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DEPARTMENT OF ADULT AND COMMUNITY EDUCATION

RESEARCH REPORT

THE EFFECT OF ARTIFICIAL INTELLIGENCE ON ADULT LEARNING: A CASE OF BACHELOR OF ADULT AND COMMUNITY EDUCATION LEARNERS

BY

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A DISSERTATION SUBMITTED TO THE DEPARTMENT OF DISTANCE AND LIFELONG LEARNING IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF ADULT AND COMMUNITY EDUCATION OF MAKERERE UNIVERSITY.

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DECLARATION

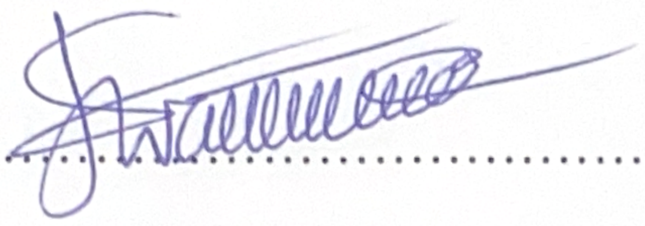
I, AINOMUGISHA MERCY, declare that this study entitled "Factors Influencing Female Learners' Participation in Mechanical Technical and Vocational Education and Training (TVET) Programmes: A Case of Nakawa Technical Vocational Education and Training Institute, Uganda" is my original work and has not been published and/or submitted for any other degree award to any other university or institution of higher learning before. I further declare that this dissertation has been submitted for examination with the approval of my supervisor(s) and bears their signatures and date.

Signed……..…… Date…07/10/2026……

APPROVAL

This is to certify that this research dissertation entitled "Factors Influencing Female Learners' Participation in Mechanical Technical and Vocational Education and Training (TVET) Programmes: A Case of Nakawa Technical Vocational Education and Training Institute, Uganda" has been written under our supervision and satisfies the requirements for submission for academic review in partial fulfillment of the award of a Bachelor's Degree in Adult and Community Education of Makerere University. It is submitted with our approval.

SUPERVISOR

Signed………… Date…07/10/2026……

DR. WATULEKE JOSEPH

DEDICATION

I dedicate this research to my parents Mr. Mulindwa Vicent Tonny and Ms. Namatovu Mariam Naluwando for their unconditional love, prayers, encouragement, and unwavering support throughout my academic journey. Their sacrifices, patience, and belief in my abilities inspired me to remain committed to my studies and successfully complete this research.

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Special appreciation goes to the students of the Bachelor of Adult and Community Education (BACE) programme who willingly participated in this study by providing the information required for the research. Their cooperation and willingness to respond to the questionnaire made this study possible.

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LIST OF ABBREVIATIONS

AI – Artificial Intelligence

APA – American Psychological Association

B – Unstandardized Regression Coefficient

BACE – Bachelor of Adult and Community Education

ChatGPT – Chat Generative Pre-trained Transformer

HEIs – Higher Education Institutions

ICT – Information and Communication Technology

LLMs – Large Language Models

MS – Microsoft

N – Number of Respondents

R^2 – Coefficient of Determination

ROI – Return on Investment

SD – Standard Deviation

Sig. – Significance Level

SPSS – Statistical Package for the Social Sciences

UGX – Uganda Shillings

β – Standardized Regression Coefficient (Beta)

ABSTRACT

The research investigated the impact of Artificial Intelligence on adult learning by Makerere University students registered for the Bachelor of Adult and Community Education (BACE) programme in Makerere University. The three specific objectives that guided this research study were to establish the artificial intelligence tools used by the students for learning, to establish the level of adoption and application of artificial intelligence tools for learning and to establish the benefits and challenges associated with using artificial intelligence tools for adult learning. This research used a descriptive cross-sectional research design and adopted a quantitative research approach.

The population for this research study consisted of 340 Bachelor of adult and community education students registering for courses at the university.

The sample size was calculated using Yamane's formula of 184 respondents and simple random sampling was used to select respondents for this study. The data collected was coded, entered, cleaned and analyzed using Statistical Package for Social Scientists (SPSS) version 26 computer program. Descriptive analysis such as frequencies, percentages, means, and standard deviations was used to analyze the data, while the regression analysis was used to establish the impact of Artificial Intelligence on adult learning. A total of 167 questionnaires were returned giving a response rate of 90.8% and as such could be used for analysis.

It was found that artificial intelligence applications such as ChatGPT, Grammarly, Gemini, Quill Bot, Microsoft Copilot, among others were popular among the respondents to support their study and ChatGPT was the most used Artificial Intelligence application.

It was further revealed that artificial intelligence provided benefits such as improving adult learners' understanding of course content, saving time in completing academic work, and increasing the motivation for adult learners to complete course work. The regression analysis revealed that the use of artificial intelligence positively and significantly influenced adult learning among Makerere university students. It was thus concluded that artificial intelligence has become an essential educational resource that can effectively complement adult learning when applied responsibly.

CHAPTER ONE
INTRODUCTION

1.0 Introduction

This chapter introduces the study, so it contains the background to the study, statement of the problem, general objective of the study, specific objectives of the study, research questions, scope of the study, significance of the study, justification of the study, and the expected limitations anticipated while conducting the study. This chapter describes what the study was all about and it provides the foundation for the study on the effect of Artificial Intelligence on adult learning among students at Makerere University.

1.1. Background to the study

1. Background of the Study Artificial Intelligence (AI) is one of the most transformative innovations of the twenty-first century and is being used in diverse sectors, such as the health sector, business sector, agriculture sector, and the education sector. AI refers to computer systems that can carry out tasks normally requiring human intelligence, for example, problem-solving, learning, reasoning, decision-making, and processing language (Russell & Norvig, 2021). Researchers are increasingly highlighting the importance of integrating artificial intelligence-enabled products and services such as intelligent tutoring systems, virtual learning assistants, generative AI tools, and automated learning feedback systems in education (Holmes et al., 2022).

The recent rapid uptake of AI-enabled tools in the education sector reflects the transformation in learning approaches, which is increasingly characterized by learners' access to information, learning in a flexible manner, engaging with learning tasks, and gaining new knowledge (Holmes et al., 2022).

Adult learning refers to an individual's ongoing process of acquiring knowledge, skills, attitudes, and competencies for personal and professional development (Merriam & Bierema, 2024). In the current era of digital revolution, adult learning plays a fundamental role in aiding individuals to adapt to constant technological changes and new knowledge developments. Digital technologies have created opportunities for adults to access learning resources that extend beyond conventional classroom settings. Adult learners who are self-directed and problem-oriented are motivated to improve their performance in various aspects of life.

As information and communication technologies continue expanding learning spaces, innovations such as AI are increasingly impacting adult learning experiences.

It is crucial to examine how these emerging technologies shape adult learners' experiences and outcomes. Previous research on artificial intelligence in education has attracted great attention from scholars and education practitioners across the globe, with the volume of research output on AI in education rising sharply following the launch of generative AI tools like ChatGPT (Wang et al, 2024). AI-enabled digital learning products and services have been observed to support personalized learning by continuously adapting learning content and experiences to individual needs and characteristics (UNESCO, 2023).

Through AI-powered learning systems such as ChatGPT, learners can access instant feedback to specific academic questions, generate new ideas, obtain explanations of complex topics, and access learning resources efficiently. These benefits of AI are likely to foster learner engagement, knowledge building, and self-directed learning, which are crucial to successful adult learning. Scholars across the globe have widely agreed that AI can be an effective learner-centered solution to adult learning in higher education.

Universities in countries including the United States of America, United Kingdom, China, and Australia have integrated AI into their learning management systems, assessment processes, academic support, and virtual learning environments (OECD, 2023).

AI-enabled solutions are promising learners' increased engagement and learning efficiency but several concerns about overreliance on AI, reduced critical thinking, academic dishonesty, and trustworthiness of information obtained through AI-powered sources have been raised in numerous studies (Kasneci et al., 2023). These issues require further inquiry on the contribution of AI to adult learning. In Africa, the use of AI is gradually picking up as learning institutions explore innovative ways to enhance access to quality education and tackle challenges related to traditional learning approaches. AI has the potential to advance education opportunities particularly in the developing countries where access to quality education may be limited (UNESCO, 2023).

However, challenges such as low digital infrastructure, limited technological skills, and access to digital devices pose significant challenges to the effective integration of AI in the education sector across many African countries.

In Uganda, the adoption of AI among university students has been growing significantly especially after the release of generative AI tools like ChatGPT, with a recent cross-sectional study reporting that 75.7% of students at four public universities in Uganda reported using ChatGPT (Ajalo et al, 2025). Following the global trend, students are increasingly utilizing such products and services for research purposes, content generation, academic writing, and information summarization, a pattern also reported among Makerere University Business School students who reported using ChatGPT to support their coursework and essay writing (Namono et al., 2025). The institutions of higher learning are exploring ways of integrating AI-enabled solutions in learning processes to improve educational outcomes and prepare learners for a technology-driven world.

Despite the growing interest in the use of AI-enabled products among university students and educators in Uganda, there is limited knowledge on the contribution of AI on adult learning among university students in Uganda. This knowledge gap requires urgent attention to inform best practices on how AI can be utilized to support adult learners. Previous research has highlighted the need to understand the relationship between emerging technology and learning outcomes.

Given the advancement in AI technology and its increased accessibility, this study will examine the effect of AI on adult learning among University students.

2. Statement of the Problem ChatGPT and other AI-enabled learning tools have recently attracted great interest among scholars and education practitioners worldwide, with a sharp increase in research output on AI-enabled learning in recent years. AI has been found to enhance personalized learning by tailoring content and learning experiences to meet individual learners' needs (UNESCO, 2023). With the use of AI-powered systems, learners are able to obtain rapid responses to academic questions, generate new ideas, simplify complex ideas, and also accelerate their access to learning content. Accordingly, many studies have suggested that AI has the potential to support adult learning, increases learners engagement and knowledge acquisition, and effectively foster independent learning in higher education.

Universities across the globe including those in China, USA, United Kingdom, and Australia have introduced AI into their learning management systems, assessment practices, and academic support systems to enhance student engagement and learning efficacy (OECD, 2023).

However, in Africa, the adoption of artificial intelligence in higher institutions is still at its infancy with only a few universities exploring the integration of AI in learning practices in

order to enhance the quality of learning and extend access to education (UNESCO, 2023). AI solutions are promising but concerns have been raised about overdependence on AI tools, reduced critical thinking, untrustworthiness of information generated from AI tools, and potential academic dishonesty. With the reported 75.7% of Makerere University students having utilized AI tools such as ChatGPT (Namono et al., 2025), the implications of AI on adult learning are still uncertain with only a few studies done on the phenomenon.

This underscores the urgency of conducting research on the contribution of AI on adult learning as a way of ensuring successful utilization of AI tools among university students and adult learners.

1.2 Statement of the problem

A new dimension Artificial intelligence (AI) has become a relevant new dimension in higher education, particularly as higher education students are using it to access information, carry out academic tasks, and foster their learning. AI tools such as ChatGPT, intelligent tutoring systems, and learning platforms such as Alexa, Watson, and Knewton are being utilized by students to provide instant feedback, generate ideas, summarise academic content, and support self-learning, which can promote the facilitation of learner knowledge, engagement, and flexibility, especially in the case of adult learners (UNESCO, 2023; Holmes et al., 2022). Nevertheless, since some learners have become extensively dependent on AI solutions and past experiences with AI have revealed issues of plagiarism, misinformation, and integrity, educators and policymakers have expressed certain reservations about the use of AI in education (Kasneci et al., 2023; Tlili et al., 2023).

However, how AI affects meaningful learning among university students remains largely unknown.

Objectives Given that AI is being used by students in higher education but has limited empirical data in the context of adult learning at Makerere University, this study aims to investigate the effect of Artificial Intelligence on adult learning among students at Makerere University.

1.3 Purpose of the study

The main purpose of this study was to examine the effect of Artificial Intelligence on adult learning among students at Makerere University.

1.4 Objectives of the study

1. To assess the level of adoption and utilization of Artificial Intelligence tools among students of Bachelor of Adult and Community Education at Makerere University.
2. To examine how students of Bachelor of Adult and Community Education at Makerere University use Artificial Intelligence tools to support their learning activities.
3. To assess the benefits and challenges associated with the use of Artificial Intelligence in adult learning among students of Bachelor of Adult and Community Education at Makerere University.

1.5 Research questions

1. What is the level of adoption and utilization of Artificial Intelligence tools among students of Bachelor of Adult and Community Education at Makerere University?
2. How do students of Bachelor of Adult and Community Education at Makerere University use Artificial Intelligence tools to support their learning activities?
3. What are the benefits and challenges associated with the use of Artificial Intelligence in adult learning among students of Bachelor of Adult and Community Education at Makerere University?

1.6 Scope of the Study

1.6.1 Content Scope

In this study, the researcher set out to study the impact of AI in adult learning among students at the university. The study specifically looked at the tools of AI the students use, how they use the tools to facilitate adult learning and the advantages and disadvantages of AI in adult learning.

1.6.2 Time Scope

Temporal scope of this study can be discussed from two perspectives: Reference period (the period of the time the study tried to analyze) This focused on the period of 2025/2026 academic year for which the study considered the usage of AI by students pursuing the Bachelor of Adult and Community Education programme as the period within which various artificial intelligence tools including GenAI tools such as ChatGPT became widely incorporated in the learning activities of students at Makerere University. Participants were therefore asked to consider their experiences with the use of AI within that period. Duration of the study From the time of conducting data collection, analysis and report writing, duration of the study was three months and from the other perspective, the study examined literature published between 2020 and

2026. This period was considered because it documented the rapid growth of artificial intelligence technologies, including genAI tools like ChatGPT.

1.6.3 Geographical scope

The study was conducted in Kampala, Uganda The study setting was at Makerere University, which is situated at Makerere Hill, in Kawempe Division, 3 kilometres North of the Kampala City Centre (The University main entrance is at the top of Makerere Hill). Makerere University is located on Makerere Hill Road, in Kawempe Division.

1.7 Significance of the study

The results of this study will be beneficial to policy makers, university leaders, teachers, and other interested parties in the role that Artificial Intelligence plays in adult learning. This study will shed light on the influence that AI has on adult learners and provide policy recommendations to ensure its appropriate use in university settings. This study will fill a gap in knowledge by providing empirical evidence on the impact that AI has on adult learners in universities. The findings of this study will enhance both the theoretical and practical understanding of the influence that AI has on the attitude of adult learners, the acquisition of knowledge, self-directed learning and, overall, the effectiveness of adult learning in universities.

This research will also be a valuable resource to future researchers interested in the use of Artificial Intelligence in education. The research results will lay the foundation for new research to be carried out on the use of Artificial Intelligence in adult education. Furthermore, students and institutions of learning will be able to understand better the advantages and disadvantages of using Artificial Intelligence in adult learning.

1.8 Justification for the study

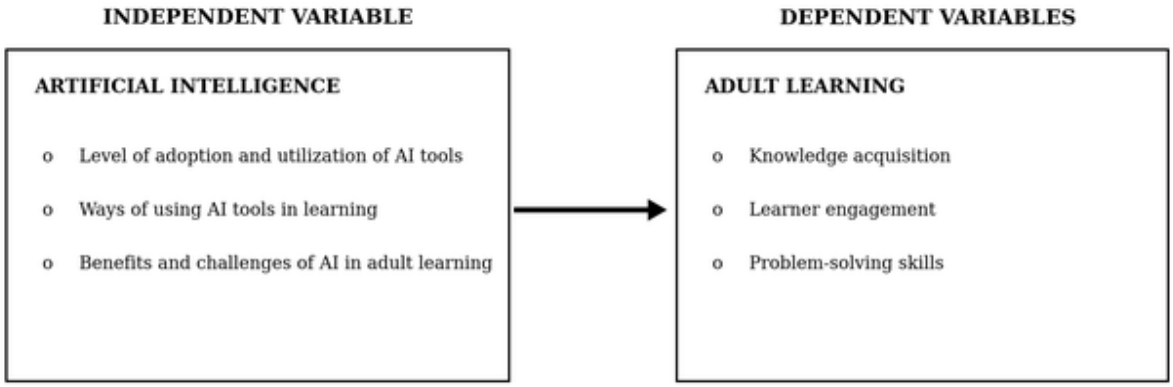
Artificial Intelligence has the capacity to foster adult learning by improving access to knowledge, enabling self-directed learning, helping to make learning more flexible and engaging. These benefits are however coupled with worries about the negative impact of the use of Artificial Intelligence, namely abuse and overuse of the tools, loss of critical thinking skills, academic dishonesty and the false information propagated through the use of the tools. This calls for an investigation on how students are using Artificial Intelligence and the impact on adult learning.

The choice of Makerere is informed by the growing trend of students of the institution using Artificial Intelligence tools to facilitate academic work such as research, assignments, writing exams, and independent learning.

This research will, therefore, provide insights into the opportunities and challenges of Artificial Intelligence in Higher Education as well as give recommendations to support its harnessing for adult learning.

1.9 Conceptual framework

The study findings were evaluated using the conceptual framework shown below, and the main focus was on Artificial Intelligence and how it influences adult learning among students at Makerere University.



Source: Adapted from Xue et al. (2025), Ofem et al. (2025), and modified by the researcher

Figure 1**: Conceptual Framework**

Artificial Intelligence is the independent variable, which will be measured by awareness of Artificial Intelligence, accessibility of AI, as well as utilization and perceived usefulness of AI. Awareness of AI is measured by how conversant students are with AI tools as well as applications of AI in learning. Accessibility of AI is measured by whether the students have access to AI tools and how easily accessible is AI to the learners. Utilization and perceived usefulness of AI is measured by how much students utilize the tools and their perception of the extent to which AI tools can help improve their learning.
Adult Learning is the dependent variable and will be measured by learners' acquisition of knowledge, learner's engagement as well as their problem-solving skills. Acquisition of knowledge is measured by the extent to which the students are capable of acquiring, understanding as well as retaining new information during learning. Learner's engagement is measured by the extent of participation of learners, their involvement as well as interest while

they are engaged in the learning process. The problem-solving skills of learners will be measured by their ability to analyze information critically, question and develop solutions to academic as well as real-life problems. The study presumes that the awareness of AI, accessibility to AI tools as well as the extent of utilization of AI will improve adult learners' acquisition of knowledge, their problem solving skills and learner engagement. The study hence aims at establishing the effect of Artificial Intelligence on adult learning among the students of Makerere University.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents the review of related literature on the effect of Artificial Intelligence on adult learning. It covers the theoretical review, empirical literature, conceptual framework and the review of related literature. It discusses what had been studied by the previous researchers and identifies the research gap that the study aimed at investigating.

2.1 Theoretical review

The theoretical review illustrates the basis to explain the relationship of the variables. Creswell and Creswell (2023) state that theories are used to explain phenomena and have been used to give a perspective in a learning to help interpret findings for the researcher. For this study, TAM (Technology acceptance model) and UTAUT (Unified Theory of Acceptance and Use of Technology) have been used to understand how individuals accept and use technology in their activities. These theories apply to the study because they explain how students accept, use, and perceive AI in learning, and how such utilization impacts adult learner outcomes such as knowledge gained, engagement, and problem-solving ability (Grani & Maranguni, 2019).

2.1.1. Technology Acceptance Model (TAM)

According to (Davis 1989), the Technology Acceptance Model (TAM) is a model that explains the factors that influence an individual's acceptance and use of technology. In the context of technology acceptance behavior, the TAM predicts that user acceptance and actual system use are determined by behavioral intention to use the system. (Davis 1989) pointed out that the two attitudes are fundamentally driven by two significant beliefs: perceived usefulness of a particular system and perceived ease of use of a particular system. TAM is one of the most widely adopted models for studying how people accept and adopt technology because it is relatively easy to use and has good explanatory power.
Research findings and studies have revealed that in an educational setting, students are more likely to accept digital learning technologies when they find the available technologies beneficial for their academic success and easy to use (Grani & Maranguni 2019). Davis (1989) has mentioned that people are more likely to adopt a technology if they believe that this technology is beneficial to them and easy to use. In line with that, the theory suggests that this perception of benefits and ease of use makes individuals form their attitude towards using technology. Once these perceptions positively shape one's attitude, they may influence

behavioral intention to use the technology and actual technology use. Davis (1989) further mentioned that the Theory of Reasoned Action provides a basis for the study by underscoring that the subjective nature of the perception of usefulness and ease of use determine the individual's attitude towards use, which leads to an individual's behavioral intention and actual use. Hence in educational settings, students will be more likely to accept digital learning technologies when they perceive the availability of the technology as supportive of their academic achievement and is easy to use (Grani & Maranguni 2019). Over time, the acceptance of digital learning technologies is likely to bring changes in the knowledge, attitude, and skills of the students.

The conceptual framework of the Technology Acceptance Model (Davis 1989) that guides the study is how the perception of usefulness and ease of use of Artificial Intelligence influences the acceptance and use of Artificial Intelligence among Makerere University students. For this study, the terminology of TAM can be interpreted in the following context: (1) perceived usefulness with AI as well as relates to the extent to which a student believes that using AI technologies would improve his or her academic performance while (2) perceived ease of use refers to the extent to which a student believes that using AI technologies would be free from effort (Davis 1989). Since technology acceptance affects the behavioral attitude of a user, understanding how students perceive the usefulness and ease of use of Artificial Intelligence tools and systems can help to inform the acceptance and use of AI technologies. (Davis 1989). The acceptance and adoption of Artificial Intelligence by students can be explained by Davis (1989) use of TAM. The theory focuses on perceived usefulness and perceived ease of use of the technology. However, the theory has limitations and challenges, notably that (1) TAM concentrates on the perceived usefulness and perceived ease of use without much insight into the social environment and user characteristics (Dwivedi et al., 2019), (2) the lack of considering different users and situation context (Dwivedi et al., 2019), (3) failure to consider additional factors such as social influence and external factors (Venkatesh et al., 2003), (4) the failure to consider perceived risk, trust, and privacy (Kasneci et al., 2023), and (5) insufficient to explain the acceptance of advanced technological systems such as Artificial Intelligence (AI). To address the challenges and limitations, the Evolution of the TAM resulted in the development of the UTAUT theory (Unified Theory of Acceptance and Use of Technology). This is the theory that guides this study and it explains the success of both the dissemination and use of AI which is a core element of this paper. As a technology, Artificial Intelligence is a new domain and therefore, the Acceptance and Use of AI can be explained by the perceived usefulness and perceived ease of use (Davis 1989) of the users. For instance, the easy of use of

a language processing system and the benefits that a student can acquire from a language processing system.

2.1.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT) The Unified theory of Acceptance and Use of Technology (UTAUT) was authored by Venkatesh et al., (2003) as an extension of the Technology Acceptance Theory and the Technology Acceptance Model (TAM). The UTAUT was motivated by the understanding that models/models of technology acceptance only account for some varied usage behavior. UTAUT synthesizes findings from eight models for understanding technology acceptance and use behavior (Venkatesh et al., 2003).

The theory postulates that four constructs namely performance expectancy, effort expectancy, social influence, and facilitating condition, directly influence an individual's behavioral intention to use technology and actual use of technology (Venkatesh et al., 2003).

Performance expectancy is the degree to which an individual believes that the use of the technology will help them improve performance. Effort expectancy is how easy the individual perceives using the technology will be. Facilitating conditions refer to how resources, infrastructure, and support, are relevant to ease of use, and social influence captures how other people who are relevant to the individual are influencing their decision to use a technology (Venkatesh et al., 2003). Supporting the theories postulation, the UTAUT emphasizes that technology acceptance is not only explained through individual perceptions but also through environmental and social factors.

In this regard, the theory is useful for conceptualization of adoption of a contemporary technology such as Artificial Intelligence.

With the phenomenon of AI tools being increasingly adopted in institutions of higher learning, it is critical that the individual and social influences are recognized as critical variables to explaining adoption (Dwivedi et al., 2023). In education, UTAUT has been used to explain the factors that influence students' acceptance of digital learning technologies (Al-Emran et al., 2023). The study found that students are more likely to accept learning management systems when they believe the technology will promote academic performance, the technology will be easy to use, the use of the technology is supported by instructors and peers, and there is sufficient internet connectivity and digital devices (Dwivedi et al., 2023).

The theory is pertinent in the light of the increased momentum in the adoption of Artificial Intelligence tools in higher education institutions (Dwivedi et al., 2023). An Adult learner in Makerere University may decide to use AI technologies because these increase the amount of learning, reduce the amount of time required to learn, and enhance ability to solve problems. At the same time, the decision to use AI in learning could be influenced by use of AI by peers, support for AI use by lecturers, internet connectivity, and digital devices (Dwivedi et al., 2023).

In addition, the presence of facilitating conditions such as access to digital devices, internet access, and information literacy are critical in the uptake of technologies such as AI in developing countries (UNESCO, 2023).

With regard to adoption of AI tools such as ChatGPT, the UTAUT has been used to explain learners' use of AI learning tools and found that learners are more likely to use AI where they believe the tool to be useful, easy to use, acceptable, and the infrastructure for AI use exists (Kasneci et al., 2023). Compared to the Technology Acceptance Model which is limited to individual perceptions, the UTAUT blends individual perceptions with social influence and infrastructure, making it a stronger model for explaining adoption of AI. Therefore, the UTAUT is relevant to the study because it explains how and why awareness of AI, access to AI tools, use of AI, and perceived usefulness of AI influences adult learning among students at Makerere University.

2.2 Conceptual review

2.2.1 Awareness of Artificial Intelligence

Awareness of AI is the degree to which people are conscious of the presence, functionalities, features, opportunities, and constraints of AI tools. In terms of education, awareness helps learners to be aware of the contribution of AI tools in facilitating academic work and improving learning experiences. As Artificial Intelligence has been changing the face of higher education, awareness has emerged as one of the significant determinants of students' willingness to adopt and use AI tools in their learning tasks. The higher the students' awareness is, the higher the likelihood of acceptance and effective use of the AI tools in education (Baba, 2025). Artificial Intelligence awareness encompasses the knowledge of the various AI tools that are available for educational purposes such as ChatGPT, intelligent tutoring systems, virtual assistants, automated feedback systems, adaptive learning systems, etc. When learners are familiar with these tools, they are more likely to understand how these tools can be used to support learning activities such as content creation, research, problem-solving, and information

retrieval. Awareness builds the foundation for technology adoption and integration in learning environments (UNESCO, 2023).

According to Baba (2025), awareness significantly influences the learners' perceptions and use of AI tools in higher education. When students are knowledgeable about how AI tools work and their applications, they are more inclined to adopt and effectively utilize AI tools compared to students with limited awareness. The study also identified that awareness increases learners' confidence in using AI tools and helps them to maximize the benefits of AI-supported learning.

AI ethical implications involve the knowledge and understanding of ethical issues that stem from the use of AI tools. Learners need to be aware of issues such as the misuse of AI tools, the limitation of AI-generated knowledge, the implications of AI tools on academic integrity, and the importance of responsible AI use (UNESCO, 2023).

Research has demonstrated that awareness has a substantial impact on the learners' perceptions of Artificial Intelligence. Students who have a clear understanding of the functioning and application of AI tools are more likely to develop positive perceptions towards the use of AI tools (Jang, 2024).

2.2.2 Accessibility of Artificial Intelligence

Accessibility of Artificial Intelligence Access to artificial intelligence refers to how easy it is for learners to access artificial intelligence (UNESCO, 2023). UNESCO notes that this includes digital devices, internet access, technological infrastructure, and artificial intelligence-enabled platforms that learners can use to facilitate their learning. Accessibility for learners is important because they need to access all the relevant learning resources before they can benefit from Artificial Intelligence.

The availability of more AI technologies has meant that learners from across the globe are able to access learning content from anywhere around the world.

Now learners can access such AI-powered applications through tablets, computers, smartphones, and other technologies. This can make learning easier as learners are able to access learning content even outside the classroom environment (Holmes et al., 2022). Internet access is a crucial factor in the accessibility of Artificial Intelligence. A lot of the platforms and tools that have AI on them require a stable internet connection to function properly.

Dwivedi et al. (2023) indicate that students with a stable internet connection are more likely to use AI technologies on a regular basis when compared to students who experience disruptions with their internet access.

Internet access is a factor in accessibility for AI in higher education. Affordability of digital technologies has an impact on access to digital content. As far as AI is concerned, students who are able to afford internet packages, digital devices, and expensive AI-powered applications will have more access than their fellow students who do not have the financial wherewithal to access such technologies (UNESCO, 2023).

2.2.3 Utilization and Perceived Usefulness of Artificial Intelligence

Use of Artificial Intelligence refers to how much students use AI technologies for the purpose of learning; whereas perceived usefulness refers to how much students believe that a particular technology is useful for their academic performance and learning. According to Davis (1989), greater perceived usefulness of a technology predicts its use. For this reason, use and perceived usefulness are highly correlated constructs, as discussed in technology adoption literature (e.g.

Venkatesh and Davis, 2000).

The advent of generative AI technologies has led to a massive increase in the use of Artificial Intelligence in higher education. Students are increasingly using AI applications and tools to carry out research, prepare assignments, find information, generate content, prepare for exams, and solve problems. Kasneci et al. (2023) noted that AI technologies have started to democratize education and opened new possibilities for learning by instantly providing access to information and supporting independent learning activities. Perceived usefulness is perhaps the most powerful predictor of technology adoption and usage.

Learners are more likely to use AI technologies when they believe that this technology makes learning easier, saves time, makes them more productive, and/or improves learning outcomes.

Al-Emran et al. (2023) found that students who perceived learning technologies to be useful were more likely to accept and use those technologies. AI technologies support learning by providing explanations to students on complex topics, summarising the information, and generating ideas for assignments and assessments. Holmes et al. (2022) state that AI-enabled learning systems provide personalized learning support to students, helping them learn more effectively and independently. Such benefits foster positive perceptions of AI usefulness.

2.3 Review of objectives

2.3.1 The level of adoption and utilization of Artificial Intelligence tools

Artificial Intelligence (AI) tools in higher education The use of AI tools has risen dramatically in the last years as higher education institutions have incorporated digital tools to the teaching

and learning process. Students are using AI tools including ChatGPT, Grammarly, Microsoft Co-pilot, Google Gemini, and intelligent tutoring systems to aid their search, summarize their learning content, stimulate their ideas, and complete their academic tasks. As UNESCO (2023) states, the widespread availability of AI tools has become a learning resource for their autonomous and flexible learning in universities.

Academic researchers have also indicated students' variation in AI adoption depending on their exposure, availability, digital competence, and use of AI. According to Dwivedi et al. (2023), students who already developed digital skills and have wider access to AI tools are more inclined to adopt AI learning applications than those with limited digital experience. Jang (2024) also revealed that students' adopters' willingness depends on their belief that AI can enhance learning performance.

According to the Technology Acceptance Model, perceived usefulness and perceived ease of use are important factor in predicting adoption of new technologies by students. Davis (1989) discusses that learners are more inclined to adopt technologies that they think are effective and easy to use. This has proved to be true in recent research studies, which reveal that students at University are beginning to adopt AI in recognition of how it makes research easier and makes difficult concepts easier to understand as well as offer immediate answers to assignments (Kasneci et al., 2023).

Though AI is making its way in the learning process, it's application is different for every student. While some use it for generating ideas, editing assignments, improving language and summarising lecture notes, other used it for solving mathematic equations, programming and literature searches. Tlili et al. (2023) state that the use of AI among students depends on their Program, Internet connectivity, institutional Guidelines and their confidence level to utilise digital tools.

Nonetheless, some experts point out that not all students have benefitted from the use of Artificial Intelligence in learning. A combination of limited awareness, digital infrastructure, data privacy and integrity, and fears around dishonesty in the classroom are impeding the use of AI tools in universities, mainly in low-income economies, even if students might find the tools beneficial (OECD, 2023). Also, there are some universities that have not yet implemented specific policies on what can be done with AI and how, so the use varies among students. While previous research has looked at the adoption and use of Artificial Intelligence in higher learning, these studies have largely been undertaken in developed countries with digital infrastructure and institutional support that is far different from that in Uganda. It is not clear what the adoption and utilization of AI tools by the students of Makerere University are like.

This study will fill this information gap by looking at how far students of Makerere University have adopted and utilized Artificial Intelligence tools for adult learning.

2.3.2 How students use Artificial Intelligence tools to support their learning activities.

AI as a Learning Resource Artificial Intelligence has also emerged as a useful learning resource that helps learners in various learning processes. For example, university students use AI services for finding academic information, describing complex concepts, brainstorming ideas, summarizing class notes, and helping them with better writing. "AI technology is progressively entering students' everyday learning as it gives learners instant access to information and tailored academic support, helping them learn more autonomously and improving access to educational resources," according to UNESCO (2023).

2. AI as an academic assistant Many students leverage AI technologies to facilitate research and writing. AI tools like ChatGPT, Google Gemini, Grammarly, and Microsoft Copilot are used to help students brainstorm research topics, structure their writing, proofread their grammar, and summarize research articles. According to Kasneci et al. (2023), those AI applications shave hours off academic tasks, freeing students to learn while AI takes care of the repetitive work of searching for information. AI has become an academic assistant for many higher learning institutions.

AI is also being used to augment learners' ability to develop understanding of complex topics and to foster self-directed learning. For instance, AI systems often act as on-demand tutors, able to provide step-by-step guidance, examples, and explanations to help learners understand a challenging topic at their own pace (Holmes et al., 2022). This is especially crucial for adult learners, many of whom have to juggle their learning with work and family commitments. However, the researcher says the students are also using the AI to improve the collaboration and problem solving during the learning. For the example, AI is used to support brainstorming ideas, finding other solutions to the problem, translating the information into other language, and preparation of the plan for studying. As Dwivedi et al. (2023) stated that when the AI system can give the feedback instantly, this can allow learners to keep learning and to get the better performance.

However, there is wide variation in how students benefit from the use of AI, both at the individual and institutional levels. While some students ethically engage AI as an ancillary to the classroom, many others rely on the technology to generate content in many academic activities. According to Tlili et al. (2023), students should use AI responsibly, which means questioning the output of AI rather than taking it at face value.

While there exists literature on different ways university students use Artificial Intelligence (AI) to support their learning, this is mainly from developed countries where the integration of AI in education is more mature. There is also a lack of empirical evidence about how students at Makerere University use the Artificial Intelligence tools to support their learning. The study will therefore look at the different ways students use AI to support their learning and how these relate to adult learning in the university setting.

2.3.3 The benefits and challenges associated with the use of Artificial Intelligence in adult learning among students

Holmes et al. (2022) point out that AI has also offered new avenues to enhance adult learning by providing learners with tailored academic assistance and instant access to learning resources. AI tools enable adult learners to seek academic explanation, paraphrase and synthesize their learning materials, generate ideas and get immediate answers to their academic questions. These tools further promote learners' self-directed learning and help them learn at their own pace thus making it an essential asset for knowledge enhancement and lifelong learning.

UNESCO (2023) note that AI has enhanced learning efficiency by making higher education learning more accessible and engaging. Adult learners use AI-based applications to plan their study schedule, proofread and edit their assignments, translate their academic content, and simplify difficult ideas thus enabling them to strike a good work-life-learner balance. This makes learners more engaged, flexible and more productive in higher learning (Dwivedi et al., 2023).

Various scholars have also indicated that AI has promoted creativity and problem solving skills when used appropriately. Kasneci et al. (2023) show that AI tools allow learners to be exposed to diverse perspectives, provide prompt feedback, foster peer-to-peer learning thus allowing the development of innovative solutions to academic challenges. Similarly, Holmes et al. (2022) claim that AI innovations supplement traditional instructional approaches by fostering a culture of lifelong learning, and boosting student confidence in managing complex academic tasks.

However, scholars have also identified the negative consequences associated with overdependence on AI. Tlili et al. (2023) point out that learners who over rely on AI responses tend to disengage from the learning process thus impairing the development of critical thinking, reasoning and independent problem-solving skills. Kasneci et al. (2023) further note that overdependence on AI can stunt the ability of learners to critically evaluate information and

formulate their independent academic statements. Academic integrity and ethical use have also been seen as other challenges associated with the use of AI. UNESCO (2023) states that AI apps can be used to generate essays, answer exam questions and submit assignments with little effort thus raising concerns over plagiarism and other forms of academic dishonesty. Other issues include misinformation, data privacy, biased outputs and the perceived accuracy of AI outputs by educators and policymakers (Dwivedi et al., 2023).

Although existing studies have pointed out both the potential benefits and risks of AI in education, very little attention has been paid to investigating experiences of learners in the use of AI-based tools in education, mainly because most empirical studies have been carried out in technologically advanced economies where the use of digital technology and the integration of AI in higher learning have been well established. In Uganda for instance, especially Makerere University, there is scanty and scattered research on how learners experience the benefits and challenges of the use of AI in higher learning. This gap creates a justification for this study to explore the benefits and challenges associated with the use of Artificial Intelligence in adult learning among students at Makerere University (Mugimu & Nakayiza, 2024).

2.4 Adult Learning

Adult learning encompasses processes by which adult learners gain and develop knowledge, attitudes, skills and abilities for making positive contributions to their personal, academic and professional growth. Merriam and Bierema (2024) defined adult learning as active, self-directed, and goal-oriented processes of gaining new knowledge and skills. Adult learning differs from that of children in that adult learners are more intentional in their learning pursuits with an aim of achieving specific outcomes. Adult learning is growing interest recently due to the need for continuous learning. Modern society requires people to continually update their knowledge and skills to cope with changes in the economy, technology, and society (UNESCO, 2023).

Adult learners are typically driven by a desire to solve problems, improve their performance, and accomplish their personal and professional aspirations. Adults have specific expectations from their learning experience; thus, adult learning emphasizes its practical dimension compared to traditional learning approaches (Knowles et al., 2020). Adult learning in higher education can be demonstrated through how students attain new knowledge, actively participate in educational activities, and how they leverage this knowledge to address academic and practical challenges (Merriam & Bierema, 2024).

Knowledge acquisition is one of the dimensions of adult learning that are important in higher education institutions. Knowledge acquisition implies the process of receiving and understanding new information and applying it effectively to different contexts. Knowledge acquisition is crucial in education because learning cannot be achieved without successfully transferring information to the learners' minds (Holmes et al., 2022). Adult learners obtain knowledge from different contexts, including instruction, independent research, and discussions. Resources for learning and support services greatly influence the acquisition of knowledge among adult learners (UNESCO, 2023).

Knowledge acquisition in adult learning is most effective when learners actively engaged with information rather than passively received. Active learners find it easier to comprehend and remember information and make the most appropriate application of the information acquired (Merriam & Bierema, 2024). Different mechanisms support successful knowledge acquisition, including access to relevant learning materials, use of appropriate educational technologies, and a supportive environment for learning (Holmes et al., 2022). Knowledge acquisition is strongly associated with learning effectiveness because information retained and understood is essential for learners' academic success (Holmes et al., 2022).

Another important dimension of adult learning is learner engagement. Learner engagement refers to the level of interest, investment, willingness, effort, and concentration that learners exhibit during learning activities. Bond et al. (2020) believed that learner engagement entails the extent to which students are actively involved in academic-related pursuits and their readiness to attain predefined learning goals. Engaged learners are highly involved in different educational activities; they are enthusiastic and ready to put in some effort during learning activities. Learner engagement is a critical predictor of learning effectiveness and success in higher education institutions (Fredricks et al., 2023).

Learner engagement consists of three aspects, which are cognitive, behavioral, and emotional engagement. The behavioral aspect of learner engagement involves engagement in specific activities, while the emotional aspect involves positive and negative reactions towards different learning activities. On the other hand, the cognitive dimension of learner engagement encompasses mental effort involved in learning activities (Bond et al., 2020). An active learner invests much effort in learning activities and exhibits high levels of motivation. Learner engagement can be promoted through the use of learner-centered learning activities and supportive learning environments (Fredricks et al., 2023). Engagement plays a significant role in academic achievement and retention because actively engaged learners have high chances of remaining in their studies and attaining greater achievement.

The effective utilization of different technological innovations has greatly advanced the scope of adult learning and its dimensions, including learner engagement. Digital learning resources, learner engagement resources, and innovative learning environments have been shown to increase students' concentration and participation, thereby enhancing their learner engagement and overall learning effectiveness (Holmes et al., 2022).

Problem-solving skills are another of the dimensions of adult learning that are essential in higher education institutions. Problem-solving refers to an individual's ability to recognize challenges, evaluate available solutions and make sound and practical decisions. Merriam and Bierema (2024) suggested that adult learners have to learn the knowledge and skills to adapt to unfamiliar situations and solve problems as part of their learning process. Problem-solving skills are fundamental because they enable adult learners to work out solutions in real-world situations. Individuals with sound problem-solving skills can effectively make decisions and develop innovative ideas (UNESCO, 2023).

Research indicates that problem-solving is a higher learning outcome because it involves analyzing information, evaluating evidence, and forming appropriate responses (Knowles et al., 2020). Furthermore, problem-solving skills are developed through the analysis of learning content, critical thinking, and deep learning. Therefore, problem-solving is an important dimension of adult learning because it facilitates independent thinking and optimization of learners' potential (UNESCO, 2023).

2.5 Conclusion

Based on the literature reviewed above, it can be concluded that Artificial Intelligence is an emerging technology in higher institutions of learning and its adoption can significantly impact learners' adult learning outcomes. Several scholars have concluded that Artificial Intelligence can enhance learning by increasing access to information, personalized learning, learner engagement, and problem-solving skills development (Holmes et al., 2022; Kasneci et al., 2023). Equally, research studies have reported that awareness, accessibility, utilization, and perceived usefulness can significantly impact the level of Artificial Intelligence adoption and benefits to learners (Al-Emran et al., 2023; Dwivedi et al., 2023). Nevertheless, issues related to over-reliance on artificial Intelligence, academic integrity, and quality of information generated by artificial Intelligence still pose research concerns.

The researcher will conduct the study to collect empirical evidence on the impact of awareness, accessibility, utilization, and perceived usefulness of Artificial Intelligence on knowledge acquisition, learner engagement, and problem-solving skills among learners in Makerere

University. The study will add to the existing body of knowledge and will assist in the effective adoption of AI in higher institutions of learning.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter highlights the methodology that was used to carry out this study. It discusses the research design, study population, sample size, sampling procedures, data sources, data collection methods, data collection tools, data quality control, data presentation, analysis and interpretation procedures and ethical considerations for the study. These are the methods that I used to carry out the research on the effect of Artificial Intelligence on adult learning among students at Makerere University.

3.1 Research Design

The research adopted a cross-sectional research design with a quantitative research approach. A cross-sectional research design was used, where data from the respondents was collected at one point in time using a cross-section of the population. It was relevant since the existing relationship between Artificial Intelligence and adult learning of students at Makerere University could be demonstrated.

This design was suitable for the study because the researcher was just describing the current adoption, utilization, and impact of Artificial Intelligence on adult learning without any intervention. The quantitative research approach was used in collecting data through a questionnaire to determine the level of the student's knowledge of Artificial Intelligence, accessibility of Artificial Intelligence, utilization and usefulness of Artificial Intelligence, and adult learning.

3.2 Study Population

The study was carried out among students doing the Bachelor of Adult and Community Education (BACE) programme at Makerere University. BACE students were the target population for the study based on the record in the department of adult and community education that indicated that the overall population of the BACE programme stood at 340 students, per Study Year One, Two, and Three. The above population was chosen because these students were adults and were believed to be having ample encounters with the use of Artificial Intelligence in carrying out academic activities.

3.3 Sample Size

A total of 340 students who were taking part in Bachelor of Adult and Community Education (BACE) programme at Makerere University were considered as the target population for this study. It was not feasible to study the whole population in the limited time and budget, therefore a representative sample was selected.

The sample size was determined using Yamane's (1967) formula as follows:

$$n = \frac{340}{1 + 340(0.05)\text{^}2}$$

$$n = \frac{340}{1.85}$$

$$\underline{\boldsymbol{n = 184\ respondents}}$$

Thus the sample size was 184 respondents. The sample size was deemed to be of a sufficient proportion to the population under study and to give reliable findings. The sample size was assumed to be sufficient for generating reliable findings without making the study unmanageable within available time and resources.

3.4. Sampling technique

The respondents were selected through a technique known as convenience sampling. This approach was employed because of the fact that the researcher did not have the complete list of all 340 students in the Bachelor of Adult and Community Education programme to allow a simple random sampling to be done. Convenience sampling was therefore the most probable as it allowed the researcher to select from individuals who were available and willing to participate at the time of data collection.

This approach does not ensure that all students had an equal chance of being selected but, due to the logistical considerations of the study, it was the most feasible approach available.

The researcher however made sure to approach students of different years of study.

3.6 Data collection instruments

The study was approached using the survey method of data collection from the sample. The survey method was used since it helped the researcher to collect standardized data from a relatively large number of respondents within a short period of time; it is also appropriate for descriptive, cross-sectional studies of this kind. Data collection was done using a questionnaire that was self-administered.

The questionnaire was the sole instrument used for data collection.

This was because using the questionnaire, the researcher was able to collect standardized data from a relatively large number of respondents within a short time. Further, the respondents were able to fill in the questionnaire at their own convenience; this led to the enhanced response quality and consistency.

3.6.1 Questionnaire

Data collection The structured questionnaire was employed to gather quantitative data from the sampled population. Saunders et al., (2023) notes that questionnaires were suitable for collection of comparable data which could be efficiently coded and analyzed. The questionnaire was designed to contain items measured on a five-point Likert scale (from Strongly agree to Strongly disagree).

The statements in the questionnaire were used to establish the level of usage and adoption of Artificial Intelligence tools in Adult education, how students utilized Artificial Intelligence to facilitate their learning and the benefits and difficulties associated with implementation of Artificial Intelligence tools in Adult Learning.

The questionnaire was used in printed form. 184 questionnaires were administered in printed form to the sampled population, with 167 questionnaires completed and returned. Therefore, the response rate was 90.8%. The collected data from the questionnaire made it possible to answer the study objectives and questions.

3.7 Data processing and analysis

The data obtained from field was examined for completeness, accuracy and consistency before analysis. The data was coded by assigning a numerical value to each response; for instance, the responses on the five-point likert scale were scored from 5 (Strongly Agree) to 1 (Strongly Disagree). Demographic variables like gender had been coded like; Male=1, Female=2.

The data was organized based on the three study objectives of the study (a) the level of adoption and use of Artificial Intelligence tools, (b) the way students used Artificial Intelligence tools to enhance their learning activities and (c) benefits and challenges of Artificial Intelligence use in adult learning.

The numerical values of the data from (a), (b), and (c) were then fed into the Statistical Package for Social Sciences (SPSS) version 26, and the frequencies, percentages, means, and standard deviations were used to analyze the data representing the views of respondents towards

Artificial Intelligence and adult learning. The results were presented using frequency tables, pie-charts, bar graphs, and tables. Regression analysis was used to analyze the effect of Artificial Intelligence on adult learning and was interpreted in light of the objectives of the study.

3.8 Data quality control

To ensure the quality of the data collected, the researcher undertook measures aimed at establishing the reliability and validity of the research instrument. The questionnaire was carefully designed based on the study objectives and was reviewed to ensure that it adequately captured the required information.

3.7.1 Reliability

Reliability. Is the extent to which the research instrument provides reliable or consistent results over time. As Creswell and Creswell (2023), Instrument is reliable if it provides similar or consistent results when taken by different persons or at different times.

Questionnaire was pre-tested among a small group of students who did not have been part of the final research sample in order to ensure reliability of results.

Cronbach's Alpha coefficient was used to determine the reliability of the Instrument using SPSS. Cronbach's alpha value of 0.70 and above is acceptable for a study, and this is an indication of a reliable questionnaire (Taber, 2018). Cronbach's alpha value informed on the necessary adjustments made to the questionnaire before the actual data collection.

3.9. Ethical considerations

Research ethics were given the importance it deserved in order to make sure the research process was conducted in an ethical manner that would be ethical, honest, transparent and would not cause any harm to the subjects. Creswell & Creswell (2023) argues that the researcher must follow the principles of ethics at all stages of the research process, including protecting the respondent from harm, having voluntary participation and confidentiality of the information given by the respondent. Conducting ethical research added to the credibility of the research findings.

The researcher ensured that respondents could take part freely in the study. Respondents were told about the aims of the study, what was involved and their responsibilities as respondents before any data was collected. They were also told that they had the right to refuse or withdraw from participation at any point without any penalty or any coercion.

The researcher ensured respondent anonymity and confidentiality. The respondent's

information was used solely for academic research and would not be disclosed to any unauthorized persons.

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter contains the analysis and interpretation of the findings. The presentation of the findings is done in line with the objectives of the study, namely to identify the Artificial Intelligence tools used by students, determine the extent of adoption and utilization of AI tools and establish the benefits and challenges of using Artificial Intelligence in adult learning. The data was analysed and presented through frequency tables as well as through descriptive statistics of means and standard deviations for easier interpretation of the results. The chapter is divided into the response rate, the socio-economic details of the respondents, the findings based on each objective of the study and a summary of the main findings.

4.2 Response Rate

The population for the study comprised 184 students undergoing Bachelor of Adult and Community Education in the faculty of Education, Makerere University. For the purpose of this study, 184 questionnaires were distributed to the sampled respondents. Out of this, 167 questionnaires were filled and collected, while 17 questionnaires were not returned, representing a response rate of 90.8%, which was deemed appropriate for analysis and presentation of the study findings.

Table 4.1: Response Rate

Response Category	Frequency	Percentage (%)
Questionnaires administered	184	100
Questionnaires returned	167	90.8
Questionnaires not returned	17	9.2
Total	184	100

Source: Field Data (2026)

The response rate of 90.8% was considered excellent and sufficient for statistical analysis. According to Mugenda and Mugenda (2003), a response rate of 70% or above is adequate for analysis, while a response rate of 90% and above is regarded as excellent. Therefore, the 167 completed questionnaires provided sufficient information for analyzing and drawing

conclusions on the effect of Artificial Intelligence on adult learning among students enrolled in the Bachelor of Adult and Community Education at Makerere University.

4.3 Demographics of respondents

This section presents the demographic characteristics of the respondents who participated in the study. The demographic information collected included gender, age, and year of study. This information was considered important because it provided a general profile of the respondents and facilitated a better understanding of the composition of the study sample.

4.3.1 Gender of respondents

The respondents were asked to indicate their gender. The findings are presented in Table 4.2.

Table 4.2: Distribution of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	91	54.5
Female	76	45.5
Total	167	100

Source: Field Data (2026)

The findings in Table 4.2 indicate that the majority of the respondents were male, accounting for 91 (54.5%) of the total respondents, while 76 (45.5%) were female. This implies that both male and female students participated in the study, although males constituted a slightly higher proportion. The participation of respondents from both genders provided a balanced representation of the study population, thereby enhancing the reliability of the findings.

4.3.2 Age of respondents

The respondents were asked to indicate their age group. The findings are presented in Table 4.3.

Table 4.3: Distribution of Respondents by Age

Age Group (Years)	Frequency	Percentage (%)
18–22	74	44.3
23–27	59	35.3
28–32	21	12.6
33 years and above	13	7.8

Total	167	100

Source: Field Data (2026)

The findings in Table 4.3 show that the largest proportion of the respondents, 74 (44.3%), were aged between 18 and 22 years. This was followed by 59 (35.3%) respondents who were between 23 and 27 years, while 21 (12.6%) were aged between 28 and 32 years. The remaining 13 (7.8%) respondents were aged 33 years and above. These findings indicated that the majority of students enrolled in the Bachelor of Adult and Community Education programme were young adults, although the programme also attracted mature learners, reflecting the diverse age composition of adult education students.

4.3.3 Year of study

The respondents were asked to indicate their year of study. The findings are presented in Table 4.4.

Table 4.4: Distribution of Respondents by Year of Study

Year of Study	Frequency	Percentage (%)
Year One	56	33.5
Year Two	57	34.1
Year Three	54	32.4
Total	**167**	**100**

Source: Field Data (2026)

The findings indicated that 57 (34.1%) of the respondents were in Year Two, 56 (33.5%) were in Year One, while 54 (32.4%) were in Year Three. This distribution showed that respondents were fairly represented across the three years of study, implying that the findings reflected the views and experiences of students at different stages of the Bachelor of Adult and Community Education programme.

4.4 Artificial Intelligence Tools Used by Students

Respondents were asked to indicate the AI tools they used in their academic learning. Since respondents were allowed to select more than one AI tool, the total frequencies exceed the total number of respondents.

Table 4.5: Artificial Intelligence Tools Used by Students

AI Tool	Frequency (n=167)	Percentage (%)

ChatGPT	151	90.4
Grammarly	128	76.6
Google Gemini	96	57.5
QuillBot	84	50.3
Microsoft Copilot	49	29.3
Intelligent Tutoring Systems	28	16.8
Other AI tools	11	6.6

The findings in Table 4.5 showed that ChatGPT was the most widely used Artificial Intelligence tool, with 151 (90.4%) respondents indicating that they used it for academic learning. Grammarly was the second most commonly used tool, reported by 128 (76.6%) respondents, followed by Google Gemini with 96 (57.5%) respondents and QuillBot with 84 (50.3%) respondents. Microsoft Copilot was used by 49 (29.3%) respondents, while Intelligent Tutoring Systems were used by only 28 (16.8%) respondents. A small proportion of the respondents, 11 (6.6%), reported using other AI tools not listed in the questionnaire, including DeepSeek, Claude AI, Perplexity AI, Poe AI, and Notion AI. These findings suggested that students largely relied on widely accessible generative AI tools, particularly ChatGPT and Grammarly, to support their academic activities, while only a few explored alternative AI platforms.

4.5 Level of Adoption and Utilization of Artificial Intelligence Tools

Respondents were asked to indicate their level of agreement with statements relating to the adoption and use of AI tools in their academic learning.

Table 4.6: Level of Adoption and Utilization of Artificial Intelligence Tools

Statement	SD	D	N	A	SA
I have adopted Artificial Intelligence tools for my academic learning.	0 (0.0%)	0 (0.0%)	7 (4.2%)	97 (58.1%)	63 (37.7%)
I regularly use Artificial Intelligence tools in my academic activities.	0 (0.0%)	0 (0.0%)	12 (7.2%)	98 (58.7%)	57 (34.1%)
Artificial Intelligence tools are easily accessible to me whenever I need them.	0 (0.0%)	0 (0.0%)	20 (12.0%)	97 (58.1%)	50 (29.9%)

I am confident in using Artificial Intelligence tools for learning purposes.	0 (0.0%)	0 (0.0%)	17 (10.2%)	97 (58.1%)	53 (31.7%)
I consider Artificial Intelligence tools to be an important part of my learning.	0 (0.0%)	0 (0.0%)	32 (19.2%)	85 (50.9%)	50 (29.9%)
I frequently utilize Artificial Intelligence tools during my studies.	0 (0.0%)	0 (0.0%)	10 (6.0%)	99 (59.3%)	58 (34.7%)

Source: Field Data (2026)

The findings in Table 4.6 demonstrate a high level of adoption and routine utilization of Artificial Intelligence tools among respondents. A vast majority of respondents agreed or strongly agreed that they had adopted AI tools for academic learning (95.8%), with 58.1% selecting Agree and 37.7% selecting Strongly Agree, while only 4.2% remained neutral. This high level of adoption is consistent with the Technology Acceptance Model (Davis, 1989), which holds that individuals adopt a technology when they perceive it as useful in achieving desired outcomes; the near-unanimous agreement recorded here suggests that BACE students perceive Artificial Intelligence as a genuinely useful academic resource rather than a peripheral tool.

High adoption was further supported by regular usage patterns, where 92.8% of respondents agreed or strongly agreed that they regularly used AI tools in their academic activities, and 94.0% indicated that they frequently utilized AI tools during their studies, with only small proportions (7.2% and 6.0% respectively) remaining neutral. This indicated that AI tools had moved beyond occasional or experimental use to become an established part of students' academic routines.

Regarding accessibility and self-efficacy, 88.0% of respondents agreed or strongly agreed that AI tools were easily accessible whenever they were needed, while 12.0% remained neutral. Similarly, 89.8% expressed confidence in using AI tools for learning purposes, with 10.2% neutral. These findings support the ease-of-use dimension of TAM (Davis, 1989) and align with the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003), which identifies facilitating conditions, such as access to resources, as a key determinant of technology use. They also echo Dwivedi et al. (2023), who found that students with reliable access to digital infrastructure use AI technologies more consistently than those facing connectivity or resource constraints.

Although the statement regarding AI tools being an important part of learning recorded the highest proportion of neutral responses (19.2%) and the lowest combined agreement of the six

statements, a clear majority (80.8%) still affirmed its importance. This finding is consistent with Jang (2024), who reported that students' willingness to adopt AI is strongly shaped by their belief that the technology improves learning efficiency and academic performance, and with Al-Emran et al. (2023), who found that perceived usefulness is one of the strongest predictors of sustained technology adoption in higher education. Taken together, these findings affirm the relevance of TAM and UTAUT to this study: BACE students' adoption of Artificial Intelligence appears to be driven jointly by their perception of its usefulness and by the accessibility of the tools, exactly as both theories would predict, and this suggests that Artificial Intelligence has become an integral and well-embedded resource in the learning practices of students enrolled in the Bachelor of Adult and Community Education at Makerere University.

4.6 Benefits and Challenges of Artificial Intelligence in Adult Learning

Respondents were asked to indicate their level of agreement with statements relating to the perceived benefits and challenges of using AI tools in their academic learning.

Table 4.7: Benefits and Challenges of Artificial Intelligence in Adult Learning

Statement	SD	D	N	A	SA
Perceived Benefits					
AI tools improve my understanding of course content.	0 (0.0%)	0 (0.0%)	12 (7.2%)	97 (58.1%)	58 (34.7%)
AI tools save me time when completing academic tasks.	0 (0.0%)	0 (0.0%)	0 (0.0%)	89 (53.3%)	78 (46.7%)
AI tools increase my engagement with learning materials.	0 (0.0%)	0 (0.0%)	18 (10.8%)	99 (59.3%)	50 (29.9%)
Perceived Challenges					
Overreliance on AI tools reduces my independent thinking.	2 (1.2%)	21 (12.6%)	32 (19.2%)	62 (37.1%)	50 (29.9%)
I am concerned about the accuracy of AI-generated information.	0 (0.0%)	13 (7.8%)	32 (19.2%)	72 (43.1%)	50 (29.9%)
I have concerns about academic integrity when using AI tools.	5 (3.0%)	22 (13.2%)	32 (19.2%)	58 (34.7%)	50 (29.9%)

Source: Field Data (2026)

The findings in Table 4.7 reveal strong consensus regarding the learning benefits of Artificial Intelligence. All respondents agreed or strongly agreed that AI tools save them time when completing academic tasks, with 53.3% selecting Agree and 46.7% selecting Strongly Agree, and no respondent expressing disagreement or neutrality. This finding aligns with Kasneci et al. (2023), who found that AI tools reduce the time required to complete academic tasks and allow students to focus on understanding concepts rather than searching for information.

A majority of respondents also agreed or strongly agreed that AI tools improved their understanding of course content (58.1% Agree, 34.7% Strongly Agree), with 7.2% remaining neutral, and that AI tools increased their engagement with learning materials (59.3% Agree, 29.9% Strongly Agree), with 10.8% neutral. These findings are consistent with Holmes et al. (2022), who observed that AI-powered tools enable students to obtain explanations, summarize learning materials, and receive instant responses to academic questions, thereby deepening their engagement with course content.

Despite these benefits, respondents also acknowledged notable challenges associated with the use of Artificial Intelligence. Regarding concerns about the accuracy of AI-generated information, 43.1% agreed and 29.9% strongly agreed, while 19.2% were neutral and 7.8% disagreed. On overreliance reducing independent thinking, 37.1% agreed and 29.9% strongly agreed, with 19.2% neutral, 12.6% disagreeing and 1.2% strongly disagreeing. This is consistent with Tlili et al. (2023), who cautioned that students who rely heavily on AI-generated responses may participate less actively in the learning process, limiting the development of critical thinking and independent reasoning.

On academic integrity, 34.7% agreed and 29.9% strongly agreed that they had concerns when using AI tools, while 19.2% were neutral, 13.2% disagreed and 3.0% strongly disagreed. This finding echoes UNESCO (2023), which noted that the capacity of AI tools to generate academic content with minimal effort increases the risk of plagiarism and other forms of academic misconduct. Taken together, these findings show that while BACE students at Makerere University derive substantial and largely undisputed efficiency benefits from Artificial Intelligence, a considerable proportion remain conscious of its risks to independent thinking, information accuracy, and academic integrity, echoing the dual-edged nature of AI adoption identified in the wider literature reviewed in Chapter Two.

4.7 Regression analysis

Regression analysis was conducted to determine the effect of Artificial Intelligence on adult learning among students enrolled in the Bachelor of Adult and Community Education at Makerere University. The analysis examined whether Artificial Intelligence significantly predicted adult learning.

Table 4.8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	0.741	0.549	0.546	0.482

Source: Field Data (2026)

The findings in Table 4.8 showed that the correlation coefficient (R) was 0.741, indicating a strong positive relationship between Artificial Intelligence and adult learning. The coefficient of determination (R Square = 0.549) indicated that Artificial Intelligence explained 54.9% of the variation in adult learning among students enrolled in the Bachelor of Adult and Community Education at Makerere University, while the remaining 45.1% was explained by other factors that were not included in the study.

4.8 Summary of findings

The study found that ChatGPT was the most widely used Artificial Intelligence tool among students enrolled in the Bachelor of Adult and Community Education at Makerere University, followed by Grammarly, Google Gemini and QuillBot, while a few respondents also used tools such as DeepSeek, Claude AI, Perplexity AI, Poe AI and Notion AI. The findings further revealed a high level of adoption and utilization of Artificial Intelligence tools, with most respondents agreeing that they had adopted AI for academic learning, regularly used it in their studies, had easy access to the tools and were confident in using them. This indicated that Artificial Intelligence had become an important learning resource that supported students in carrying out their academic activities.

The study also established that Artificial Intelligence improved students' understanding of course content, saved time when completing academic tasks and enhanced engagement with learning materials. Despite these benefits, respondents expressed concerns regarding overreliance on AI, the accuracy of AI-generated information and issues of academic integrity.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the major findings, conclusions and recommendations of the study on the effect of Artificial Intelligence on adult learning among students enrolled in the Bachelor of Adult and Community Education at Makerere University. The summary of findings is presented according to the study objectives, followed by the conclusions drawn from the findings and recommendations aimed at enhancing the effective use of Artificial Intelligence in adult learning. The chapter concludes with areas for further research that may be considered by future researchers.

5.2 Summary of Findings

5.2.1 Artificial Intelligence Tools Used by Students

The first objective sought to identify the Artificial Intelligence tools used by students enrolled in the Bachelor of Adult and Community Education at Makerere University. The study found that students used a variety of AI tools to support their academic work, with ChatGPT emerging as the most widely used, followed by Grammarly, Google Gemini, QuillBot and Microsoft Copilot. A smaller number of respondents also reported using other tools such as DeepSeek, Claude AI, Perplexity AI, Poe AI and Notion AI, indicating that students' exposure to Artificial Intelligence extended beyond the most popular platforms.

This pattern showed that generative AI platforms, particularly those supporting writing assistance, grammar checking, content generation and information retrieval, had become part of students' routine learning activities. The clear preference for a small set of widely accessible tools suggested that ease of access and familiarity, rather than the sheer number of tools available, shaped which platforms students actually adopted for their studies.

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5.2.2 Level of Adoption and Utilization of Artificial Intelligence Tools

The second objective sought to examine the level of adoption and utilization of Artificial Intelligence tools among the respondents. The study found a high overall level of adoption and utilization, with students agreeing that they had adopted AI tools for academic learning, used them regularly, and utilized them frequently during their studies. This indicated that Artificial Intelligence had moved beyond occasional or experimental use to become an integral part of students' academic routines.

The findings also showed that students found AI tools easy to access whenever needed and felt confident using them for learning purposes, suggesting that both availability and digital competence supported their consistent use. Although students rated AI tools as slightly less central to their overall learning experience compared to other adoption indicators, the level of agreement remained high, pointing to generally positive attitudes toward Artificial Intelligence as a learning resource.

5.2.3 Benefits and Challenges of Artificial Intelligence in Adult Learning

The third objective sought to assess the benefits and challenges associated with the use of Artificial Intelligence in adult learning. The study found that Artificial Intelligence contributed positively to learning, particularly by saving time on academic tasks, improving understanding of course content, and increasing engagement with learning materials. These findings suggested that AI had enhanced learning efficiency by making academic work easier and more manageable for students balancing multiple responsibilities.

At the same time, students raised concerns about overreliance on AI tools, the accuracy of AI-generated information, and academic integrity in its use. This indicated that while Artificial Intelligence offered clear educational benefits, students remained aware of the risks it posed to independent thinking and academic honesty, pointing to a need for more deliberate guidance on responsible use rather than unrestricted adoption.

5.2.4 Effect of Artificial Intelligence on Adult Learning

The study established a strong, positive, and statistically significant effect of Artificial Intelligence on adult learning among the respondents. This confirmed that greater adoption and use of AI tools was associated with meaningful improvements in students' learning outcomes, rather than a relationship attributable to chance.

Taken together with the findings on adoption and perceived benefits, this result reinforced the view that Artificial Intelligence was not merely a convenience tool for students of the Bachelor

of Adult and Community Education programme, but an influential factor shaping how effectively they learned, provided its risks were properly managed.

5.3 Conclusions

The study concluded that Artificial Intelligence tools have become widely used among students enrolled in the Bachelor of Adult and Community Education at Makerere University. ChatGPT, Grammarly, Google Gemini and QuillBot were identified as the most commonly used AI tools because they supported students in academic activities such as research, writing, editing and information retrieval. The widespread use of these tools demonstrated that Artificial Intelligence had become an important educational resource that was increasingly supporting adult learning.

The study further concludes that there was a high level of adoption and utilization of Artificial Intelligence tools among the respondents. Students had embraced AI technologies because they were easily accessible, easy to use and beneficial in supporting their academic work. The study also concluded that Artificial Intelligence provided several benefits, including improving understanding of course content, saving time and increasing engagement with learning materials. However, concerns relating to overreliance on AI, the accuracy of AI-generated information and academic integrity remained important issues that required attention to ensure responsible use of the technology.

The study concluded that Artificial Intelligence had a positive and statistically significant effect on adult learning among students enrolled in the Bachelor of Adult and Community Education at Makerere University. Increased adoption and utilization of Artificial Intelligence tools contributed to improved learning experiences and better academic outcomes. Therefore, the study concluded that Artificial Intelligence has become an important component of adult learning and, when used responsibly, has the potential to enhance teaching and learning in higher institutions of learning.

5.4 Proposed study recommendations

In line with the significance and justification of this study, which set out to generate evidence to guide the effective and responsible use of Artificial Intelligence in higher education and to address concerns regarding overreliance, reduced critical thinking, academic integrity, and the accuracy of AI-generated content, the following recommendations are made to the relevant stakeholders:

Makerere University (Policy Level)

The study recommends that Makerere University formulates and operationalizes a policy for the use of Artificial Intelligence in teaching and learning, and develops course content that builds Artificial Intelligence literacy, providing ongoing training for both students and staff on the safe, ethically responsible, and effective integration and application of AI tools for learning.

University Staff

The study recommends that university staff guide the use of Artificial Intelligence by designing and implementing activities that ensure critical thinking, creativity, and problem-solving alongside AI use, rather than its blind adoption, thereby directly addressing the risk of reduced critical thinking identified in this study.

Students

The study recommends that students engage in the appropriate use of Artificial Intelligence tools in their academic endeavors by searching for corroborating information from reliable sources to check the accuracy of AI outputs, preventing over-reliance on AI tools for academic work, and building analytical skills to research, think critically, and write original work.

Department of Adult and Community Education

The study recommends that the Department of Adult and Community Education raises student consciousness about the responsible and appropriate use of AI tools in their assignments, with particular attention to safeguarding academic integrity. The department should also integrate AI-related themes into relevant course content, thereby exposing students to information and know-how on the appropriate use of AI tools without compromising academic standards.

Makerere University Library and Directorate of ICT

The study recommends that Makerere University Library and the Directorate of ICT broaden students' access to authorized Artificial Intelligence learning tools and digital learning resources, and offer training that enhances students' practical application of AI for research, writing, and accessing information, in an endeavor to help students fully realize the educational potential of Artificial Intelligence while avoiding its misuse.

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APPENDIX I: QUESTIONNAIRE

The Effect of Artificial Intelligence on Adult Learning: A Case of Bachelor of Adult and Community Education Makerere University

Dear Respondent,

My name is Matovu Trevor Simon and I am conducting a study entitled *"The Effect of Artificial Intelligence on Adult Learning: A Case of Bachelor of Adult and Community Education (BACE), Makerere University."* This study is being carried out as part of the requirements for the award of a Bachelor's Degree at Makerere University.

You have been selected to participate in this study because your views and experiences are important in understanding how Artificial Intelligence influences adult learning. The information you provide will be treated with the highest level of confidentiality and will be used strictly for academic purposes only. You are not required to write your name anywhere on this questionnaire.

Please tick (✓) the response that best represents your opinion or provide the required information where applicable.

Thank you for your valuable time and cooperation.

Section A: Background Information

Please tick (✓) the box that applies to you.

1. Gender: ☐ Male ☐ Female

2. Age bracket: ☐ 18–24 ☐ 25–30 ☐ 31–35 ☐ Above 35

3. Year of study: ☐ Year 1 ☐ Year 2 ☐ Year 3

Section B: Artificial Intelligence Tools Used

Objective: *To identify the Artificial Intelligence tools used by students enrolled in the Bachelor of Adult and Community Education at Makerere University.*

Please tick (✓) all the AI tools you have used to support your learning.

☐ ChatGPT ☐ Google Gemini ☐ Microsoft Copilot

☐ Grammarly ☐ QuillBot ☐ Intelligent tutoring systems

☐ Other (Specify) _____

Please indicate your level of agreement with the following statements (SA = Strongly Agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly Disagree).

Statement	SA	A	N	D	SD
I am aware of a wide range of AI tools available for learning.	☐	☐	☐	☐	☐
I frequently use AI tools as part of my academic work.	☐	☐	☐	☐	☐
I use more than one AI tool depending on the academic task.	☐	☐	☐	☐	☐
New AI tools for learning are easy for me to discover and try.	☐	☐	☐	☐	☐

Section C: level of adoption and utilization of Artificial Intelligence tools

Objective: *To examine the level of adoption and utilization of Artificial Intelligence tools among students enrolled in the Bachelor of Adult and Community Education at Makerere University.*

Please indicate your level of agreement with the following statements.

Statement	SA	A	N	D	SD
I have adopted Artificial Intelligence tools for my academic learning.	☐	☐	☐	☐	☐
I regularly use Artificial Intelligence tools in my academic activities.	☐	☐	☐	☐	☐
Artificial Intelligence tools are easily accessible to me whenever I need them.	☐	☐	☐	☐	☐
I am confident in using Artificial Intelligence tools for learning purposes.	☐	☐	☐	☐	☐

Statement	SA	A	N	D	SD
I consider Artificial Intelligence tools to be an important part of my learning.	☐	☐	☐	☐	☐
I frequently utilize Artificial Intelligence tools during my studies.	☐	☐	☐	☐	☐

Section D: Benefits and Challenges of Artificial Intelligence in Adult Learning

Objective: *To assess the benefits and challenges associated with the use of Artificial Intelligence in adult learning among students enrolled in the Bachelor of Adult and Community Education at Makerere University.*

Please indicate your level of agreement with the following statements.

Statement	SA	A	N	D	SD
AI tools improve my understanding of course content.	☐	☐	☐	☐	☐
AI tools save me time when completing academic tasks.	☐	☐	☐	☐	☐
AI tools increase my engagement with learning materials.	☐	☐	☐	☐	☐
Overreliance on AI tools reduces my independent thinking.	☐	☐	☐	☐	☐
I am concerned about the accuracy of AI-generated information.	☐	☐	☐	☐	☐
I have concerns about academic integrity when using AI tools.	☐	☐	☐	☐	☐

End of Questionnaire. Thank you for your time.

APPENDIX II: Table for Determining Sample Size from a Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Source: Krejcie, Robert V., Morgan, Daryle W., "Determining Sample Size for Research Activities", Educational and Psychological Measurement, 1970.