the impact of AI itself.

Despite these limitations, the study was designed to achieve the highest possible scientific rigor, balancing qualitative and quantitative analysis, and employing statistical and critical methods to minimize the impact of these limitations on the final results.

Expected Outcomes

This study is expected to yield a range of scientific and educational findings that reflect the nature of the relationship between artificial intelligence (AI) use and academic performance among university students in Saudi Arabia. It will also provide in-depth insights into the mechanisms of this influence and the contexts in which it is most evident.

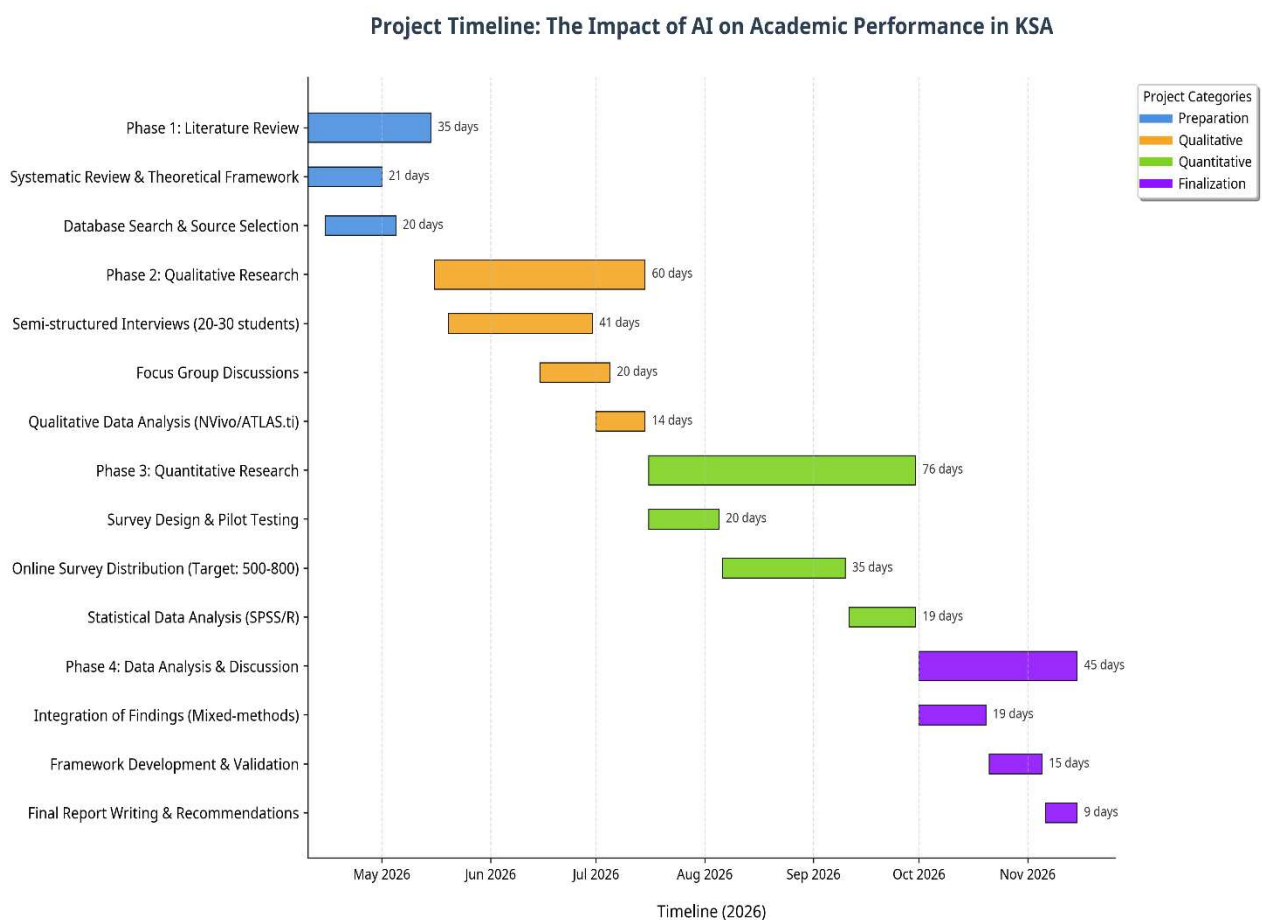
- **Identifying AI Use Patterns:** The study is expected to reveal a wide variety of AI usage patterns among students. Some will use AI tools to enhance understanding and analysis, while others will rely on them for faster task completion. This diversity will allow for an understanding of individual and institutional differences in how AI is employed.
- **Clarifying the Relationship Between Use and Academic Performance:** The study will provide quantitative data demonstrating the correlation between AI use and improved academic performance and various learning skills. It will also identify differences between scientific and theoretical disciplines and different academic levels.
- **Revealing Positive Impacts:** The study's findings are expected to show that the structured and conscious use of AI contributes to enhanced self-directed learning, improved research and analytical skills, and the provision of immediate feedback, ultimately leading to higher quality academic performance.
- **Uncovering Potential Negative Impacts:** The findings may also indicate that excessive reliance on these tools, without educational supervision or guidance, could limit the development of critical thinking skills, weaken student autonomy in learning, and create a partial dependence on technology rather than deep learning.
- **Highlighting Mediating Factors:** The study will contribute to identifying a set of factors that influence the relationship between artificial intelligence and academic performance, such as students' level of technological awareness, the

nature of their academic specialization, and the pattern of tool integration in the educational process. This can help in formulating more effective educational strategies.

- **Providing Scientific and Applied Recommendations:** The study is expected to lead to clear recommendations for educational institutions and decision-makers regarding how to guide the use of artificial intelligence in a way that promotes effective learning and balances technological benefits with maintaining the quality of students' thinking and analytical skills.

In summary, the expected results aim to provide a comprehensive and in-depth view of the impact of artificial intelligence on higher education, not only in terms of its direct impact on academic performance, but also in terms of understanding its mechanisms and exploring the opportunities and challenges associated with its use.

Gantt Chart



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