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LEVERAGING ARTIFICIAL INTELLIGENCE (AI) IN TERTIARY EDUCATION FOR DEVELOPING IMPROVED LEARNING OUTCOMES AMONG GRADUATE STUDENTS

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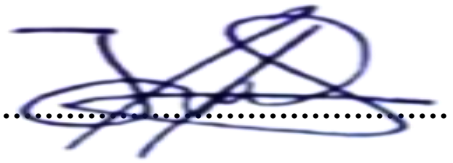
DECLARATIONS

Student's Declaration

I, Agar Judith Makafui Adzo, confirm that this thesis is my own original work. All sources are acknowledged, and it has not been submitted elsewhere. I take full responsibility for any shortcomings.



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Supervisors' Declaration

I, the undersigned supervisor, declare that I supervised the preparation and presentation of this work in line with UniMAC's guidelines for Master's thesis supervision.

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DEDICATION

I dedicate this work to Almighty God for His guidance, strength, and blessings throughout my academic pursuits. I also dedicate it to my family for their love, support, and encouragement every step of the way.

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I thank Almighty God, Major Rev. Addo Galevo Richard, my parents Mr. Kwame Yao Theophilus and Mrs. Kodzi-Kwame Grace, and my siblings Lucy Agar and Forster Agar for their constant support, encouragement, and prayers throughout this journey.

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ABSTRACT

This study investigated the role of artificial intelligence (AI) in developing graduate students in Ghana. It addressed the level of AI adoption, its influence on learning outcomes, the ethical challenges associated with its use, and the strategies that may support responsible practice among students at UniMAC. The study was guided by the Technology Acceptance Model (TAM) and Social Constructivist Theory. Using a quantitative research design, data were collected from 110 students through structured questionnaires and analysed using descriptive statistics, correlation, and regression analyses. The findings revealed moderate to high AI adoption, with students primarily using AI for writing support, data analysis, idea generation, and summarisation of complex materials. Confidence in AI usage was moderately high, although variation in digital literacy and prior experience influenced engagement levels. Correlation ($r = 0.181$) and regression ($\beta = 0.181$, $p = 0.058$) analyses indicated a weak positive relationship between AI usage and learning outcomes, suggesting that AI enhances comprehension, efficiency, and skill development but is not a strong predictor of academic performance. Ethical and practical challenges identified included unclear guidelines, unequal access, academic integrity concerns, data privacy, and overreliance on AI outputs. Students endorsed strategies for responsible AI adoption, including training on ethical and academic use, institutional policies, mentorship, continuous monitoring, and access to secure platforms. The study concludes that AI can support academic tasks and learning outcomes when integrated into structured, ethically guided pedagogical frameworks. Recommendations emphasize policy development, digital literacy training, faculty mentorship, and provision of secure AI tools to maximise benefits while mitigating risks.

Keywords: Artificial intelligence, AI adoption, learning outcomes, ethical challenges, Technology Acceptance Model, Social Constructivist Theory, digital literacy, academic integrity, data privacy, UniMAC graduate students.

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LIST OF ABBREVIATIONS

AGI	Artificial General Intelligence
AI	Artificial Intelligence
AI-enabled	Artificial Intelligence-enabled
ANI	Artificial Narrow Intelligence
ANOVA	Analysis of Variance
AR	Augmented Reality
ASI	Artificial Superintelligence
ATU	Attitude Toward Using (AI)
BI	Behavioural Intention
DC	Development Communication
GenAI	Generative Artificial Intelligence
GPT	Generative Pre-trained Transformer
LLMs	Large Language Models
Max	Maximum
Min	Minimum
ML	Machine Learning
MM	Media Management
PCM	Political Communication Management
PEOU	Perceived Ease of Use
PRM	Public Relations with Marketing
PU	Perceived Usefulness
SD	Standard Deviation
SPRM	Strategic Public Relations Management
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model

UniMAC	University of Media, Arts and Communication
VR	Virtual Reality
ZPD	Zone of Proximal Development

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Artificial intelligence has expanded rapidly in the past few years. For example, in health, finance, education, and transportation, it has been shown to support decision processes and improve the functioning of systems (Brynjolfsson & McAfee, 2017; Luckin et al., 2016; Reuters, 2023). Such large language models like GPT are a sign of a big step forward in natural language processing. They write text with a level of fluency that resembles human expression (Eloundou et al., 2023; Bubeck et al., 2023). A few studies report positive results from such systems on academic and professional exams, though the performance question has emerged whether the models display true reasoning or, rather, mainly detect patterns (OpenAI, 2023; Zhang et al., 2023).

Scholars define AI in different terms. McCarthy described it as the process of creating intelligent computer programmes (Stanford University, n.d.). AI, according to UNESCO (2022), involves machine abilities to imitate perception, learning, and reasoning. Others center on data. According to them, AI systems gather information, process it, and act toward set goals (Delipetrev et al., 2020). These perspectives vary, but they all hint at attempts to simulate problem-solving and decision processes. Generative AI is among those trends. It creates new text, images, and other media with the help of deep learning models trained on large datasets (Cooper, 2023; Tlili et al., 2023). Neural networks assist the system to recognize patterns and produce mostly coherent and context-relevant content (Dwivedi et al., 2023). AI tools like GPT and DALL·E reflect the shift of AI from primarily analytical tasks to more expressive forms of output (Chan & Hu, 2023).

There is mixed evidence for the effect of generative AI. It has also been found to enhance productivity for workers with less experience (Brynjolfsson et al., 2023; Noy & Zhang, 2023). At

the same time, others note that the creative industries have capacity gains and worries of diminishing originality (Zhou & Lee, 2024). This distinction might mean that generative AI can assist work practices, but also disrupt long-standing ones.

In education, the use of AI has broadened its scope. Intelligent tutoring systems, adaptive platforms, and data-driven tools to cater for personalised learning is now the current trend (Luckin, 2018; Williamson & Eynon, 2020). Many private tertiary institutions are using AI for teaching and learning, often through adaptive algorithms or automated feedback (Siemens & Long, 2013). Generative AI builds on this by producing study materials and supporting students with explanations and summaries. These tools may minimize the burden on teachers by alleviating the teaching load and enhance student engagement (Zawacki-Richter et al., 2019; Holmes et al., 2019). However, concerns remain. Scholars warned about academic dishonesty, a decline in independent thinking, and reliance on content that may not be completely accurate (Shukurova & Ma'murov, 2024; Ipek et al., 2023). Some institutions offer direction in response; others limit its use.

The release of ChatGPT in 2022 intensified these debates. Its performance in medical, legal, and business examinations raised questions about the quality of assessment, as well as the future of academic standards (Kelly, 2023; Purtill, 2023). Several universities and journals placed restrictions, mainly to protect academic integrity and ensure students can demonstrate their own competence (Chan, 2023; Vincent, 2023). Additional matters like access limitations, high requirements for computation, and uneven digital resources underscore obstacles relating to equitable integration, especially in scenarios of resource limitations (Ramalakshmi & Asha, 2024).

Even so, AI continues to influence higher education. Adaptive learning systems and immersive tools are linked with improvements in learning performance and student confidence (Hwang et al., 2020; Andreoli et al., 2022). Virtual assistants and chatbots, including ChatGPT, are used for

academic support, though they lack qualities such as empathy and contextual judgment, which remain important in teaching (Holmes & Tuomi, 2022; Wu, 2023). The challenge for higher education lies in balancing innovation with the need to cultivate graduates who are critical, adaptable, and ethically grounded.

1.2. Statement of the Problem

Artificial Intelligence (AI) has come a long way from having very narrow implementations to also having systems capable of reasoning and producing creative outputs. Models such as GPT-3.5 and GPT-4 illustrate this transition, generating contextually aware, human-like responses (Eloundou et al., 2023; Bubeck et al., 2023; Hoffmann, 2022). AI, though, shows shortcomings in social and emotional comprehension, thus, limited to empathy or complex human interaction activities (Kaswan et al., 2024; Shukurova & Ma'murov, 2024). These constraints suggest that AI cannot be a full replacement for human intelligence. There are also ethical challenges. Algorithms can perpetuate bias when taught using biased data (O'Neil, 2016; Selwyn, 2022) and generative AI is associated with plagiarism and misuse without clear guidance (Qadir, 2023; Cotton et al., 2024). This indicates that mere technological advancement does not guarantee ethical or responsible use.

AI influences are more than just about technical issues. It transforms professional work and increases productivity in workplaces and knowledge organisation, which is already transforming many sectors such as education (Eloundou et al., 2023; Bankins et al., 2024; Allen & Seaman, 2017; Al Qalhati et al., 2020). AI in higher education was used to manage rising numbers of new students, to adapt curricula to labour market needs. Adoption introduces uncertainty, though. Students can face differing degree of access, fears of data privacy and ethical dilemmas (Selenko et al., 2022; Monod et al., 2024; Golgeci et al., 2025). This highlights the limited understanding of the level of AI usage among graduate students, particularly in the context of UniMAC.

Additionally, there is very limited evidence about the impact of AI on learning results either. While AI is able to help with comprehension, efficiency, and personalised learning, the impact on students' academic performance remains uncertain. This is important to have as some students find the use of AI-enabled resources valuable, and others may find it less beneficial, as they may fall back too far on machine-generated material which may undermine independent reasoning (Zawacki-Richter et al., 2019; Holmes et al., 2019; Ipek et al., 2023). Therefore, this variation indicates that AI's effects are uneven and underscores the need to better understand how AI usage influences the learning outcomes of HIPAA students. Also, although literature identifies risks such as plagiarism, bias, and unequal access (O'Neil, 2016; Qadir, 2023; Selwyn, 2022), little is known about how these issues emerge among graduate students in Ghana. Identifying these challenges is crucial for promoting responsible and equitable AI use in higher education.

Additionally, strategies for responsible AI adoption remain underdeveloped. Some institutions have implemented guidance-oriented approaches or restrictive policies, but evaluation of their effectiveness is limited (Reuters, 2023; The Tab, 2023). Issues such as digital literacy, mentorship, institutional support, and secure platform access are often inconsistent, particularly in resource-constrained settings (Belanche et al., 2024; Gupta & Rathore, 2024; Wirtz et al., 2023). This points to the need to identify practical strategies for responsible AI use among UniMAC graduate students that balance technological benefits with ethical and educational considerations.

In light of these gaps, the present study investigates the role of AI in graduate education. It seeks to examine the level of AI usage, its effect on learning outcomes, the ethical challenges experienced by students, and strategies for responsible adoption. The study aims to develop a framework that aligns technological potential with ethical responsibility, reflecting both the opportunities and constraints within the UniMAC context.

1.3 Purpose of the Study

The purpose of this study is to investigate the role of artificial intelligence (AI) in developing graduate students in Ghana.

1.3.1 Research objectives

The study seeks to address the following objectives:

1. To examine the level of AI usage among UniMAC students.
2. To examine the effect of AI usage on the learning outcome of UniMAC students.
3. To examine ethical challenges in AI usage among UniMAC students.
4. To identify strategies for responsible use of AI among students UniMAC graduates.

1.4 Research Questions

The study addresses the following questions

1. What is the level of AI usage among UniMAC students?
2. How does AI usage affect the learning outcomes of UniMAC students?
3. What ethical challenges arise from AI usage among UniMAC students?
4. What strategies can promote the responsible use of AI among UniMAC graduates?

1.6 Scope of the Study

This study is limited to AI usage in tertiary education among UniMAC students. It examines the extent to which AI is used, its effect on teaching and learning, and the challenges associated with its adoption. The study also explores strategies for using AI to produce quality, job-ready graduates responsibly. The research is limited to AI applications within the academic environment, including learning tools, virtual assistants, and generative platforms. It does not cover AI use outside education, such as in industry or professional workplaces.

1.7 Significance of the Study

This study is significant because it examines the use of AI in tertiary education and its potential effects on teaching and learning outcomes. At international level, such technologies have received extensive discussion. However, there exists very little evidence on how students in Ghana actually engage with them. By studying UniMAC students, one gains an understanding of their use patterns and the potential benefits and challenges in the local context. The study also highlights ethical and practical issues that may arise, which could guide institutional practices and decision-making. The findings may inform strategies and policies to improve learning outcomes while addressing ethical concerns. They could also support curriculum design and teaching approaches aimed at producing competent, job-ready graduates.

Furthermore, the study provides insights that may influence broader institutional governance and operational frameworks, particularly in contexts where technology evolves quickly and unevenly. This evidence may help ensure that interventions are relevant, practical, and aligned with local educational needs. In addition, the findings could guide national education policy by showing how emerging technologies might be integrated responsibly into tertiary institutions. Other researchers may use the results as a basis for further investigation into the ethical, practical, and pedagogical implications of artificial intelligence in higher education.

1.8 Organization of the Study

This study is organised into five chapters. Chapter One is introduction to the study, which includes introduction of study, problem statement, research objectives, research questions, hypotheses, significance, scope, and organisation. Chapter Two reviews literature relevant to digital storytelling, digital literacy, ethical challenges and theoretical frameworks. Chapter Three presents the methodology of the research, including design and sample population (population, samples,

sampling methods, method of data collection, procedures, and method of data analysis). Chapter Four presents the results and the data analyses (statistical tests) are covered here. Chapter Five concludes by presenting the main findings of the study but also draws conclusions, offers policy and practice recommendations and concludes with directions for future research.

1.9 Conclusion

This chapter introduced the background, problem, purpose, objectives, research questions, significance, and scope of the study. It has shown that artificial intelligence in tertiary education offers both opportunities and challenges. Though AI has the capacity to improve teaching and learning, ethical and practical issues need to be addressed. The chapter further set the focus on UniMAC students, outlining the research context. In addition, it is clear that the methods of student engagement with AI are key for designing meaningful educational tools. But the study admits that technology may assist learning, but it can serve as an excellent aid and not a replacement for critical thinking and human judgement. These issues emphasize taking a balance in technological innovation with ethical and pedagogical responsibility. The following chapter provides a review of relevant literature to locate the research in the existing knowledge and theoretical perspectives.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

In this chapter, existing literature examining the application of artificial intelligence in tertiary education, particularly for students at UniMAC in Ghana, is surveyed. This review intends to offer a theoretical, conceptual and empirical foundation for the study itself. It aims to identify current gaps in knowledge that this research will attempt to fill especially with regard to the ethical, practical and pedagogical dimensions of AI integration in teaching and learning. Learning from these gaps will clarify the challenges and opportunities of integrating AI into the local educational context. Furthermore, the review provides insights that can guide both institutional decision-making and future research in higher education.

2.1 Theoretical Framework

2.1.1 Technology Acceptance Theory

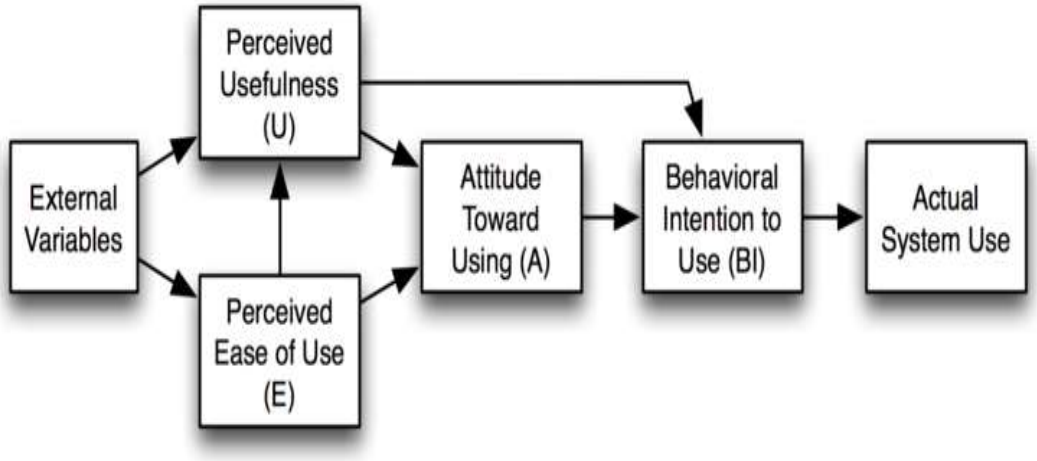
The first theoretical framework introduced in this study is the Technology Acceptance Model (TAM), which is utilized to represent how people take on new technologies. TAM suggests that perceived usefulness (PU) and perceived ease of use (PEOU) are key determinants of user acceptance (Davis et al., 1989). Adoption rates are also increased when technologies are seen as useful and easy to use (Davis et al., 1989; Gefen et al., 2003). Within the AI field in higher education, PU indicates the level at which AI supports learning outcomes, personalised instruction, and skill development to meet labour market needs. PEOU measures how accessible and manageable AI tools are for students and staff, including technical support, guidance, and institutional infrastructure.

Empirical studies demonstrate that attitudes toward using technology (ATU) and behavioural intention to use technology (BI) mediate the relationship between PU, PEOU, and actual adoption

(Islami et al., 2021; Selwyn, 2020). Positive attitudes toward AI, for example, motivate students and staff to be more engaged with AI tools for learning, research, and teaching. Similarly, favourable perceptions of usefulness and ease of use enhance intentions to apply AI consistently, which can lead to improved learning outcomes and practical, job-oriented competencies.

TAM posits that PU and PEOU influence ATU and BI, which determine AI usage, allowing the study to examine both adoption and its impact on educational outcomes. Previous research highlights that successful technology integration also depends on institutional support, digital literacy, and ethical oversight (Baker & Hawn, 2021; UNESCO, 2023a), indicating that TAM can be applied flexibly to account for contextual factors. By grounding the study in TAM, the research can systematically examine how perceptions of AI tools shape engagement, behavioural intentions, and ultimately the quality of learning. It also provides a clear conceptual basis for linking theoretical constructs with practical interventions, such as training, policy development, and resource allocation, that aim to enhance AI adoption and its impact on student outcomes.

Figure 2.1 Technology Acceptance Model



Source: TAM, Davis et al. (1989).

2.1.2 Social Constructivist Theory

The Social Constructivist Theory offers a suitable framework to look at how AI can improve learning in higher education. Emerging from Lev Vygotsky's work and proposed in the early 20th century, the theory focuses that knowledge is actively constructed in social interaction, cultural mediation, and language (Vygotsky, 1978). The experience of learning is best accomplished under the ZPD, where the tutor and the guide assist in the realization that more than that which can be accomplished independently of them (Wibowo et al., 2025). Scaffolding, or brief supports, allows a student to develop skills incrementally in the building so that they can master it independently (Whitaker et al., 2016). Newer evidence indicates that constructivist methods such as project based learning and collaborative learning increase engagement in learning and problem-solving skills, confirming the ongoing applicability of Vygotsky's theories to contemporary institutions of education (Wu et al., 2022; Lim et al., 2022; Tan et al., 2023).

AI has transformed the social and pedagogical ecology of higher education. More and more, traditional teacher driven instruction is complemented by AI powered platforms/learning systems, adaptive ones, intelligent tutors, that provide personalised guidance and feedback (Smith, 1997; Chen & Bryer, 2012). As per a constructivist paradigm, AI would be able to enhance scaffolding by providing personalized levels of assistance in response to learners' needs, thus freeing up teachers to support (Ebert, 2015) mentoring teaching, critical thinking skills, and cooperative labour (Vygotsky, 1986). The integration of content with teaching lies well with the tenets of social constructivism, which encourages interaction, problem solving and reflection, while allowing teachers to remain facilitators, not replacements of human guidance (Smith, 1997). The relationship was the central focus in the present study to AI, pedagogical practices and student impacts.

AI tools can enable social interactions between students and teachers, collective building of knowledge, and access to real-time feedback, which all contribute to the development of skills relevant for the workplace (Switzer & Csapo, 2005; Patten, Sánchez, & Tangney, 2006). Teachers monitor AI outputs, scaffold tasks, and encourage reflection, while students engage with content, discuss their work, and establish critical competencies. This casts AI not merely as an instructive component but a social partner that mediates the relationship of teaching practices (independent variable) with graduate employability and skills development (dependent variable). So integrating AI into blended learning environments realises social constructivist principles to produce job-ready graduates. Such efforts also recognize the implications of ethical and pedagogical oversight (UNESCO, 2023b).

2.2 Conceptual Review

2.2.1 Artificial Intelligence

AI refers to computer systems designed to perform tasks associated with human intelligence. This includes learning, reasoning, problem-solving, perception, and language understanding (Delipetrev et al., 2020; UNESCO, 2021). Early definitions focused on building "intelligent machines" (Stanford University, n.d.), while contemporary views emphasise data-driven systems acting autonomously toward complex goals (Teneo.AI, 2023). AI can perform simple pattern recognition and advanced generative tasks, yet it remains limited in social and emotional intelligence (Giannini, 2023; Cooper, 2023). Most applications today are narrow AI, specialised for specific tasks, while general and superintelligent AI remain theoretical (Fjelland, 2020; Bostrom, 2014). Machine learning, particularly deep learning, underpins these systems, allowing algorithms to detect patterns, make predictions, and improve performance without explicit instructions (Goodfellow et al., 2017; Choi et al., 2020; Aydın & Karaarslan, 2023). Other techniques, such as expert systems

and knowledge graphs, support decision-making and automate routine tasks (Hodhod et al., 2019; Chaudhri et al., 2021).

AI is now embedded across many sectors like education, finance, healthcare, transportation, and entertainment. In healthcare, AI can interpret medical images and detect disease patterns faster than traditional methods (Park et al., 2020). Finance uses AI to predict loan eligibility, manage investment portfolios, and detect fraud (Cao, 2020). There are advantages in transportation such as semi-autonomous driving and route optimisation, however ethical and safety concerns are still the main worries (Ondruš et al., 2020; Bates et al., 2020). Social media and ridesharing websites leverage AI for personalization and increased efficiency (Sadiku et al., 2021; Ghahramani, 2019). The emergence of generative AI such as ChatGPT has the potential to generate content and aid in professional and educational tasks, but risks are in plagiarism, algorithmic bias, unequal access, and over-reliance on machine outputs (Belanche et al., 2024; Wirtz et al., 2023; Kaswan et al., 2024). These challenges demonstrate that technical advancement is not sufficient by itself to encourage responsible use or obtain equitable outcomes.

Education offers significant promise but also uncertainty for AI adoption. Chatbots and intelligent tutoring systems can provide personalised learning, assist gifted students, and support learners with special needs (Okonkwo & Ade-Ibijola, 2021; de la Higuera & Iyer, 2024; Holmes, 2023). AI can increase access to information, improve engagement, and supplement teaching, yet evidence of learning impact remains mixed (Abd-alrazaq et al., 2019; Hughes, 2023). Overreliance on AI may weaken independent thinking and critical reasoning. Successful integration therefore requires attention to technical, ethical, and cultural factors, alongside human oversight and equitable access (UNESCO, 2021; Giannini, 2023). These considerations highlight that AI should complement

rather than replace human intelligence, and that careful evaluation is essential to balance innovation with fairness, accountability, and meaningful learning outcomes.

2.2.2 Artificial Intelligence and Quality of Education

Artificial intelligence (AI) is increasingly influential in education, offering tools that can personalise learning and respond to individual student needs (Chauhan et al., 2024; Kunjumuhammed, 2024). Adaptive systems can track performance, identify learning behaviours, and adjust lesson difficulty in real time. This may support students who struggle in conventional classrooms while keeping others sufficiently challenged (Tembo & Mulenga, 2024). AI also improves accessibility. Students with disabilities or language barriers can engage through speech-to-text, text-to-speech, or translation tools (Yagyaeva et al., 2024; Yadav, 2025). These technologies may help reduce inequities, though limitations remain where infrastructure or devices are lacking. AI provides valuable support for educators as well. Data analytics offer insights into student progress, enabling timely interventions for those falling behind (Goswami & Sharma, 2024; Nkechi et al., 2024). Automation of grading and lesson delivery reduces routine workload, freeing teachers to concentrate on mentorship and interaction (Jiang, 2024; Chari, 2024).

Generative AI (GenAI) can streamline administrative tasks and content creation, but it also raises ethical concerns. Issues such as plagiarism, algorithmic bias, and inequitable access must be considered (Baidoo-Anu & Ansah, 2023; Bulathwela et al., 2024). These factors suggest that careful oversight is necessary for responsible implementation. Integration of AI into teaching extends beyond personalisation. Students can learn with AI and about AI, developing skills to navigate technology and preparing for emerging career demands (Nartey, 2024; Hashmi & Bal, 2024). Conversational agents and intelligent tutoring systems provide round-the-clock, personalised support, which can enhance learning outside classroom hours (Heidig & Clarebout, 2022; Baidoo-

Anu & Ansah, 2023). While these tools can improve engagement and outcomes, over-reliance may reduce critical thinking and problem-solving abilities. Limited human interaction could also affect social and emotional development, which often depends on teacher-student relationships for motivation and guidance.

While AI holds great promise, it is not without its own hurdles in the education space. When student information is gathered on large platforms, data privacy and the ethics of use stand out as key concerns (Rathore, 2024). Such lack of infrastructure, particularly in lower-income areas, can inhibit access and perpetuate existing inequalities (Kohun et al., 2024; Martinez, 2024). Institutions will need to adopt that system but do so in a way that we can safeguard it against harm with appropriate protective measures, including curriculum development that supports critical thinking, digital literacy, and ethical AI use. As AI becomes embedded in a more sophisticated form of learning, there is a sense that thoughtful integration of AI should be thoughtful and careful, in the sense that AI is supposed to add to (not replace) effective human teaching, and should serve to support fair, efficient, and sustainable educational experiences.

2.2.3 Challenges of AI in Education

AI has shown potential to enhance education, yet its adoption faces considerable challenges. Data privacy remains a pressing concern. AI platforms often collect sensitive information about user (students), making strong safeguards essential to prevent misuse (Rathore, 2024). Without careful oversight, data could be exposed, raising ethical and legal questions. Algorithmic bias is another significant issue. AI models trained on unrepresentative datasets may disadvantage marginalised students, limiting support for diverse learning needs (Bulathwela et al., 2024). Fairness and transparency in AI algorithms are therefore crucial for maintaining educational equity (Zawacki-Richter et al., 2019; Johnson et al., 2020). The digital divide further complicates AI integration. In

low-income or rural areas, students often lack access to high-speed internet or AI-enabled devices, reducing the effectiveness of these tools (Kohun et al., 2024; Martinez, 2024). Such gaps threaten to entrench structural inequities as dubbed “digital divide”.

Generative AI (GenAI) has also created a concern about academic integrity because students may misuse GenAI for writing or coding tasks, potentially undermining independent thinking (Lim et al., 2023; Malik et al., 2023; Yilmaz & Yilmaz, 2023). Although the help AI can provide may help, excessive reliance on it hinders critical thinking and problem-solving abilities, and as such, careful guidance is needed before the use of AI. Further restraints on AI adoption are the financial and institutional factors.Implementing AI demands investment in software, infrastructure, and staff training (Seldon & Abidoye, 2018; Makridakis, 2017). Schools in low-resource settings may struggle to afford these tools, potentially widening disparities (Czerniewicz et al., 2020). Educators’ unfamiliarity with AI can lead to resistance, while students require support to use AI responsibly (Lima et al., 2024; Baker & Smith, 2019). Socio-technical aspects, such as cultural attitudes and mistrust, also influence engagement with AI, particularly for disadvantaged learners (Carter et al., 2020; Pisa & OECD, 2016; Fraillon et al., 2020). This highlights the need for culturally responsive and inclusive AI design.

Socio-emotional and global considerations also matter. Over-reliance on artificial intelligence (AI) may reduce human interaction, affecting social skills, empathy, and trust among students (Holmes, 2023; UNESCO, 2023). Access to advanced tools, such as VR or AR, often depends on financial and technical capacity, which can widen the achievement gap (Alzahrani, 2020). Globally, AI innovation is concentrated in high-income countries, while lower-income regions often provide labour-intensive support under poor conditions (Gray & Suri, 2019; Jones, 2021; Perrigo, 2023). These disparities shape which students benefit from AI, potentially reinforcing educational and

economic divides. Equitable implementation therefore requires attention to both local and global socio-economic contexts.

2.2.4 Strategies for Improving AI Usage in Education

AI provides higher education with opportunities to equip graduates with skills relevant to modern labour markets. Institutions can use AI to personalise learning, improve assessments, and streamline administrative tasks, potentially enhancing employability (Selwyn, 2020). Strategy design should be holistic, considering ethics, pedagogy, and infrastructure to ensure sustainability. Policies form a foundation for AI adoption. Guidelines on fairness, transparency, inclusivity, and data protection help govern AI usage (Vu, 2024; Johnson et al., 2020). Equitable access, particularly for marginalised students, can be supported through collaboration with government and industry partners (Selwyn, 2020; Floridi & Cowls, 2019). Building AI literacy among faculty, administrators, and students is essential. Professional development programmes, such as workshops and online modules, allow educators to understand applications and ethical considerations (Zawacki-Richter et al., 2019).

Incorporating AI literacy into curricula develops skills in ethical reasoning, computational thinking, and AI-enabled problem-solving (Baker & Smith, 2019). Phased implementation, including pilot programmes, helps institutions test adaptive learning systems and automated assessments before wider adoption. These pilots provide evidence to inform best practices, address training gaps, and mitigate unintended consequences. AI also supports research and community engagement. Tools for data analysis, predictive modelling, and interdisciplinary collaboration can enhance research productivity and expose students to advanced analytical skills (Seldon & Abidoye, 2018; Iwuoha & Ezike, 2021). In community service, AI can inform interventions and guide collaborations with local organisations, providing students with practical experience while addressing societal needs

(Floridi & Cowls, 2019; Adebayo, 2020). Participation in AI-driven projects cultivates problem-solving skills, social responsibility, and alignment with labour market expectations.

Infrastructure investment and ethical oversight are crucial for sustainable AI use. High-performance computing, cloud storage, and reliable software platforms support learning and research (Makridakis, 2017). Partnerships and funding reduce inequalities in access. AI systems must be monitored for bias, accessibility, and cultural insensitivity to ensure inclusivity (Baker & Hawn, 2021; Selwyn, 2023). Institutions should establish committees to oversee ethical compliance and fairness in AI-supported assessments (Johnson et al., 2020; Porayska-Pomsta & Rajendran, 2019). Cross-disciplinary collaboration and ongoing refinement of AI tools foster adaptability, ensuring graduates are technically skilled, socially aware, and ethically prepared for complex work environments (Czerniewicz et al., 2020; Adewale et al., 2021).

2.3 Empirical Study

2.3.1 Level and Effects of the Usage of AI on Learning Outcomes

AI has risen to become an integral part of tertiary education. Its influences learning, teaching, and research practices. Globally, AI adoption in higher education is growing, with students using tools for academic writing, content generation, translation, and research assistance. Yusuf et al. (2024) conducted an online survey with 1,217 participants across 76 countries, highlighting widespread use of AI tools alongside the need for ethical and cultural awareness to prevent misuse and academic dishonesty. Similarly, Nartey (2024) reported rising AI literacy among UK university students, facilitated by institutional encouragement, which allowed responsible exploration of AI tools for learning enhancement.

In Australia, Gruenhagen et al. (2024) AI was found to aid writing, summarising, and idea generation, though inconsistent policies and ethical guidance remain a concern. Guo et al. (2024)

noted that AI has become integral to personalised learning and instructional decision-making, with usage levels dependent on infrastructure and student awareness. Yildiz (2023) demonstrated that chatbot satisfaction among university students positively influenced visual design self-efficacy, engagement, and course satisfaction, highlighting the educational potential of AI-based guidance tools. Collectively, these studies indicate that AI adoption among university students is rising rapidly, though disparities in access, institutional support, and ethical awareness affect the extent and quality of use.

AI application has also shown tremendous push in learning outcomes, motivation, and academic performance. Bai and Wang (2024) reported that high-quality AI interaction enhanced learning motivation, creative self-efficacy, and academic outcomes among Chinese university students. Rasheed et al. (2025) found that AI-driven personalised learning reduced educational inequality and improved engagement. Similarly, Eairheart and Azimzadeh (2025) highlighted both the positive impacts of AI on student motivation, self-efficacy, and academic performance, and potential negative effects, such as anxiety over privacy and opportunities for academic dishonesty.

Experimental studies further support these findings. Lee et al. (2022) showed that AI-based chatbots improved learning motivation, attitude, and performance in Taiwanese public health courses. Wang and Fan (2025), through a meta-analysis of 51 studies, demonstrated that ChatGPT significantly enhanced learning performance and moderately improved learning perception and higher-order thinking. Essel et al. (2022) found that a chatbot-assisted teaching approach improved academic performance among undergraduate students in Ghana, suggesting AI integration is feasible even in low-resource contexts. Ma'amor et al. (2024) and Bećirović et al. (2025) confirmed AI literacy, self-efficacy, and practical use positively influence engagement and output quality, although critical appraisal skills may negatively impact perceived performance. Vieriu and Petrea (2025), Chanpetch

and Songserm (2023), and Khan et al. (2015) further indicate that AI fosters engagement, creativity, and motivation, although excessive reliance can diminish critical thinking.

In the Ghanaian context, research on AI in higher education is still emerging. Osondu et al. (2024) highlighted AI's potential to enhance student engagement, personalise learning, and improve administrative efficiency, provided strategic, context-sensitive implementation occurs. Ampofo et al. (2023) reported growing interest among diagnostic imaging students, while Nyabba and Zhai (2024) found varied familiarity with AI among teacher educators, alongside interest in integrating AI tools into teaching practices. Adarkwah et al. (2023), Nyaaba Akanzire et al. (2023), Butakor (2023), Mohammed (2023), and Ofosu-Ampong et al. (2023) combined, suggest that Ghanaian students and instructors have positive attitudes toward AI with emphasis on training, infrastructure, ethical guidance, and alignment to the needs of learners. These studies, however, underscore the potential of AI in Ghanaian tertiary education whilst revealing the gaps in empirical research on the usage of AI and its effects on learning outcomes.

While global studies demonstrate the benefits of AI in enhancing learning outcomes, engagement, and motivation, evidence from Ghana remains scant. Existing studies provide insights into perceptions and emerging applications, but few empirically assess the level of AI usage and its effects on academic performance among Ghanaian university students. This gap underscores the need for a focused investigation at UniMAC to determine both the adoption of AI tools and their educational impact within the local context.

2.3.2 Ethical Challenges and Strategies to Improve AI Usage

Despite its advantages, Artificial Intelligence (AI) adoption in tertiary education raises serious ethical and practical concerns affecting students, educators, and institutions. Mulaudzi (2025) identified plagiarism, data misuse, and academic dishonesty as major risks in AI-assisted

assessment, recommending AI-detection tools, redesigned evaluation methods, and the promotion of critical thinking as preventive measures. Similarly, Klimova and Pikhart (2025) stated too much dependence on AI could lead to technostress, social isolation, and lack of interpersonal connection, even though it is a major contribution towards customised learning and psychological health.

Ethical issues extend beyond the educational context. Weiner et al. (2025) outlined five central ethical principles in AI use, justice, transparency, accountability, consent, and fairness, emphasising that algorithmic bias and lack of transparency can reinforce inequalities. Al-Kfairy et al. (2024), in a systematic review of generative AI, identified privacy breaches, misinformation, copyright violations, and deepfakes as critical concerns that threaten democratic and educational values. The study recommended comprehensive ethical frameworks built on fairness, human rights, and transparency.

Marin et al. (2025) as well, found that more than half of respondents surveyed, students and lecturers, worried about data privacy and opacity of the system, urging for more institutional scrutiny, audit techniques, and ethics training. Belanche et al. (2024) and Gupta and Rathore (2024) also made similar observations and revealed that biased algorithms and weak data governance remain persistent points of concern. Wang et al. (2023), in addition to demonstrating cognitive sophistication, AI systems lack the emotional and social intelligence which can lead to a less significant human communication in learning environments.

Across Africa, scholars acknowledge both the promise and challenges of AI in education. Nsoh et al. (2023) noted that AI can support adaptive learning and promote educational inclusion but cautioned against widening inequalities due to limited access. In Ghana, Suuk and Mwakideu (2023) reported that legislators are pushing for regulatory frameworks to prevent bias and protect

users' rights. Amegadzie et al. (2021) and the World Bank (2021) highlighted Ghana's growing investment in AI innovation through initiatives such as the National Entrepreneurship and Innovation Plan and partnerships with UN Global Pulse. However, these policies remain largely developmental, with limited practical implementation in higher education.

Pedagogical studies also highlight a need for balance between technological enhancement and human engagement. Bauer et al. (2025) and Zhai et al. (2024) found that while AI can augment teaching and learning, overdependence may reduce cognitive effort and critical reasoning. Huang (2023) demonstrated that AI-enabled personalised recommendations improved engagement and learning among moderately motivated students, suggesting that responsible integration enhances outcomes when guided by sound pedagogical principles.

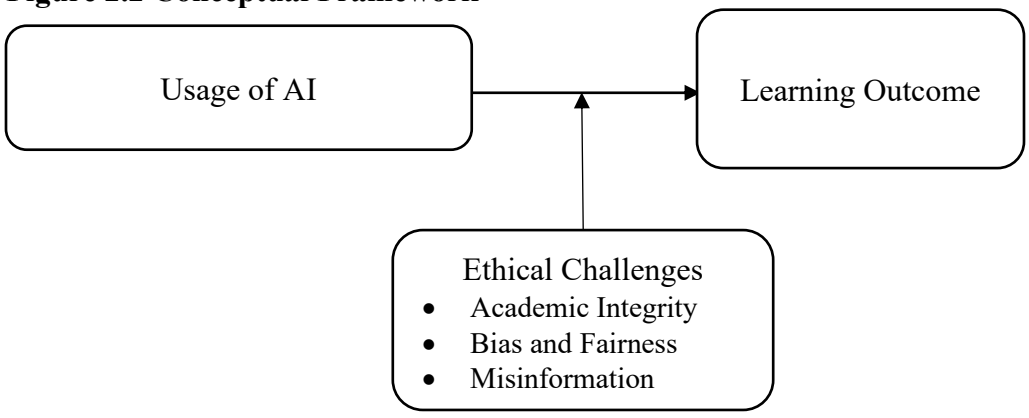
To address these issues, scholars propose strategies grounded in ethical governance and inclusive policy. Kurtz et al. (2024) recommended faculty training, student–teacher collaboration, and institutional oversight to ensure responsible AI use. Varsik and Vosberg (2024) emphasised learner-centred adoption and continuous professional development to promote equitable participation. Wong (2024) and Nartey (2024) stressed embedding AI literacy and ethical competence in curricula to prepare graduates for a technology-driven labour market. In conclusion, the ethical challenges surrounding AI in higher education revolve around academic integrity, data protection, algorithmic bias, and overreliance on technology. These concerns call for institutional commitment to ethical oversight, digital literacy, and transparent policies. For UniMAC, responsible AI integration requires embedding ethics into academic practice, developing AI literacy modules, and promoting responsible digital conduct among students and staff.

Although several global studies have addressed ethical challenges in AI use, limited empirical evidence exists on how tertiary students in Ghana navigate these concerns within their learning environments. Most research has focused on general technological adoption or policy-level analysis, neglecting students lived experiences and institutional safeguards. There is little understanding of how ethical awareness, academic integrity, and institutional frameworks influence responsible AI usage in Ghanaian universities. Consequently, this study also seeks to explore the ethical challenges associated with AI adoption among UniMAC students and to identify effective strategies for promoting responsible, equitable, and ethical AI use in academic settings.

2.4 Conceptual Framework

The conceptual framework examines the effect of AI usage (independent variable) on the learning outcomes (dependent variable) of UniMAC students. The model suggests that effective use of AI tools enhances students' understanding, engagement, and skill acquisition, thereby improving academic performance and preparing them for job-oriented tasks. However, the unethical usage or ethical challenges in the use of AI, limited or ineffective AI usage may hinder learning, reduce engagement, and negatively affect outcomes, highlighting the importance of integrating AI thoughtfully into teaching and learning processes.

Figure 2.2 Conceptual Framework



Source: Author's Construct, 2025.

2.5 Conclusion

This chapter reviewed conceptual, theoretical, and empirical literature on AI in tertiary education, with focus on UniMAC students. The conceptual review clarified key ideas, such as AI-enhanced learning, digital literacy, and collaborative pedagogy. The theoretical perspective, anchored in the Technology Acceptance Model and social constructivism, highlighted factors influencing AI adoption and the role of social interaction in knowledge construction. Empirical studies illustrated AI's potential to improve engagement, learning outcomes, and job-ready skill development while revealing challenges in ethics, access, and teacher preparedness. The conceptual framework integrated these insights, guiding the study in examining strategies for leveraging AI to produce quality, employable graduates while mitigating potential risks.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

This chapter presents the methodology adopted to examine the impact of AI usage on the learning outcomes of UniMAC students. It explains the research design, data collection procedures, and analytical techniques employed to ensure that the study's objectives are addressed systematically and rigorously. Attention is given to issues of reliability, validity, and ethical considerations throughout the research process. By detailing the methodological steps, the chapter provides a clear account of how evidence was gathered and analysed, ensuring transparency and supporting the credibility of the study's findings.

3.1 Research Paradigm

A research paradigm provides the philosophical foundation guiding how researchers understand reality, construct knowledge, and select methods appropriate to the study context. This study adopted the positivist paradigm. This paradigm views social reality as objective, observable, and measurable, allowing phenomena to be studied through empirical evidence (Saunders & Lewis, 2012; Creswell & Creswell, 2018). Positivism is appropriate because the research investigates the relationship between AI usage and learning outcomes among UniMAC students. This allows the use of quantifiable variables such as frequency of AI use, academic performance, and skill development. By emphasising numerical data and statistical analysis, the study seeks to identify patterns, correlations, and causal links, providing evidence-based insights into the effects of AI in tertiary education (Creswell, 2014; Saunders et al., 2019). This paradigm supports rigorous hypothesis testing and ensures that findings are generalisable, thereby informing institutional strategies to leverage AI effectively while promoting quality, job-oriented graduate outcomes.

3.2 Research Design

According to Leedy and Ormrod (2010), research design can be categorized into exploratory, descriptive, or explanatory. This study employed a combined descriptive and explanatory research design to examine the effect of AI usage on the learning outcomes of UniMAC students. The descriptive component outlines the current level and patterns of AI adoption among students, providing a contextual foundation, while the explanatory component utilizes statistical analysis to explore the potential causal relationship between AI usage and students' learning outcome, thereby testing the study's hypotheses. According to Denzin and Lincoln (2011) Zikmund et al. (2013), explanatory study enables researchers to investigate cause-and-effect relationships between variables, allowing for a clearer understanding of how one factor influences another.

3.3 Research Approach

This study adopted a quantitative approach to examine the effect of AI usage on the learning outcomes of UniMAC students. Quantitative methods allow for the systematic collection and analysis of numerical data, enabling statistical testing of hypotheses (Creswell & Creswell, 2018). Surveys and structured questionnaires measured both AI usage and learning outcomes, providing empirical evidence to determine the strength and direction of their relationship. This aligns with the positivist paradigm, which emphasises objective measurement and generalisable findings (Kivunja & Kuyini, 2017; Yilmaz, 2013). The quantitative approach is appropriate because it allows the impact of AI usage to be expressed numerically, facilitating rigorous statistical analysis and identification of significant relationships (Hair et al., 2015; Field, 2018). It also enables efficient handling of large datasets, ensuring reliable and robust results. By using this method, the study can objectively assess how AI integration influences learning outcomes, providing insights that can inform strategies for producing quality, job-ready graduates at UniMAC.

3.4 Population

Population refers to the complete group of individuals who share the characteristics relevant to a study (Sekaran and Bougie, 2016). Clear identification of this group helps ensure that the findings can be interpreted in relation to the wider context (Cohen, Manion, and Morrison, 2018). For this study, the population consists of master's students enrolled at the University of Media, Arts and Communication (UniMAC), Ghana. These students form the core group for examining how artificial intelligence is used to support learning and academic tasks. The total population is 270 students, distributed across the programmes shown in Table 2.1.

Table 3.1: Population Distribution

Programme	Population
Public Relation Marketing	72
Strategic Public Relation Management	73
Media Management	20
Journalism	3
Political Communication Management	14
Development Communication	88
Total	**270**

3.5 Sampling and Sampling Procedure

Sampling is the process of selecting a portion of a population to represent the whole, enabling researchers to make inferences about the larger group (Creswell & Creswell, 2018; Neuman, 2014). It is important because studying the entire population is often impractical due to time, financial, and logistical constraints (Bryman, 2012; Dillman et al., 2014). Despite potential challenges such as sampling bias or limited representativeness, careful sampling ensures that the study produces reliable and generalisable findings (Saunders et al., 2019). In this study, given the estimated

population of 270 master's students, sampling was necessary to ensure efficiency and accuracy in data collection. The sample size was calculated using Yamane's (1967) formula: $n = N / [1 + N(e^2)]$. In this study, the population size is 270 and the chosen margin of error is 0.05. Thus, n = 161. This indicates that a sample size of 161 master's students participated in the study.

In terms of sampling technique, the study used a convenience sampling to select the 161 respondents to participate in the study. Convenience sampling is a non-probability technique in which participants will be selected based on their availability and willingness to take part (Etikan et al., 2016). This approach will allow for the efficient collection of data, particularly when time and resources are limited, although it may reduce generalisability due to potential selection bias (Taherdoost, 2016). In this study, students who will be readily accessible and willing to participate in the research on AI usage at UniMAC will be included. Despite its limitations, convenience sampling will enable the study to gather timely and relevant insights into students' use of AI and its effect on learning outcomes.

3.6 Data Collection Instruments

Data collection instruments are tools that will be used to gather information relevant to the research objectives (Ghauri et al., 2020). The primary data for this study will be collected using structured, self-administered questionnaires. Structured questionnaires will allow standardised responses, ensuring consistency, comparability, and reliability across participants (Creswell & Creswell, 2018; Saunders et al., 2019). The questionnaire will include sections on demographic information, AI usage patterns, perceptions of usefulness and ease of use, and challenges, measured primarily on a five-point Likert scale. To ensure reliability and validity, the questionnaire will be adapted from previous studies on AI in higher education and refined through a pilot test, with internal consistency assessed using Cronbach's alpha. Self-administration will minimise bias and allow participants to

respond at their own pace (Kasomo, 2010). This method will ensure the systematic collection of primary data suitable for robust statistical analysis of AI usage and its impact on learning outcomes.

3.7 Data Collection Procedure

The data collection process for this study will follow a structured and systematic approach to ensure accuracy and reliability. Ethical clearance and permission will first be obtained from UniMAC authorities to access students. Respondents will be informed about the purpose of the study and assured of confidentiality and voluntary participation. Questionnaires will be distributed to selected students in line with the sampling strategy, with clear instructions provided for completion. Both physical and electronic formats will be used to enhance reach and convenience. Respondents will be given sufficient time to complete the questionnaires independently to minimise bias and encourage thoughtful responses. Upon completion, data analysis will be conducted.

3.7 Data Analysis

Data analysis is a systematic process of organising, cleaning, and interpreting data to reveal patterns and relationships (Bell et al., 2018). In this study, quantitative data that will be collected through structured questionnaires from UniMAC graduate students will be analysed using IBM SPSS Statistics version 27 (IBM Corp., 2020). Descriptive statistics, including frequencies and percentages, will summarise the demographic profiles of respondents. Objective (1), which examines AI usage among students; Objective (3), which explores the ethical challenges associated with AI usage; and Objective (4), which identifies strategies to address these challenges, will be analysed using means and standard deviations.

Inferential statistics will then be applied to examine relationships and test hypotheses related to Objective (2), which focuses on the effect of AI usage on graduate students' learning outcomes. Pearson's correlation analysis will measure the strength and direction of the relationship between

AI usage and learning outcomes, while linear regression analysis will assess the predictive influence of AI usage on student performance. The regression model will follow: $Y = \beta_0 + \beta_1 X_1 + \mu$. Where,

- Y = Learning Outcomes (Dependent Variable)
- X_1 = AI Usage (Independent Variable)
- β_0 = Intercept
- β_1 = Regression Coefficient
- μ = Error Term

Prior to data analysis, the reliability of the measurement scales will be assessed using Cronbach's alpha, with a threshold of 0.70 considered acceptable (Creswell, 2014), to confirm the internal consistency of the questionnaire items. Assumptions of normality, linearity, and homoscedasticity will be examined and satisfied to ensure the validity of the results. Findings will be presented in tables, charts, and graphs to aid clear interpretation. The results will provide empirical evidence on how AI usage influences learning outcomes and inform strategies for responsible AI integration in tertiary education.

3.9 Ethical Considerations

Ethical adherence will be paramount to maintain the integrity and credibility of this study at UniMAC, as neglecting ethical principles could compromise the validity and trustworthiness of the findings (Resnik, 2015; Bryman, 2016). Key ethical principles to be observed will include avoiding harm, respecting participant dignity, obtaining informed consent, ensuring confidentiality, and preventing deception. Participants will be fully informed of their right to withdraw at any stage without penalty. Confidentiality will be maintained by anonymising responses and securely storing all data. Ethical clearance will be obtained from UniMAC's Research Ethics Committee to ensure compliance with institutional requirements. Potential conflicts of interest will be disclosed to

maintain objectivity, and all external sources will be properly referenced to uphold academic integrity throughout the research process.

3.10 Conclusion

This chapter has outlined the research methodology employed to examine the impact of AI usage on the learning outcomes of UniMAC students. It detailed the positivist research paradigm, a combined descriptive and explanatory design, and a quantitative approach aligned with the study objectives. The population, sampling procedure, and sample size were clearly defined, with convenience sampling used to efficiently select 161 participants. Data collection procedures, instruments, and analysis techniques were explained, including the use of structured questionnaires, Likert-scale measurements, and statistical methods such as Pearson correlation and linear regression. Ethical considerations, reliability, and validity measures were also emphasised to ensure credible and trustworthy findings. Overall, the chapter provides a transparent and rigorous methodological foundation, enabling the study to systematically investigate how AI integration influences students' learning outcomes and to generate evidence-based insights for improving educational practices.

CHAPTER FOUR
DATA ANALYSIS AND DISCUSSION OF RESULTS

4.0 Introduction

This study investigates the role of artificial intelligence (AI) in developing graduate students in Ghana. This chapter presents the analysis and discussion of the study's findings. Out of 161 respondents sampled, 110 returned completed questionnaires, yielding a response rate of 68.3%. This response rate is considered acceptable according to previous literature (Fincham, 2008; Sataloff & Vontela, 2021). The analysis begins with the demographic analysis, followed by the assessment of the study objectives.

4.1 Demographic Data of Respondents

This section outlines the respondents' demographic characteristics to explain the sample and provide context. It includes gender, age, and academic programme of study, which are relevant for understanding the perspectives and experiences captured in the study.

Table 4.1: Demographic Data of Respondents

Characteristic	Category	Frequency	Percentage (%)
Gender	Female	50	45.5
	Male	60	54.5
Age (years)	Below 25	5	4.5
	25–29	14	12.7
	30–39	66	60.0
	40 and above	25	22.7
Programme of Study	Strategic Public Relations Management	27	24.5
	Development Communication	24	21.8
	Media Management	12	10.9
	Public Relations with Marketing	32	29.1
	Journalism	2	1.8
	Political Communication Management	13	11.8

Source: Author's Field Survey (2025).

Table 4.1 presents the results of the demographic profiling of the participants. In terms of gender, slightly more than half of the respondents (54.5%) were male, while 45.5% were female, indicating a relatively balanced representation. Regarding age, the majority of respondents (60%) were aged 30–39 years. suggesting that most participants are mid-career professionals with considerable work experience. Respondents aged 40 and above accounted for 22.7%, while those aged 25–29 and below 25 years represented 12.7% and 4.5%, respectively.

Concerning academic programmes, respondents were drawn from various master's level courses. Public Relations with Marketing accounted for the largest share (29.1%), followed by Strategic Public Relations Management (24.5%) and Masters in Development Communication (21.8%). Smaller proportions were observed for Political Communication Management (11.8%), Media Management (10.9%), and Journalism (1.8%). This distribution indicates that the study captured participants from diverse but professionally relevant backgrounds, particularly in communication and public relations fields.

Overall, the sample reflects a mid-career, highly educated, and professionally oriented population. These demographic characteristics provide useful context for interpreting the main findings and suggest that participants possess the experience and academic grounding to provide informed perspectives on the study topic.

4.2 Analysis of Study Objectives

This study investigates how AI usage influences the learning outcomes of graduate students at UniMAC, Ghana. Specifically, the study assessed: (1) assess the extent of AI adoption among UniMAC students; (2) examine the effect of AI usage on students' academic performance and skill

development; (3) explore the ethical challenges associated with AI use in tertiary education; and (4) identify effective strategies to promote responsible, equitable, and ethical AI integration in academic settings. Descriptive statistics summarised data on students' AI usage, ethical concerns, and integration strategies. Pearson correlation assessed the relationship between AI usage and learning outcomes, while linear regression examined its predictive effect on learning outcomes.

4.2.1 Extent of AI Usage among UniMAC Students

The adoption of AI tools in tertiary education is increasingly important for enhancing learning outcomes and preparing students for a technology-driven labour market. This study first examines the patterns and extent of AI usage among UniMAC graduate students, including frequency and ways of engagement in research, assignments, and skill development.

Table 4.2: Extent of AI Usage among UniMAC Students

Item	Mean	Std. Deviation
I frequently use AI tools to assist with academic writing and assignments	3.35	1.03
I rely on AI platforms for research support and information retrieval	3.33	0.87
I use AI applications to generate ideas or summaries for class tasks	3.48	0.87
I feel confident in my ability to use AI tools effectively	3.61	0.76
I use AI to improve grammar, structure, and clarity in my written work	3.76	0.83
I use AI for data analysis or visualisation in academic projects	3.75	0.85
Overall, I make frequent use of AI tools to enhance my learning outcomes	3.88	0.88

Source: Author's Field Survey (2025).

The Table 4.2 shows that students use AI tools for a range of academic tasks, with most mean scores falling between 3.30 and 3.90. The strongest use was reported for improving grammar, structure, and clarity (M = 3.76, SD = 0.83). This suggests that AI has become a regular support tool for written work. The pattern reflects the argument in the Technology Acceptance Model that perceived usefulness encourages adoption (Davis, 1989). Earlier studies support this trend. Kasneci et al.

(2023) found that AI-assisted writing improves text quality and often builds user confidence, even though the level of improvement varies across students.

AI was also used for idea generation and summarisation (M = 3.48, SD = 0.87). Students appear to rely on these tools to simplify difficult material or guide early stages of academic tasks. This may relate to Constructivist Learning Theory, which highlights the value of scaffolding in helping learners build understanding. Tlili et al. (2023) similarly show that generative AI often acts as a cognitive aid when students work with complex content. A relatively high mean score was recorded for confidence in using AI tools (M = 3.61, SD = 0.76). This suggests that many students feel capable of handling AI systems. Self-Efficacy Theory may help explain this, as frequent exposure to digital tools tends to strengthen beliefs about competence. Zawacki-Richter et al. (2019) reported similar findings in digital learning contexts, although some students remained cautious or unsure.

Students also reported considerable use of AI for data analysis and visualisation (M = 3.75, SD = 0.85). This indicates that AI use has expanded beyond writing support into more technical academic tasks. Bond et al. (2021) also observed rising student dependence on analytic and visualisation tools, especially in research-based courses. However, the variation in responses suggests that not all students have reached this level of integration, possibly due to programme differences or unequal access to software. The overall mean score (M = 3.88, SD = 0.88) shows that AI plays a significant role in students' academic routines. This finding aligns with international reports that note a steady increase in AI adoption in higher education because students view these tools as helpful for productivity and comprehension (Holmes et al., 2023).

4.2.2 Effect of AI Usage on the Learning Outcomes of UniMAC Students

This second objective examines how AI usage affects the learning outcomes of UniMAC students. The analysis considers whether engagement with AI tools enhances understanding, critical thinking, problem-solving, and skill development. The findings were analysed using correlation and regression analysis.

Table 4.3: Correlation between Level of AI Usage and Learning Outcomes of Students

Variables	Level of AI Usage	Learning Outcome
Level of AI Usage	1	
Learning Outcome of Students	0.181	1

**Correlation is significant at the 0.01 level (2-tailed)

Source: Author's Field Survey (2025).

Table 4.3 shows a weak positive correlation between AI usage and students' learning outcomes ($r = 0.181$, $p = 0.058$), suggesting that AI may slightly enhance comprehension, analytical thinking, and skill development, though the relationship is not statistically significant. This implies that AI supports learning but is not the only factor, as motivation, instructional support, and institutional resources also play roles (Davis, 1989; Venkatesh & Bala, 2008; Huang, 2023). Social Constructivist Theory suggests that AI can mediate knowledge construction through interaction with digital content and collaboration (Vygotsky, 1978; Kramarae, 1981).

The results highlight the need for guided AI use to avoid overreliance, which can reduce critical thinking and engagement (Zhai et al., 2024; Wong, 2024; Nartey, 2024). At UniMAC, AI should complement structured learning and faculty support. Incorporating digital literacy and ethical AI practices into the curriculum can ensure AI enhances comprehension, creativity, and independent reasoning rather than undermining them.

Table 4.4: Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	0.181	0.033	0.024	0.64233

Source: Author's Field Survey (2025).

The model summary indicates a weak positive relationship between AI usage and learning outcomes ($R = 0.181$, $R^2 = 0.033$), suggesting that AI contributes only modestly to academic performance. Other factors such as teaching quality, access to resources, and ethical awareness likely play a larger role (Davis, 1989; Venkatesh & Bala, 2008). This supports the view that AI is a supportive tool rather than a primary determinant of learning (Vygotsky, 1978; Kramarae, 1981).

AI can enhance learning when combined with guidance, structured activities, and ethical use frameworks. Research shows that its benefits are maximised alongside digital literacy training and pedagogical support, reducing overreliance and fostering critical engagement (Huang, 2023; Zhai et al., 2024). For UniMAC, this highlights the importance of institutional policies and faculty guidance to ensure responsible and effective AI integration.

Table 4.5: ANOVA of Regression Analysis

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.511	1	1.511	3.663	0.058
Residual	44.559	109	0.413		
Total	46.071	110			

a Dependent Variable: Learning Outcome
b Predictors: (Constant), Level of AI Usage

Source: Author's Construct (2025).

The ANOVA results in Table 4.5 show that the regression model is marginally insignificant ($F = 3.663$, $p = 0.058$), indicating that the level of AI usage does not strongly predict students' learning outcomes at the conventional 0.05 significance level. This suggests that while AI use may influence

learning, the effect is relatively weak. The result aligns with previous studies indicating that AI can support learning, but its impact depends on additional factors such as teaching quality, student motivation, and institutional support (Davis, 1989; Huang, 2023).

From a theoretical perspective, social constructivist theory explains that AI can act as a mediating tool for knowledge construction and collaboration (Vygotsky, 1978; Kramarae, 1981). However, the large residual sum of squares (44.559) highlights that other variables beyond AI usage contribute substantially to learning outcomes. This underscores the need for integrating AI within a broader pedagogical framework that includes ethical guidance, faculty supervision, and structured learning activities to maximise educational benefits (Wong, 2024; Nartey, 2024).

Table 4.6: Coefficients of Regression Analysis on AI Usage and Learning Outcomes

Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.	Tolerance	VIF
Constant	3.086	0.381		8.12	0.000	1.00	1.000
Level of AI Usage	0.181	0.095	0.181	1.91	0.0586	1.00	1.000

a Dependent Variable: Learning Outcome

Source: Author's Construct, 2025

The regression coefficients indicate that a one-unit increase in AI usage is associated with a 0.181 increase in students' learning outcomes, holding other factors constant. The positive coefficient suggests a beneficial effect of AI on academic engagement and knowledge acquisition. Although the significance value ($p = 0.058$) is marginally above the conventional 0.05 threshold, it still points to a trend where greater AI usage may contribute to improved learning. This aligns with the TAM, which posits that users' intention and actual use of technology influence outcomes in educational contexts (Davis, 1989; Venkatesh & Bala, 2008).

The standardized beta (β = 0.181) reflects a weak to moderate effect of AI usage on learning outcomes, highlighting that other factors, such as teaching quality, motivation, and institutional support, also play critical roles (Huang, 2023; Bauer et al., 2025). From a social constructivist perspective, AI tools facilitate learning by mediating interaction with content and peers (Vygotsky, 1978; Kramarae, 1981). However, caution is warranted, as overreliance on AI could undermine independent critical thinking and problem-solving (Zhai et al., 2024; Wong, 2024). These findings suggest that ethical guidance, digital literacy training, and structured pedagogical integration are essential to maximise the positive impact of AI on student learning.

4.2.3 Ethical and Practical Challenges Associated with AI Usage Among UniMAC Students

AI is seen to provide considerable benefits as an educational tool; however, it comes with many challenges that must be understood. The third objective of the study examines these ethical and practical challenges associated with AI usage among UniMAC students. The analysis of these challenges, including issues such as academic integrity, data privacy, algorithmic bias, and overreliance on AI, is presented descriptively in Table 4.7 below.

Table 4.7: Ethical and Practical Challenges Associated with AI Usage

Item	Mean	Std. Deviation
Overreliance on AI tools limits my ability to think critically and independently.	3.55	0.99
AI tools sometimes provide misleading or inaccurate information.	3.75	0.82
Using AI for assignments can lead to plagiarism or academic dishonesty.	3.78	0.82
There is limited awareness of ethical guidelines for AI usage among students.	3.92	0.76
Some AI tools violate privacy by collecting and storing personal data.	3.87	0.74
Unequal access to AI technology creates unfair academic advantages.	3.91	0.80
AI-generated content reduces originality in students' academic work.	3.85	0.78

Source: Author's Construct (2025).

The findings in Table 4.7 highlight a strong awareness among students regarding the ethical and practical challenges of AI usage in academic work. The results indicate that students reported the highest concern for "There is limited awareness of ethical guidelines for AI usage among students" (M = 3.92, SD = 0.76), suggesting that many perceive a lack of formal institutional guidance on responsible AI use. This aligns with research showing that higher education institutions have yet to implement comprehensive policies for generative AI, leaving students without clear direction (Ghimire & Edwards, 2024; Lim et al., 2025). Similarly, concerns about unequal access to AI technology (M = 3.91, SD = 0.80) and data privacy (M = 3.87, SD = 0.74) highlight awareness that AI adoption may deepen disparities and pose security risks. Studies emphasise that inequitable access and privacy concerns are key ethical challenges in educational AI adoption (Floridi & Cowls, 2019; Kohun et al., 2024).

Students also showed considerable concern for academic integrity and originality. "AI-generated content reduces originality in students' academic work" scored M = 3.85 (SD = 0.78), while "Using AI for assignments can lead to plagiarism or academic dishonesty" scored M = 3.78 (SD = 0.82), and "AI tools sometimes provide misleading or inaccurate information" scored M = 3.75 (SD = 0.82). These findings indicate recognition that overreliance on AI may compromise independent thinking and ethical academic practice. Prior studies similarly note that generative AI can blur boundaries between assistance and misconduct, especially when outputs are unverified or unattributed (Batista et al., 2024; Cordero et al., 2025).

"Overreliance on AI tools limits my ability to think critically and independently" recorded the lowest mean (M = 3.55, SD = 0.99), though it still represents moderate concern. The relatively high standard deviation suggests varied experiences: some students maintain critical engagement while others may rely heavily on AI, potentially reducing analytical and problem-solving skills. Literature

shows that excessive dependence on AI can undermine cognitive engagement, creativity, and overall academic performance (Yaroshenko & Iaroshenko, 2023; Shorey et al., 2024).

In sum, students recognise both the benefits and limitations of AI, highlighting the need for institutional guidelines, ethical frameworks, and digital literacy programmes to support responsible use in higher education.

4.2.4 Strategies for Responsible Use of AI Among Students of Unimac Graduates

Objective four explores strategies and interventions aimed at optimising AI usage in tertiary education to improve learning outcomes and graduate employability. It examines measures that foster responsible, ethical, and equitable adoption of AI, including institutional policies, faculty development programmes, and AI literacy initiatives for students. The analysis uses mean scores and standard deviations to summarise respondents' views on strategy effectiveness and feasibility.

Table 4.8: Strategies for Responsible Use of AI among UniMAC Students

Statement	Mean	Std. Deviation
Students should receive training on ethical and academic use of AI tools	4.31	0.81
Clear institutional policies should regulate AI usage	4.30	0.82
Lecturers should guide students on balancing AI assistance with independent thinking	4.38	0.75
Awareness should be created on plagiarism risks and academic integrity	4.46	0.65
Regular monitoring and feedback should ensure appropriate AI use	4.45	0.62
Access to credible and secure AI platforms should be encouraged	4.47	0.67
Collaboration between students and faculty should promote responsible AI practices	4.46	0.69

Source: Author's Construct (2025).

The findings in Table 4.8 show a strong consensus among respondents on strategies to ensure responsible AI usage. The findings generally demonstrate a strong consensus among respondents on the strategies necessary to ensure responsible AI usage. The results show that respondents

highlighted the need for training and orientation on ethical and academic AI use (M = 4.31, SD = 0.810). This indicates that students recognise the dual potential of AI to enhance learning while posing ethical risks. Previous studies emphasise that ethical AI literacy is critical in higher education to prevent misuse and encourage critical engagement (Baker & Smith, 2019; Lim et al., 2023). Clear institutional policies and guidelines regulating AI usage were also rated highly (M = 4.30, SD = 0.819), reflecting the need for governance frameworks that provide boundaries and guidance in academic and research contexts (Selwyn, 2020; Floridi & Cowls, 2019).

Guidance from lecturers on balancing AI assistance with independent critical thinking scored M = 4.38 (SD = 0.754). This aligns with Social Constructivist Theory, which emphasises scaffolding and mentorship to facilitate active knowledge construction (Vygotsky, 1978; Whitaker et al., 2016). Students highlighted awareness campaigns on plagiarism and academic integrity as important (M = 4.46, SD = 0.645). This suggests they recognise the preventive value of institutional initiatives, supporting previous studies (Mulaudzi, 2025; Weiner et al., 2025).

Regular monitoring and feedback were highly endorsed (M = 4.45, SD = 0.615), highlighting the importance of continuous oversight to mitigate misuse and ethical breaches (Gupta & Rathore, 2024; Wang et al., 2023). Encouraging access to credible and secure AI platforms scored M = 4.47 (SD = 0.673), reflecting concerns about data privacy, reliability, and the quality of AI outputs, supported by previous research (Rathore, 2024; Bulathwela et al., 2024). Collaboration between students and faculty also received strong agreement (M = 4.46, SD = 0.686), reinforcing constructivist principles that stress social mediation in knowledge construction and responsible practice (Smith, 1997; Chen & Bryer, 2012).

In a nutshell, the analysis shows that students support strategies such as ethical training, policy enforcement, mentorship, awareness campaigns, monitoring, secure AI platforms, and collaboration to promote responsible AI use and uphold academic integrity.

4.3 Stability and Diagnostic Test Results

Table 4.9 presents the stability and diagnostic test results for the study's main constructs. Cronbach's alpha values range from 0.887 to 0.903, indicating high to excellent internal consistency. The highest reliability is observed for Ethical Challenges in AI Usage ($\alpha = 0.903$), followed closely by Effect of AI Usage on Learning Outcomes ($\alpha = 0.901$), Level of AI Usage among UniMAC Students ($\alpha = 0.890$), and Strategies for Responsible AI Use ($\alpha = 0.887$). These values exceed the conventional threshold of 0.70, confirming consistent measurement across all constructs (Hair, Black, Babin, & Anderson, 2019).

Normality assessment using Kolmogorov-Smirnov and Shapiro-Wilk tests shows slight deviations from perfect normality, with p-values all below 0.05. Skewness and kurtosis values remain within acceptable limits, none exceeding ±1. Level of AI Usage is slightly negatively skewed (-1.004) with a kurtosis of 3.224, while Learning Outcome shows near symmetry (skewness = 0.066, kurtosis = -0.526). These minor departures from normality are typical for Likert-scale data and do not compromise parametric analyses, which are robust to such small deviations, particularly in moderate sample sizes (Tabachnick & Fidell, 2019). Histograms, Q-Q plots, and residual statistics further support approximate normality and stability of the variables, indicating suitability for regression and correlation analyses.

Table 4.9: Stability and Diagnostic Test Results

Construct Variable	Cronbach's α	Kolmogorov-Smirnov (D)	Shapiro-Wilk (W)	Skewness	Kurtosis
Level of AI Usage	0.890	0.184 (0.000)	0.904 (0.000)	-1.004	3.224
Learning Outcome	0.901	0.128 (0.000)	0.953 (0.001)	0.066	-0.526
Ethical Challenges in AI Usage	0.903	–	–	–	–
Strategies for Responsible AI Use	0.887	–	–	–	–

Source: Author's Field Survey (2025)

4.4 Discussion of Results

This study investigated the role of artificial intelligence (AI) in developing graduate students at UniMAC, Ghana. The discussion focuses on four objectives: (1) the extent of AI adoption, (2) the effect of AI usage on learning outcomes, (3) ethical and practical challenges associated with AI usage, and (4) strategies for responsible and effective AI use. The findings are interpreted quantitatively and critically, situating the results within broader theoretical and empirical contexts, highlighting implications, limitations, and practical considerations for higher education.

4.4.1 Extent of AI Usage among UniMAC Students

The first objective assessed the level and patterns of AI adoption among graduate students. The results indicate moderate to high engagement, with the overall mean of 3.88 suggesting that AI tools are commonly used to support various academic tasks, particularly writing, data analysis, and idea generation. This finding aligns with the Technology Acceptance Model, which emphasises that perceived usefulness and ease of use promote adoption (Davis, 1989). Students most frequently used AI to improve grammar, structure, and clarity (M = 3.76), indicating that AI is primarily seen as a tool for enhancing text quality. This may suggest that while students are comfortable leveraging

AI for routine academic tasks, they may be more cautious about applying it for higher-order analytical tasks, such as critical reasoning or hypothesis formulation. Similar patterns have been observed internationally, where AI supports surface-level academic productivity but does not fully replace critical engagement (Kasneci et al., 2023; Bond et al., 2021).

Use of AI for idea generation and summarisation (M = 3.48) highlights a secondary function of scaffolding learning, where AI assists in understanding complex materials. Constructivist Learning Theory supports this observation, positing that cognitive scaffolding enhances knowledge acquisition when learners actively interact with supportive tools (Tlili et al., 2023). Variation in responses may reflect differing levels of digital literacy, prior exposure, or confidence in AI outputs, signalling the need for structured guidance. Confidence in using AI (M = 3.61) was moderately high, suggesting that students generally feel capable of navigating AI systems. Self-Efficacy Theory explains this, as repeated interaction with technology strengthens belief in competence (Zawacki-Richter et al., 2019). However, the spread in scores indicates some students remain hesitant, which may reflect limited familiarity with complex AI functionalities or concerns about accuracy and reliability.

Students reported substantial engagement with AI for data analysis and visualisation (M = 3.75), indicating an expansion beyond text-based applications into technical academic tasks. This suggests that AI is increasingly integrated into research processes, mirroring global trends in higher education where analytics tools facilitate project completion and data interpretation (Bond et al., 2021; Holmes et al., 2023). Yet, not all students fully leverage these capabilities, likely due to programmatic differences or resource constraints. Overall, the findings suggest that AI is moderately embedded in graduate students' academic routines. While usage patterns reveal recognition of AI's benefits, disparities in access, confidence, and skill highlight the importance of

institutional support. These insights emphasise that AI adoption alone is insufficient; structured policies, training, and supervision are necessary to maximise impact and ensure equitable use across the student population.

4.4.2 Effect of AI Usage on Learning Outcomes of UniMAC Students

The second objective examined the relationship between AI usage and learning outcomes. The correlation analysis ($r = 0.181$) indicates a weak positive relationship, suggesting that AI usage may contribute modestly to comprehension, critical thinking, and skill development. The finding supports the view that AI can serve as a complementary academic tool, but is not a primary driver of learning outcomes (Davis, 1989; Huang, 2023). Regression analysis ($\beta = 0.181$) further indicates that a one-unit increase in AI usage corresponds to a slight increase in learning outcomes, though the effect is marginally insignificant ($p = 0.058$). This reflects that AI is supportive but dependent on broader contextual factors, including teaching quality, student motivation, and access to resources. Social Constructivist Theory provides a theoretical lens here, as AI can mediate knowledge construction when combined with interaction, discussion, and guided learning (Vygotsky, 1978; Kramarae, 1981).

Despite modest quantitative influence, students reported qualitative benefits such as faster task completion, clearer writing, and improved data organisation. These outcomes indicate that AI enhances efficiency and reduces cognitive load, enabling students to focus on higher-level thinking. Prior research confirms this, highlighting AI as a cognitive aid rather than a substitute for analytical reasoning (Wong, 2024; Zhai et al., 2024). The model summary ($R^2 = 0.033$) suggests that most variance in learning outcomes is explained by factors beyond AI usage. This highlights the multifactorial nature of academic performance, where intrinsic motivation, faculty support, and

pedagogical design exert stronger influence. The residual variance emphasises that AI's contribution is supportive rather than transformative.

Weak predictive strength suggests a need for structured integration of AI into curricula, where tools complement assignments, research, and critical thinking exercises. Institutions can enhance impact by combining AI with digital literacy training, faculty guidance, and supervised practical applications. Such integration can ensure that AI enhances learning outcomes without fostering overreliance. Overall, the findings indicate that AI's contribution to learning outcomes is modest but positive. While AI supports efficiency and clarity, its full potential depends on contextual factors, including student engagement, ethical awareness, and institutional facilitation. These results underline that technology alone cannot guarantee improved learning outcomes, requiring complementary pedagogical interventions.

4.4.3 Ethical and Practical Challenges Associated with AI Usage

The third objective explored ethical and practical challenges linked to AI adoption. Descriptive statistics indicate that students perceive significant ethical concerns, particularly regarding limited awareness of guidelines (M = 3.92) and unequal access (M = 3.91). These findings align with global literature emphasising that digital divides and unclear policies pose substantial barriers to equitable AI use (Floridi & Cowls, 2019; Kohun et al., 2024). Concerns about academic integrity were prominent, with AI-generated content reducing originality (M = 3.85) and risks of plagiarism noted (M = 3.78). These findings suggest that students are aware of the fine line between legitimate support and academic misconduct. Research corroborates this, noting that generative artificial interligence (AI) can blur authorship boundaries and complicate academic evaluation (Batista et al., 2024; Cordero et al., 2025).

Additionally, data privacy and misinformation emerged as additional challenges, with students expressing concern about AI collecting personal data (M = 3.87) and generating inaccurate content (M = 3.75). Such practical risks highlight the need for secure, credible platforms and continuous monitoring. Previous studies indicate that data breaches and algorithmic biases are growing concerns in AI integration for education (Ghimire & Edwards, 2024; Lim et al., 2025). Overreliance on AI scored slightly lower (M = 3.55), but remains significant. This indicates variability in experiences: some students maintain critical thinking, while others may depend heavily on AI outputs. Excessive reliance could hinder cognitive development and analytical reasoning, supporting arguments from cognitive load theory and constructivist perspectives (Yaroshenko & Iaroshenko, 2023; Shorey et al., 2024).

The results demonstrate that students show both enthusiasm for AI and caution about its limitations, highlighting the need for clear guidelines, training, and support. Ethical and practical challenges, including integrity, equity, and privacy, are central to their experiences. Institutions should provide structured guidance and monitoring to ensure responsible and effective AI use.

4.4.4 Strategies for Responsible and Effective AI Use

The fourth objective examined strategies to promote ethical, equitable, and effective AI integration. Descriptive results indicate strong agreement on the need for training, institutional policies, mentorship, monitoring, and access to secure platforms (means ranging 4.30–4.47). These measures suggest that students recognise the dual potential of AI to enhance learning while posing ethical risks. Training on ethical and academic use of AI (M = 4.31) is essential to equip students with competencies for responsible engagement. This finding aligns with research emphasising AI literacy as a core skill in higher education, ensuring students can leverage AI without compromising originality or integrity (Baker & Smith, 2019; Lim et al., 2023).

Institutional policies scored similarly high (M = 4.30), reflecting the necessity of formalised guidelines that define acceptable AI use. Policy frameworks provide accountability, reduce misuse, and clarify boundaries between assistance and academic misconduct, as recommended by Floridi and Cowls (2019) and Selwyn (2020). Faculty guidance and collaboration were emphasised (M = 4.38–4.46), reinforcing the role of mentorship in constructivist learning. Students benefit when instructors scaffold AI use, balancing tool support with independent critical thinking. This approach ensures that AI supplements, rather than replaces, analytical and problem-solving skills (Vygotsky, 1978; Whitaker et al., 2016).

Continuous monitoring and feedback mechanisms scored highly (M = 4.45), highlighting the importance of oversight in mitigating misuse and reinforcing best practices. Access to secure, credible AI platforms (M = 4.47) underscores the need for reliable technological infrastructure to prevent data breaches and inaccuracies. Overall, these strategies reflect a comprehensive, multi-layered approach. By combining training, policy, mentorship, monitoring, and secure access, institutions can support responsible AI integration, maximise learning outcomes, and maintain ethical standards. The findings indicate that AI's potential is maximised when embedded in structured, guided, and ethically aware educational frameworks.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the key findings, conclusions, policy recommendations, and suggestions for future research. It synthesises insights from the preceding analysis to highlight the broader implications of AI adoption, learning outcomes, ethical considerations, and strategies for responsible and effective use in higher education. The chapter provides actionable guidance for institutional planning, policy development, and student support initiatives.

5.1 Summary of Results

The study investigated AI adoption and use among graduate students at UniMAC. focusing on four objectives: the extent of AI usage, its effect on learning outcomes, ethical and practical challenges, and strategies for responsible AI use.

First, AI adoption among students was moderate to high, with most students using AI for writing, data analysis, and idea generation. Students primarily leveraged AI to improve grammar, clarity, structure, and organisation of their academic work, while also using AI to summarise and scaffold complex materials. Confidence in AI use was moderately high; however, some students expressed hesitation due to differences in digital literacy, prior experience, and concerns about reliability, suggesting the need for structured guidance and support.

Second, AI usage had a weak but positive effect on learning outcomes. Quantitative analyses showed modest contributions to comprehension, task efficiency, and skill development, while qualitative feedback highlighted benefits such as faster completion of assignments, improved clarity, and better organisation of information. Regression results indicated that AI alone is not a

strong predictor of academic performance, emphasising that effectiveness depends on complementary factors such as teaching quality, student motivation, and structured supervision.

Third, students identified several ethical and practical challenges associated with AI use. The most significant concerns included unclear guidelines, unequal access, risks to academic integrity, plagiarism, data privacy issues, misinformation, and potential overreliance on AI outputs. These findings illustrate that while AI offers substantial support for academic tasks, it also presents risks that must be carefully managed to maintain fairness, transparency, and critical thinking.

Fourth, students strongly endorsed strategies for responsible AI adoption. Recommended measures included ethical and digital literacy training, institutional policies, mentorship and guidance, continuous monitoring, and access to secure AI platforms. These multi-layered strategies indicate that students recognise AI's dual potential to enhance learning and pose ethical risks, and that effective adoption requires structured support and oversight.

5.2 Conclusion

The study concludes that AI is moderately integrated into graduate students' academic routines at UniMAC. Students value its benefits, including improved efficiency, writing quality, and support for complex tasks, but remain cautious due to concerns about reliability, academic integrity, and equitable access. AI's effectiveness depends on users' digital literacy, ethical awareness, and confidence. While AI can positively influence learning outcomes, its effect is modest. Quantitative results show a weak correlation with performance, and qualitative feedback indicates that AI primarily supports routine tasks and cognitive efficiency rather than higher-order reasoning. Structured integration into curricula, combined with faculty guidance, is therefore essential to maximise its potential. Responsible AI adoption requires a multi-layered institutional approach. Ethical and practical challenges, along with varying student confidence, highlight the need for

policies, training, mentorship, and secure platforms. Institutions must ensure that AI is used as a supportive tool that promotes critical thinking, integrity, and equitable access, aligning technology use with pedagogical goals while mitigating risks.

5.3 Recommendations

Based directly on the findings, the following recommendations are proposed:

Students' moderate confidence and concerns about ethical use indicate the need for structured training that equips learners to navigate AI responsibly, understand risks, and apply tools effectively in academic tasks.

The lack of awareness of guidelines and concerns about academic integrity suggest that formal policies are essential. Institutions should define acceptable usage, clarify boundaries, and provide accountability mechanisms to prevent misuse.

Given the variations in students' confidence and skill levels, faculty mentorship is critical. Instructors should scaffold AI use in assignments, research, and critical thinking exercises to balance tool support with independent reasoning.

Concerns about data privacy, misinformation, and unreliable outputs indicate the need for safe technological infrastructure. Universities should provide vetted platforms and continuous monitoring to safeguard students and institutional credibility.

The study highlights that effective AI adoption depends on coordinated support. Collaboration between faculty, administrators, and technology providers can provide comprehensive guidance, resources, and oversight for responsible and equitable AI integration.

5.4 Suggestions for Further Research

Examine how students' socio-economic backgrounds, fields of study, and prior technological experience influence responsible AI adoption.

Conduct comparative studies on the effectiveness of different AI platforms or tools in enhancing learning, collaboration, and skill development.

Explore the impact of institutional policies and mentorship programmes on mitigating ethical and practical challenges associated with AI use.

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APPENDIX

INSTITUTE OF JOURNALISM
SCHOOL OF GRADUATE STUDIES AND RESEARCH
DEPARTMENT OF PUBLIC RELATIONS
QUESTIONNAIRE FOR GRADUATE STUDENTS OF UNIMAC

Dear Respondent,

I am a Master's student at UniMAC, and as part of the requirements for the award of my degree, I am conducting a study on "Leveraging Artificial Intelligence (AI) in Tertiary Education for Developing Improved Learning Outcomes among Graduate Students."

The purpose of this questionnaire is to collect information on the use of AI tools, their effects on learning outcomes, ethical challenges, and strategies for responsible use among graduate students. Your responses will be treated with strict confidentiality and used solely for academic purposes. Participation is entirely voluntary, and you may withdraw at any time without penalty.

Your honest and thoughtful responses will be highly appreciated and will contribute significantly to the success of this study.

Thank you for your time and cooperation.

SECTION A: DEMOGRAPHIC INFORMATION
Please tick (✓) the appropriate option for each question.

1. Gender: a. Male ☐ b. Female ☐

2. Age: a. Below 25 ☐ b. 25–29 ☐ c. 30–39 ☐ d. 40 & above ☐

3. Programme of Study:

a. Journalism ☐
b. Public Relations with Marketing ☐
c. Media Management ☐
d. Development Communication ☐
e. Strategic Public Relations Management ☐
f. Political Communication Management ☐

SECTION B: LEVEL OF AI USAGE AMONG STUDENTS

Artificial Intelligence (AI) has become a vital tool in higher education, influencing how students learn, research, and communicate. This section seeks to determine how frequently and in what ways UniMAC students use AI applications in their academic work. The focus is on the extent of use, type of tools employed, and the purpose of usage.

S/N	Item	1	2	3	4	5
LU1	I frequently use AI tools to assist with academic writing and assignments.					
LU2	I rely on AI platforms for research support and information retrieval.					
LU3	I use AI applications to generate ideas or summaries for class tasks.					
LU4	I feel confident in my ability to use AI tools effectively.					
LU5	I use AI to improve grammar, structure, and clarity in my written work.					
LU6	I use AI for data analysis or visualisation in academic projects.					
LU7	Overall, I make frequent use of AI tools to enhance my learning outcomes.					

SECTION C: EFFECT OF AI USAGE ON LEARNING OUTCOMES

Learning outcomes encompass the knowledge, skills, and competencies students acquire during academic study. This section assesses how AI usage influences these outcomes among UniMAC students, particularly in relation to understanding, originality, and critical thinking. Scale: 1 = Strongly Disagree, 2 = Disagree 3 = Neutral, 4 = Agree, & 5 = Strongly Agree.

S/N	Item	1	2	3	4	5
EAU1	AI tools help me understand complex academic concepts.					
EAU2	AI usage has improved my academic performance (e.g., assignments, projects, tests).					
EAU3	AI helps me manage time and complete tasks more efficiently.					
EAU4	AI enhances the development of skills relevant to my future career.					
EAU5	AI improves my ability to apply classroom knowledge to real-world situations.					
EAU6	AI makes me feel more prepared for the demands of the job market.					
EAU7	Overall, AI contributes positively to my academic and career readiness.					

SECTION C: ETHICAL CHALLENGES IN AI USAGE

The integration of AI in higher education introduces ethical concerns regarding fairness, originality, data security, and academic honesty. This section explores the ethical challenges that may arise from AI use among UniMAC students. Scale: 1 = Strongly Disagree, 2 = Disagree 3 = Neutral, 4 = Agree, & 5 = Strongly Agree.

S/N	Item	1	2	3	4	5
CAU1	Overreliance on AI tools limits my ability to think critically and independently.					
CAU2	AI tools sometimes provide misleading or inaccurate information.					
CAU3	Using AI for assignments can lead to plagiarism or academic dishonesty.					
CAU4	There is limited awareness of ethical guidelines for AI usage among students.					
CAU5	Some AI tools violate privacy by collecting and storing personal data.					
CAU6	Unequal access to AI technology creates unfair academic advantages.					
CAU7	AI-generated content reduces originality in students' academic work.					

SECTION E: STRATEGIES FOR RESPONSIBLE USE OF AI AMONG GRADUATE STUDENTS.

Responsible AI use involves applying artificial intelligence tools ethically and effectively to enhance learning and research while avoiding misuse and overdependence. Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

S/N	Item	1	2	3	4	5
SAU1	Students should receive training and orientation on the ethical and academic use of AI tools.					
SAU2	Clear institutional policies and guidelines should regulate AI usage for academic and research activities.					
SAU3	Lecturers should guide students on balancing AI assistance with independent critical thinking.					
SAU4	Awareness should be created on plagiarism risks and the importance of academic integrity when using AI.					
SAU5	Regular monitoring and feedback should be provided to ensure AI is used appropriately in academic work.					
SAU6	Access to credible and secure AI platforms should be encouraged to prevent misuse of unreliable tools.					
SAU7	Collaboration between students and faculty should promote shared understanding of responsible AI practices.					

THANK YOU FOR YOUR PARTICIPATION!