AI TECHNOLOGY IN SHAPING STUDENT SATISFACTION ON EDUCATION



The thesis is submitted in partial fulfilment of the requirements for the award of Bachelor of Technology Management (High Tech Marketing) with Honours

> Faculty of Technology Management and Technopreneurship Universiti Teknikal Malaysia Melaka

> > FEBRUARY 2025

APPROVAL

"I hereby declare that I had read and go through for this thesis and it is adequate in term of scope and quality which fulfil the requirements for the awards Bachelor of Technology Management (High Tech Marketing) with Honours"



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DECLARATION OF ORIGINAL WORK

"I admit this report is the result of my own, except certain explanations and passages where every of it is cited with sources clearly."



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DEDICATION

I want to express my gratitude to my family members, who have been incredibly supportive and have served as an inspiration to me as I have worked hard to finish my thesis both physically and psychologically. Thank you for having always been here for me. Then, for my respected supervisor, Mr.Mukhiffun Bin Mukapit and panel, Dr.Aslina Binti Siman that have guided me throughout the research. Finally, also thank you to my fellow friends that assisted me throughout this research.



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I want to express my appreciation to everyone who supported and mentored me along the course of finishing this research project. In addition, I would like to express my regret if I inadvertently offended anyone throughout the research study.

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ABSTRACT

In this era, learning is inseparable from advanced technology such as AI technology. Gemini, as an artificial intelligence, is an AI that can help and satisfy students in their education. This purpose of this study is the AI technology in shaping student satisfaction on education at University Teknikal Malaysia Melaka (UTeM). A research framework was obtained from previous research to examine the relationship among completeness, accuracy, precision, reliability, timeliness, convenience, format on student's satisfaction. The outcome from this research study were knowing the factors that contribute to student satisfaction with Gemini as educational tools, the significance of positive effect of Gemini on students' education was clearly examined and the main factor that contribute to student satisfaction with Gemini as educational tools was identified. The researcher collected data from 370 respondents through the questionnaire survey. To investigate the hypothesized associations, a quantitative research technique was used, along with a survey research method and sampling, and the data was analyzed by using the Statistical Package for the Social Sciences (SPSS). As a result, the Multiple Regression Analysis and Pearson's Correlation Coefficient revealed that completeness, accuracy, precision, timeliness, convenience, and format except reliability achieved through the use of AI technology (Gemini) had a significant and strong relationship with student satisfaction. The conclusion is using AI technology to help and satisfied students on education.

ABSTRAK

Pada era ini, pembelajaran tidak dapat dipisahkan daripada teknologi canggih seperti teknologi AI. Gemini, sebagai kecerdasan buatan, adalah AI yang boleh membantu dan memuaskan pelajar dalam pendidikan mereka. Tujuan kajian ini adalah teknologi AI dalam membentuk kepuasan pelajar terhadap pendidikan di Universiti Teknikal Malaysia Melaka (UTeM). Kerangka kajian telah diperolehi daripada kajian lepas untuk mengkaji hubungan antara kesempurnaan, ketepatan, ketepatan, kebolehpercayaan, ketepatan masa, kemudahan, format terhadap kepuasan pelajar. Hasil daripada kajian penyelidikan ini adalah mengetahui faktor-faktor yang menyumbang kepada kepuasan pelajar terhadap Gemini sebagai alat pendidikan, kepentingan kesan positif Gemini terhadap pendidikan pelajar telah diteliti dengan jelas dan faktor utama yang menyumbang kepada kepuasan pelajar terhadap Gemini sebagai alat pendidikan ialah dikenalpasti. Pengkaji mengumpul data daripada 370 orang responden melalui tinjauan soal selidik. Untuk menyiasat persatuan yang dihipotesiskan, teknik penyelidikan kuantitatif digunakan, bersama-sama dengan kaedah kajian tinjauan dan persampelan, dan data dianalisis menggunakan Pakej Statistik untuk Sains Sosial (SPSS). Hasilnya, Analisis Regresi Berganda dan Pekali Korelasi Pearson mendedahkan bahawa kesempurnaan, ketepatan, ketepatan, ketepatan masa, kemudahan dan format kecuali kebolehpercayaan yang dicapai melalui penggunaan teknologi AI (Gemini) mempunyai hubungan yang signifikan dan kukuh dengan kepuasan pelajar. Kesimpulannya ialah menggunakan teknologi AI untuk membantu dan memuaskan pelajar dalam pendidikan.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will discuss AI Technology in Shaping Student Satisfaction on Education. The researcher also discussed the problem statement, research questions, research objectives and the significance of study. Lastly, a detailed discussion of the research will be held regarding the project's scope and the chapter's summary.

In the contemporary landscape of education, several aspects of the educational process have changed as a result of the use of Artificial Intelligence (AI) technology. AI, characterized by its capacity to mimic human cognitive functions, has found profound applications across educational domains, ranging from personalized learning experiences to administrative tasks automation. One pivotal aspect influenced by AI's integration is student satisfaction, a multifaceted construct encompassing students' perceptions, experiences, and fulfillment within the educational context. As educational institutions strive to optimize student satisfaction, understanding the role of AI technology becomes imperative.

The significance of student satisfaction on AI technology has been explored in various studies. Thoresen (2006) highlighted the importance of patient satisfaction in a chiropractic clinic setting, emphasizing the need to establish a baseline for future comparison. Alshamsi et al. (2021) discussed the successful deployment of off-campus assessments during the COVID-19 lockdown, focusing on student performance

indicators and stakeholders' satisfaction rates. Prior study by Jiang et al. (2021) explained that how the factors of Technology Satisfaction Model affect the Chinese university students' satisfaction when using various online learning platforms. On the other hand, Li et al. (2022) proposed the use of AI image recognition technology to analyze consumer facial expressions for consumer behavior analysis, emphasizing the importance of understanding how the E-commerce enhance their consumer satisfaction. Suárez et al. (2022) conducted a study on using an artificially intelligent chatbot to develop dental students' diagnostic skills, highlighting the positive value of incorporating AI technology in dental curricula based on student satisfaction. Furthermore, Narayan et al. (2022) discussed the digitalization of feedback systems in the hospitality sector, emphasizing the importance of AI, IoT, big data, and cloud computing in enhancing customer quality and satisfaction. Lastly, Cornwall et al. (2023) explored ethical concerns surrounding the utilise of AI in anatomy education, suggesting that the unique benefits of student exposure to the dissection room and body donors outweigh the advantages of AI technology in this space. Overall, these studies collectively demonstrate the significance of student satisfaction on AI technology in various educational and consumer contexts, highlighting how important it is in understanding and addressing determinants of satisfaction in influencing learning experiences and customer interactions.

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The emergence of Artificial Intelligence (AI) in education has brought about new possibilities and challenges, particularly in higher education in India (Chatterjee et al., 2020). With an emphasis on the factors influencing data-based teaching and learning pathways, new data-based business models have emerged in educational technology firms as a result of the continuous datafication of our social reality. (Renz et al., 2020). The rapid development of AI technologies has resulted in the emergence of advanced language models like ChatGPT, which have transformative potential in education and academic research in the 21st century (Silva et al., 2021). Generative AI tools like ChatGPT are also impacting Information Systems (IS) education, presenting challenges and potential future scenarios for IS educators (Slyke et al., 2023). Furthermore, the evolve of ChatGPT has influence towards the legal education and practice, highlighting the need to include AI technology into teaching methods (Ajevski et al., 2023).

In many domains, including education, artificial intelligence (AI) is becoming more and more common. Optimizing learning experiences for students, particularly those with special needs, is the primary goal of artificial intelligence in education. (Plitnichenko, 2021). By offering individualized learning experiences, AI can help students achieve the course's goals and objectives. (Zawacki-Richter et al., 2019). The use of AI in education aligns with the mission of organizations like the International Baccalaureate (2023), which aims to develop knowledgeable and caring individuals through education. Research has shown that AI can enhance mathematical reasoning skills through innovative computational technologies (National Science Foundation, 2024). AI development in education is critical for tackling future difficulties and opportunities in teaching and learning (Office of Educational Technology, 2023). Education institutions can better educate students for future demands by integrating AI with policy objectives. (Office of Educational Technology, 2023). Overall, the integration of AI in education serves the purpose of improving learning outcomes and providing access to quality education for all students (Plitnichenko, 2021). As AI continues to evolve, it is essential for educators and policymakers to consider the implications and benefits of incorporating AI technologies in educational settings (Office of Educational Technology, 2023). AI in education aims to improve teaching techniques, promote student learning, and eventually contribute to the formation of a more knowledgeable and skilled workforce (National Science Foundation, 2024).

Despite the potential benefits, using AI in education poses obstacles and issues. Various studies have highlighted the potential benefits of AI in reshaping traditional learning paradigms and improving instructional methods. However, along with these benefits, challenges related to privacy, ethical considerations, and the human-machine interface have also been identified (Kaledio, P., Robert, A., & Frank, L., 2024). In the context of higher education institutions (HEI), AI and machine learning (ML) have been recognized as having great potential in e-learning and academic settings . Studies have aimed to explore the opportunities and challenges of implementing AI and ML in HEIs, addressing issues such as common knowledge and research bases regarding AI and ML, best practices for their usage, and students' attitudes towards these technologies (Kuleto et al., 2021). Ethical considerations have been a key focus in discussions about the implementation of AI in various fields, including education. To

help guide the integration of AI in engineering education and strengthen the ties between technology and society, initiatives such as "The IEEE Global Initiative for Ethical Considerations in Artificial Intelligence and Autonomous Systems" have offered ethical principles and recommendations (IEEE Global Initiative, 2016). Similarly, frameworks like "IDEE" have been proposed to ensure ethical considerations when applying generative AI, such as ChatGPT, in educational settings (Haidar, 2024). While AI has the potential to change education by enabling improved teaching, learning, evaluation, and educational assistance, it is necessary to address ethical considerations, privacy concerns, and the need for successful human-AI collaboration. (Kaledio, P., Robert, A., & Frank, L., 2024).

1.2 Background of Study

Rapid technological breakthroughs in the digital age are causing major shifts in the educational landscape. Traditional pedagogical approaches are being augmented and sometimes replaced by innovative methodologies empowered by Artificial Intelligence (AI). AI, defined as machines simulating human cognitive processes, has gained traction in diverse sectors, including healthcare, finance, and education (Holstein & McLaren, 2019).

In the realm of education, AI technology holds the promise of revolutionizing teaching and learning practices, offering personalized, adaptive, and data-driven approaches to instruction (Siemens & Gasevic, 2012). Artificial intelligence (AI) systems may examine large volumes of educational data to identify the trends, forecast student outcomes, and offer customized suggestions by utilizing predictive analytics, natural language processing, and machine learning algorithms. (Asad Abbas, 2024).

One of the key challenges facing educational institutions today is ensuring student satisfaction. Student satisfaction, a critical metric for assessing the quality and effectiveness of educational institutions, encompasses various dimensions such as academic experiences, support services, and campus climate (Indy Man Kit Ho, 2021).

High levels of student satisfaction are associated with increased engagement, positive institutional, and reputation retention rates (Fernando de Oliveira Santini, 2016). However, Despite its relevance, many students experience feelings of dissatisfaction.

The consequences of failing to address low student satisfaction are significant. Dissatisfied students are less likely to be engaged in their studies and more likely to drop out (Fernando de Oliveira Santini, 2016). This can have a negative impact on student success and institutional graduation rates. Additionally, a poor reputation for student satisfaction can make it harder to attract and retain students in the future.

While AI technology offers promising potential to improve student satisfaction (Oseremi Onesi-Ozigagun, 2024), there is a critical knowledge gap that needs to be addressed through further research. Currently, we lack a deep understanding of the specific mechanisms through which AI can influence student satisfaction. For instance, how exactly do personalized learning experiences powered by AI systems like Gemini or AI-powered support systems contribute to a more satisfied student body? Additionally, we don't fully grasp the factors that might mediate this relationship. Does a student's learning style or prior experience with technology influence how AI impacts their satisfaction? By investigating these questions, researchers can gain a deeper understanding of how AI, particularly large language models like Gemini, can be most effectively implemented to address the challenge of low student satisfaction in education.

1.3 Problem Statement

According to Prabhakar (2024), the image generation (AI technology) of Gemini is not functioning as expected by the users. This is due to the fact that the image that has been generated are inaccurate and even offensive in term of ethics. In the beginning of creating Gemini image generation, Google makes sure that it avoids some of the image generation problems that have previously witnessed from various generative AI such as producing graphic or violent images or representations of actual individuals. However, it does not work. For instance, Google neglected to adjust for situations in which a range should not have been shown in order to guarantee that Gemini displayed a range of people. Thus, Google decided to temporarily stop Gemini's image generation features to enhance the accuracy of responses.

Gemini is an AI tool with remarkable GenAI features that enable it to be used as an educational material generator in a variety of ways. These include organizing study materials, assisting with the drafting lesson plans, and adding visual impacts, as well as additional instructional materials including worksheets, questions, imaginative concepts, output in formats other than text, such graphs, images, and videos, error analysis, and fiction and non-fiction (Lee, G. et al., 2023). Additionally, it facilitates the completion of multilingual tasks by removing linguistic obstacles. Especially in a multilingual community with a range of linguistic demands, Gemini's capacity for multilingual communication may work to the benefit of educators developing educational resources for a variety of student demographics. Effective teaching techniques are greatly enhanced by interactive learning resources. Thus, as a multitasking tool, Gemini can offer interactive learning components that can increase engagement in a shorter amount of time. Imran, M., & Almusharraf, N. (2024) recommends that educators utilize Gemini to create daily assignments for their classrooms and homework as Gemini can enhance the appeal and energy of educational resources.

Nathan (2024) claimed that generative artificial intelligence (GenAI) in education is demonstrating great promise and has the potential to revolutionize several learning-related areas. However, there are certain difficulties with implementing GenAI in the classroom. Since the privacy of student information needs to be protected from security, data privacy and breaches and misuse are main considerations. Moreover, there is the practical difficulty of successfully integrating GenAI technologies into various educational contexts and guaranteeing that educators and administrators receive sufficient training to utilize these novel instruments. Enterprises exhibit a cautious optimism, acknowledging the possible advantages as well as the obstacles that must be surmounted. Despite these obstacles, there is a trend in the early stages of GenAI adoption in education toward using these advancements to build more adaptable and dynamic learning environments.

From the prior study "enhancing user information satisfaction with ai-powered ChatGPT in higher education" carried out by (Fu et al., 2024), the investigation was constrained by its focused on ChatGPT and various universities on foreign country. Therefore, this research aims to study how Gemini in Shaping Student Satisfaction on Education at University Teknikal Malaysia Melaka (UTeM) in order to identify the factors influence student satisfaction, the main factor contribute to student satisfaction with Gemini as educational tools and examine the most significant positive effect of Gemini on students' education.

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1.4 Research Question

1.What are the factors that influence student satisfaction with Gemini as educational tools?

2. What are the main factors that influence student satisfaction with Gemini as educational tools?

3. What is the most significant positive effects of Gemini on students' education?

1.5 Research Objective

1. To identify the factors that contribute to student satisfaction with Gemini as educational tools.

2. To identify the main factor that contribute to student satisfaction with Gemini as educational tools.

3. To examine the most significant positive effect of Gemini on student satisfaction in education.

1.6 Scope of Study

This research will focus on examining the role of AI technology in shaping student satisfaction. As the time restrictions in data collection, hence, the researcher choose UTeM students as the respondents. The purpose of this study is to investigate the factors influence the usage of AI technology among students Universiti Teknikal Malaysia Melaka (UTeM) as an educational tool and the focus of the AI tool would be on Gemini, which is an AI create by Google. The study will encompass undergraduate students enrolled in various programs offered by UTeM. The research will assess student satisfaction across multiple dimensions, such as completeness, accuracy, precision, reliability, timeliness, convenience, and format.

While the study aims to provide insights into the role of AI technology in shaping student satisfaction at UTeM, it acknowledges certain limitations. This study has limitations that open avenues for future research. The investigation was constrained by its focus on UTeM students. In addition, this study focusses on Gemini as the AI educational tool and this has constraint that the findings of this research may not applicable to other AI educational tools as different AI educational tools may assess student satisfaction in different dimensions and giving different findings. Hence, this study provides the views of how Gemini can shapes the satisfaction of university students and further research can be done on other AI educational tools for filling the research gaps.

According to Merchant, S. (2024), Google's Gemini is reported to have about 330 million monthly visitors, whereas ChatGPT is projected to have 180 million active users at the moment, having generated 1.6 billion visits in January 2024. This study concentrated on Gemini rather than ChatGPT because Gemini provides prompt responses that have improved in accuracy over time. Though your mileage may vary, it can reply quicker than ChatGPT's free GPT-3.5 version, even if it's not as quick as ChatGPT Plus. Furthermore, Gemini may be used to create photographs and allows users to input photos for inquiry. (Diaz, M. 2024).

1.7 Significant of Study

The proposed study on "AI Technology in Shaping Student Satisfaction in Education" holds substantial significance within the field of educational research and practice. Understanding the importance of this study involves recognizing its potential contributions to multiple stakeholders, including educational institutions, policymakers, educators, and students themselves.

First of all, Enhancing Educational practices. The study demonstrate the intersection of AI technology and student satisfaction, providing insights into how AI can be leveraged to enhance various educational practices. By identifying effective AI-driven interventions and strategies, educational practitioners can optimize teaching and learning experiences, leading to improved student outcomes and satisfaction levels.

Second, Informing Institutional Decision-Making. Educational institutions face numerous challenges in meeting the diverse needs and expectations of their student populations. By understanding the influence of AI towards student satisfaction, this study provides valuable information for institutional decision-makers. Information gained from the study can inform resource allocation, curriculum development, and

strategic planning initiatives aimed at enhancing retention rates and overall student satisfaction.

Next, Addressing Student Needs. Students are at the heart of the educational experience, and their satisfaction is important in shaping their academic success. By understanding how AI technologies influence student satisfaction, educators and administrators can tailor interventions and support services to better meet the changing requirements and preferences of students. This may involve implementing AI-driven personalized learning platforms, adaptive support systems, or proactive intervention strategies which can enhance student satisfaction.

In addition, Fostering Innovation and Adaptation. In an era of rapid technological advancement and changing educational paradigms, fostering innovation and adaptation is basic for educational institutions to remain relevant and effective. By exploring the role of AI in shaping student satisfaction, this study contributes to ongoing conversations about the incorporation of technology in education. It encourages stakeholders to embrace innovative approaches and leverage AI tools to build more responsive, inclusive, and student-centered learning environments.

Last but not least, Advancing Research and Scholarship. Finally, the proposed study contributes to the broader body of educational research and scholarship focused on the intersection of technology and student satisfaction. By synthesizing existing literature, examining theoretical frameworks, and presenting empirical findings, the study advances knowledge in this area and provides a foundation for future research endeavors. It encourages scholars to explore nuanced aspects of AI integration, evaluate its long-term impact on student satisfaction, and develop evidence-based recommendations for educational practice.

In conclusion, the proposed study is important because it has the ability to improve academic understanding in the ever-changing field of education, empower stakeholders, address student needs, encourage innovation, and inform and modify educational practices.

Summary

This chapter explores the profound impact of Artificial Intelligence (AI) technology on student satisfaction within educational settings, particularly focusing on Universiti Teknikal Malaysia Melaka (UTeM). It outlines the significance of student satisfaction as a pivotal metric for assessing educational quality and effectiveness, highlighting how AI integration holds promise in revolutionizing teaching and learning practices. The chapter identifies key research questions, objectives, and challenges associated with AI implementation in education, emphasizing the need for empirical research to understand its nuanced effects on student satisfaction comprehensively. Furthermore, it delineates the scope of the study, focusing on UTeM students and various AI-driven tools and applications within the institution. The study's importance lies on its ability to influence educational practices, institutional decision-making, and student-centric interventions, fostering innovation and advancing scholarly understanding in the evolving landscape of education.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter has examined both the independent and dependent variables. In general, all aspects of thesis writing require accurate sources to support our scientific and observational research. This literature review seeks to explore the multifaceted role of AI technology in shaping student satisfaction within the educational domain. By examining a diverse array of scholarly works and theoretical frameworks, this review aims to elucidate the various ways in which AI applications, ranging from intelligent tutoring systems to personalized learning algorithms, impact student engagement, academic performance, and overall contentment with the educational experience. With an emphasis on its implications for promoting increased student satisfaction and performance, this study seeks to put understanding of the opportunities and difficulties related to the integration of AI technology in education by a thorough analysis of the content of existing material.

2.2 Concept

2.2.1 Artificial intelligence (AI)

Applications of artificial intelligence (AI), a quickly developing technology, can be found in many different fields. Lu et al. (1995) introduced the use of artificial neural network technology for inspection path management on a Coordinate Measuring Machine (CMM), specifically for multi-component inspection tasks. This approach utilized genetic algorithm theory to establish an optimizer and artificial neural networks for pattern recognition and self-learning functions. Chao (2005) talked about creating a general intelligent guided-view system using RFID technology, incorporating AI techniques such as expert systems, intelligent agents, and neural networks to achieve context-aware capabilities. Liu et al. (2005) addressed the validation methodology for AI simulation models, emphasizing the importance of accuracy and reliability in AI simulation models. Hassan et al. (2009) reviewed the use of AI techniques in power system stabilization, highlighting the limitations of controllers designed based on conventional control theories. Hwang et al. (2010) focused on the application of neural networks in an artificial intelligent analyzer for mechanical properties of rolled steel bars. Recent research has explored the integration of AI algorithms in various fields. Tang et al. (2018) reviewed computational intelligence for StarCraft AI, while Chakrabarti et al. (2018) discussed the use of AI techniques for transmission line fault location. Li et al. (2021) presented AI models for predicting soil-water characteristic curves and aiding in the design of sands. Chen et al. (2022) highlighted the combination of AI algorithms with metamaterials research to develop photonic devices with intelligent functionalities. Furthermore, Assareh et al. (2023) conducted a comprehensive techno-economic analysis of an innovative Compressed Air Energy Storage (CAES) system integrated with hydrogen, geothermal, and solar energy technologies in different climate areas using AI. These studies collectively demonstrate the diverse applications and advancements in artificial intelligence across various disciplines.

2.2.2 AI Technology on education

Ennals (1990) discusses the potential of artificial intelligence (AI) technology for education and training, emphasizing its multi-disciplinary nature and the need for collaborative research. Wogu et al. (2019) argue that the impact of AI on education and human development is overestimated, and they ask for more research to properly appreciate its benefits. Xu (2020) categorizes AI applications in education into students-oriented, teachers-oriented, and school managers-oriented, highlighting the challenges that may hinder its development despite a promising future. Panigrahi (2020) provides examples of AI use in education, particularly in developing countries like India, aiming to help stakeholders understand the extent of AI's potential benefits in education. Tahiru (2021) undertakes a systematic literature analysis to examine the prospects, benefits, and problems of AI in education, with the goal of providing educators with an understanding of AI technology in education. Liu et al. (2021) emphasize the importance of cultivating AI literacy among normal university students, focusing on deep cognition of an intelligent society, computational thinking, programming ability, and digital literacy.

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2.2.3 Theoretical Foundations of AI in Education

Theoretical Foundations of AI for Education, the use of artificial intelligence (AI) in education has been a topic of attention in recent years, with many research addressing the possible benefits and issues connected with incorporating AI into educational settings. Frair et al. (2000) discussed the theoretical foundations for core competencies that are believed to positively impact engineering education. These competencies are essential for enhancing educational outcomes in engineering disciplines. Zhai et al. (2021) conducted a review of AI in education from 2010 to 2020, analyzing how AI has been utilized in the education sector and identifying research trends and challenges. The study highlighted the increasing use of AI in education and the need for further exploration of its potential applications. Ng et al. (2021) focused on AI literacy, proposing a conceptual framework for defining, teaching, and

evaluating AI literacy. The review emphasized the importance of understanding, using, evaluating, and addressing ethical issues related to AI in fostering AI literacy among individuals. Kunda (2021) discussed the competencies required for AI expertise, emphasizing the integration of computational, conceptual, and mathematical knowledge in AI education. This systematic understanding of AI competencies is crucial for enhancing education and promoting broader participation in AI-related fields.

2.2.4 Personalized Learning with AI

The application of artificial intelligence (AI) in education has demonstrated encouraging outcomes in terms of improving students' individualized learning experiences. Ciolacu et al. (2018) introduced an innovative method to AI-assisted higher education process that employs smart sensors and wearable gadgets to promote self-learning. Similarly, Nazaretsky et al. (2021) focused on utilizing AI to empower educators by collaborating to create a learning analytics platform for individualized scientific education. Xu et al. (2021) developed an AI-assisted personalized feedback system that significantly improved academic achievement with personalized and reasonable predictive feedback. Furthermore, St-Hilaire et al. (2022) conducted a study comparing traditional online learning platforms with a highly personalized learning experience on the Korbit platform, showing a substantial increase in learning outcomes for students receiving personalized feedback.

2.2.5 Intelligent Tutoring Systems (ITS)

Research on Intelligent Tutoring Systems (ITS) has been a topic of interest nowadays. Ohlsson (1986) discusses The significance of offering adaptable training that addresses the shifting cognitive needs of individual learners. He emphasizes the need for computer tutors to having a technique that transforms tutorial goals into teaching actions. Polson et al. (1988) further explore the foundations of ITS, highlighting pragmatic considerations in the research, development, and implementation of these systems. Merrill et al. (1992) Contrast the direction and assistance provided by AI tutoring systems with those of human tutors. They note that while human tutors provide more flexible and subtle support, the two are more similar than often argued. Shute et al. (1994) delve into the past, present, and future of ITS, addressing the precursors of these systems. Hegarty et al. (1996) and Graesser et al. (2001) focus on ITS and conversational dialogue, respectively, showcasing the evolution and advancements in this field.

2.2.6 Adaptive Assessments

In recent research, there has been interest in the application of AI technology in adaptive evaluations. Willcox (2020) explored the use of Swarm AI technology to assess group personality, showing that it may be a more effective tool for predicting team performance compared to traditional survey approaches. Oladele et al. (2021) discussed the importance of item banks and rigorous item development processes in Computer Adaptive Testing (CAT), emphasizing the role of AI algorithms in maintaining quality and leveraging Item Response Theory (IRT). Maureira et al. (2021) presented an adaptive approach to AI algorithm assessment in the AEC-AI industry, focusing on text content mining related to technological processes and applications. Jahic et al. (2021) developed a knowledge-based sufficiency assessment methodology to encourage the use of AI, highlighting the importance of capturing architects' knowledge about AI properties to avoid mistakes in the adoption process. Harati et al. (2021) studied the impact of the ALEKS adaptive system on students' self-regulated learning skills, demonstrating a significant decline in SRL abilities according to students' opinions and comments.

2.2.7 Data-Driven Decision-Making in Education

The use of artificial intelligence (AI) technology into decision-making processes is a developing trend across numerous sectors, including education. Cukurova et al. (2019) argue that AI might enhance human intelligence by supporting decision-making processes rather than replacing them. This is exemplified in their case study on debate tutoring, where prediction and classification models improve the transparency of expert teachers' decision-making processes for advanced reflection and feedback.. Similarly, Yang et al. (2019) discuss the potential of clinical decision support tools (DST) in improving healthcare outcomes through data-driven insights. In the context of education, Panigrahi (2020) highlights the application of AI to education in order to accomplish sustainable development goals, especially in poor nations like India. The perceived benefits of AI in education are emphasized to help stakeholders understand the extent to which AI can be utilized. Furthermore, Jayakumar et al. (2021) demonstrate the effectiveness of AI-enabled decision aids in collaborative decision-making for the surgical treatment of knee osteoarthritis, showcasing the personalized, data-driven approach these tools provide.

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2.2.8 Ethical Considerations in AI-Powered Education

Artificial intelligence (AI) in education has the potential to completely transform teaching strategies and learning environments. Yu et al. (2017) discuss how AI can enhance learning and research in Massive Open Online Courses (MOOCs) while also highlighting the ethical considerations that come with its application in education. Silva et al. (2020) emphasizes the need for robust teacher training programs to effectively leverage AI tools in education, ensuring their seamless integration into instructional practices. Garrett et al. (2020) analyzes stand-alone AI ethics courses and incorporates ethics into technical AI courses at different universities to investigate the importance of ethics in AI education. They identify two pathways for ethics content in AI education, emphasizing the importance of ethical considerations in teaching AI. Chaudhry et al. (2022) further stress the importance of transparency in developing AI-

powered educational technologies and propose a Transparency Index framework for conceptualizing transparency in AI in education, involving educators, ed-tech experts, and AI practitioners in its design. Chatbots powered by AI, such as ChatGPT, have the potential to transform various fields, including marketing, education, and medical education. Rivas (2023) discusses the ethical aspects of using GPT-based chatbot technology in marketing, emphasizing the importance of considering ethical consequences when adopting AI technologies.

2.2.9 Gemini

Gemini AI, a cutting-edge technology developed by Google, has been the subject of various studie. Chen et al. (2022) introduced The Kinova Gemini is a robotic device that helps humans retrieve objects and finish perception-based activities by combining visual reasoning and conversational AI interaction. Perera et al. (2023) focused on the potential integration of GenAI in higher education, emphasizing the importance of regulatory measures and ethical considerations. McIntosh et al. (2023) conducted a survey on the evolving landscape of generative AI, highlighting advancements in multimodal learning and the potential for Artificial General Intelligence (AGI). Team et al. (2023) introduced the Gemini family of multimodal models, showcasing their capabilities in video, image, audio, and text understanding. Saeidnia (2023) examined Google's motivation behind developing Gemini and its impact on the information industry. Masalkhi et al. (2024) conducted a comparative analysis between Google DeepMind's Gemini AI and ChatGPT in the field of ophthalmology, while Alhur (2024) explored the transformative impact of AI technologies like Gemini in healthcare. Meral et al. (2024) highlighted the applicability of AI programs in emergency department triage by comparing Gemini, emergency medicine specialists ChatGPT in ESI triage evaluation. Yang et al. (2024) focused on advancing Gemini's multimodal medical capabilities, particularly in the development of Med-Gemini models optimized for medical use. Lastly, Lee et al. (2024) compared cardiology-related responses from ChatGPT and Gemini, emphasizing the importance of health literacy and education. Overall, the literature

surrounding Gemini AI showcases its potential in various fields, from robotics and education to healthcare and medical imaging. The studies highlight the importance of responsible deployment, regulatory measures, and ethical considerations in utilising the full potential of Gemini AI in different domains.

2.2.10 Satisfaction

Satisfaction in AI has been a topic of interest in various fields, including healthcare, education, and aesthetics. Kraus et al. (2019) highlighted the challenge of generating explanations that increase user satisfaction in multi-agent environments, proposing the xMASE research direction. Wu et al. (2020) investigated the efficacy of problem-based learning with AI tutoring in ophthalmology clerkship with the goal of evaluating student opinions of the module. Yildirim et al. (2020) evaluated the aesthetic outcome of iris reconstruction using an artificial iris (AI) in patients with aniridia. In the healthcare sector, Wang et al. (2021) examined the effects of AI responsibility signals on the attitudes, contentment, and usage intentions of healthcare professionals. Chi et al. (2021) created an AI system to improve clinician assessment of patient records, aiming to reduce the time spent on reviewing electronic health records. Nguyen et al. (2021) studied the impact of AI service quality on employees' job satisfaction, finding that AI satisfaction with service quality mediated this relationship. In education, Kim (2021) focused on elementary school students' experiences with AI teaching-learning models, aiming to increase students' understanding and satisfaction with AI education. Chen et al. (2022) the factors impacting students' willingness to participate in AI software development, including self-efficacy, AI literacy, and the theory of planned behavior. Furthermore, Xie et al. (2022) investigated the degree to which consumers are content with AI interactions by doing a meta-analysis on user happiness and gratification with AI-powered chatbots. Buzzaccarini et al. (2023) highlighted the growing importance of AI technologies in aesthetic medicine, emphasizing the role of AI in personalizing treatment plans and increasing precision and satisfaction. Overall, the literature review indicates a diverse range of studies exploring satisfaction in AI across different domains, emphasizing the

importance of user experience and outcomes in the adoption and implementation of artificial intelligence technologies.

2.3 The factors that influence student satisfaction with Gemini as educational tool

2.3.1 Completeness

The literature on completeness in AI technology Gemini highlights the advancements and potential of this innovative system. Google has introduced Gemini as a powerful AI technology that has the capability to transform businesses and interactions (Google Cloud Blog, 2024). The development of Gemini has been a significant milestone in the field of artificial intelligence, with Google being at the forefront of this technology (ANIL, 2024). The introduction of Gemini 1.0 by Google has opened up new possibilities in AI, showcasing the potential of this multimodal LLM technology (The Complete, 2023). Additionally, Accenture and Google Cloud have collaborated to provide AI managed services, including the deployment of Gemini, emphasizing the importance of this technology in scaling generative AI (Accenture and Google Cloud, 2023). Gemini has been recognized for its clarity in interactions and promising aspects in the world of AI technology (ChatGPT and Gemini Advanced, 2024). However, there have been discussions around the completeness of Gemini, with reports of staged demo videos to showcase its capabilities (r/technology, 2023). Despite these concerns, Gemini continues to evolve, with newer versions like Gemini 1.5 Pro offering a complete guide for users in 2024 (Getting Started with Gemini 1.5 Pro, 2024). The availability and power of Gemini have been highlighted, with a complete course available for those looking to learn more about generative AI with Gemini (Google Gemini Complete Course, 2024). In conclusion, the literature review on completeness in AI technology Gemini showcases the advancements, collaborations, and potential of this innovative system. Google's Gemini has emerged as a powerful AI technology with the capability to transform businesses and interactions, offering new possibilities in the field of artificial intelligence. Despite concerns about staged demo videos, Gemini continues to evolve,

with newer versions and courses available for users to explore the capabilities of this groundbreaking technology.

2.3.2 Accuracy

The development and advancement of artificial intelligence (AI) technology have brought in a new era of thinking and technological use (Kaftan, A. N. et al., 2024). Various AI models, such as ChatGPT, Gemini, Pi, and Med-Gemini, have been introduced to the market, each with its unique capabilities and applications (Hudson, A. 2024). Boucher, M. (2024) mentioned that Gemini 1.5, in particular, boasts an impressive 99% accuracy in recalling vast amounts of information, showcasing the potential of AI models in information retrieval. Ethics in the creation and application of artificial intelligence, particularly in ensuring accuracy and diversity, have become increasingly important (Ioan-Andrei Cursaru & Laura Léger 2024). Google's efforts to limit election information on Gemini AI demonstrate a strategic approach to maintaining the accuracy of AI-generated content (Zulhusni, M. 2024). Additionally, partnerships between companies like Mantle and Google, utilizing technologies like Vertex AI and Gemini, have shown remarkable accuracy in applications such as equity management (Yamssi, M., & Forde, D. 2024). Overall, the literature suggests that AI technology, including models like Gemini, continues to evolve and improve in terms of accuracy and capabilities. Ethical considerations and strategic approaches are essential in ensuring the responsible development and use of AI technology in various fields.
2.3.3 Precision

A new era of accuracy and precision across a wide range of applications is being entered in by the advancement of AI technology, particularly in the form of Gemini. Gemini AI models from Google, including Gemini 1.5, have demonstrated unprecedented accuracy in recalling vast amounts of information (Boucher, M. 2024). This level of precision is crucial in fields such as medicine, where Google's medical AI powered by Gemini has outperformed benchmarks and achieved a high level of precision (McClure, P. 2024). Moreover, the use of Gemini in platforms like Mantle for equity management showcases the importance of precision in data extraction and analysis (Yamssi, M., & Forde, D. 2024). This precision is further highlighted in the context of digital marketing, where Google Gemini promises to deliver astute and impactful results through cutting-edge AI technology (Sylvestre, R. 2024). As AI technology continues to evolve, the focus on precision remains paramount. Gemini's ability to handle and interpret large datasets with remarkable speed and accuracy is a critical need in today's data-centric world (Davydov Consulting, 2023). The advancements in Gemini 1.5 Pro further emphasize the power and precision that AI technology can bring to a wide range of applications (Datacenters.com Artificial Intelligence, 2024). In conclusion, the precision of AI technology, particularly in the form of Gemini models, is a key factor in driving innovation and ethical development across various industries. The ability of AI to achieve high levels of accuracy and recall information with precision has the potential to revolutionize fields such as medicine, digital marketing, and data analysis.

2.3.4 Reliability

The literature on the reliability of AI technology Gemini presents a mixed perspective. On one hand, Gemini is praised for its potential in advancing scientific discovery and healthcare through data analytics and early disease detection (Alhur, A., 2024). However, according to Singh (2024), concerns have been raised about the reliability of Gemini, particularly in responding to prompts related to political topics.

While Google has clarified that Gemini is built as a creativity and productivity tool, it may not always be reliable in certain contexts. In conclusion, while Gemini shows promise in various applications such as healthcare and scientific discovery, its reliability in certain contexts remains a topic of debate and scrutiny (Livemint., 2024). As AI technology continues to evolve, ensuring the reliability and accuracy of these systems will be crucial in fully leveraging their potential (Alhur A., 2024).

2.3.5 Timeliness

The timeliness of AI technology Gemini implementation has been shown to have a significant impact on satisfaction in various contexts. For example, in the patent office setting, reducing application delays through the use of AI tools has been a common priority in order to improve efficiency and quality (Van Der Herten, K. 2022). In the healthcare sector, the timeliness of AI technology diagnostic systems has been found to influence patient satisfaction and trust in the technology same goes to others technology like Gemini (Alam, L., & Mueller, S. T. 2021). Delayed patient visits start times have also been shown to negatively affect overall satisfaction, highlighting the importance of timeliness in healthcare settings (Agazaryan, N. et al., 2020). Timeliness has been identified as a key factor that can impact patient satisfaction, health outcomes, and resource utilization in healthcare settings (Vpale, K.2021). Overall, the timeliness of AI technology Gemini implementation plays a crucial role in various industries and can have a significant impact on satisfaction levels. By leveraging AI to improve timeliness in processes and services, organizations can enhance customer and patient satisfaction, ultimately leading to better outcomes.

2.3.6 Convenience

Leveraging AI capabilities, Gemini can increase operational efficiency, optimize workflows, and automate repetitive duties (Tsantalis, J. 2023). Integrating

Gemini AI with Salesforce has shown benefits such as increased efficiency, productivity, and automation of tasks like report generation (Parmar, S. 2023). Gemini's unique advantages in marketing over other AI tools include enhanced personalization, real-time optimization, predictive modeling, user-friendly interface, seamless integration, and advanced data analysis (Robotic Marketer. 2023). Google Gemini AI is praised for its ability to provide comprehensive summaries and answers to queries, thanks to its vast training data (Pogla, M. 2024). Overall, Gemini AI is considered one of the most powerful AI ChatBots with capabilities that can surprise anyone. The convenience of Gemini AI is further enhanced by its no-code agent builder console and powerful grounding, orchestration, and customization capabilities.

2.3.7 Format

Ahmed et al. (2024) conducted a study to compare the quality of AI-generated multiple-choice questions for educators using Google Bard (now known as Gemini) and ChatGPT language models. The study discovered that both models could create dental caries-related questions, with Gemini's queries having higher cognitive levels than ChatGPT's. However, ChatGPT had more format errors in the questions generated. The study highlighted the importance of language models in generating subject-specific questions for educational purposes, allowing educators to focus on class planning and student involvement rather than assessment design.. In a related study by ChatGPT and Gemini (2024), the future impact of AI technologies on society was discussed, emphasizing the need for evolving methods to evaluate their effects. Bill Gates (2023) also acknowledged the disruptive nature of artificial intelligence and the unease it may cause among people. According to Lau, J. (2024), ChatGPT is better for voice chat and keeping conversation history. Gemini is better for research and factual accuracy. Both models can generate creative text formats, like poems and code, but Gemini allows users to do this for free.

2.4 Research Framework

Some User Information Satisfaction metrics that are relevant to the information systems (IS) under examination and their environment have been established by prior research (Galletta and Lederer, 1989), for example, developed up to 23 criteria to gauge user satisfaction with the effectiveness and implementation of IS. On the other hand, Laumer and colleagues (2017) identified seven variables that impact user satisfaction with corporate content management systems, in addition to a number of other varied questions (see Ives et al., 1983; Laumer and colleagues, 2017; Bai et al., 2008). These academic projects demonstrate that there is a solid theoretical foundation for quantifying UIS. On the other hand, assessing UIS particularly for AI-supported systems such as Gemini is conspicuously lacking. Thus, the goal of this research is to create customized UIS metrics for Gemini, offering useful information to developers and users alike-including Gemini and other companies using chatbot technology. The breadth of UIS application is expanded by this endeavor, which also helps to improve AI-supported systems' ability to better fulfill user needs. The development of these metrics could have a substantial impact on how technology is customized and improved, increasing consumer utility and satisfaction in a variety of settings.

This study adopted theoretical framework (Figure 2.1) from the previous study by Fu et al., (2024) which develops a seven-step framework to assess the ChatGPT system for the goal of the research, which is created specific UIS metrics for ChatGPT, offering insightful information to developers and users alike—including organizations like OpenAI and others working on chatbot technology. The range of UIS applications is expanded by this endeavor, which also helps to improve AI-supported systems' ability to better fulfill user needs. The development of these metrics could have a substantial impact on how technology is customized and improved, increasing consumer utility and satisfaction in a variety of settings while in this study, the framework assess the Gemini system which will be empirically tested among students. It does this by drawing on the notion of User Information Satisfaction from previous research (Foroughi et al., 2023; Ives et al., 1983; Laumer et al., 2017). Through careful testing during this inquiry, a user satisfaction model based on these seven UIS constructs has been operationalized. The UIS dimensions that are specific to Gemini include completeness, accuracy, precision, reliability, timeliness, convenience, format. These constructs, which are arranged within a conceptual study framework as shown in Figure 2.1, will be evaluated in respect to user satisfaction. This comprehensive approach aims to give a complete picture of how users engage with and view the Gemini system. Through the examination of these diverse dimensions, the research aims to identify the key domains in which Gemini performs exceptionally well and those areas that warrant further development, thus enhancing its effectiveness as a tool for users. It is predicted that the research's findings will offer insightful information about how to optimize Gemini and other AI-supported systems. The Figure 2.1 below shows the theoretical framework of this study by adopting to theoretical framework by Fu et al., (2024).



Figure 2.1. The Study's Theoretical Framework Measuring Student Satisfaction with Gemini on education. (Fu et al., 2024)

2.5 Hypothesis Testing

Based on the research framework in Figure 2.1, The researcher developed seven hypotheses to investigate the factors that influence students' satisfaction with AI-integrated educational tools. The hypotheses were:

Completeness

H1: There is a positive relationship between the completeness of information provided through AI technology and student satisfaction in educational settings.

Accuracy

H2: A positive relationship exists between the accuracy of AI-generated content and student satisfaction with educational resources and materials.

Precision

H3: The precision of AI technology in delivering personalized learning experiences is positively associated with student satisfaction in education.

Reliability

H4: The reliability of AI technology in delivering consistent and dependable support is positively affected to the student satisfaction with educational resources.

<u>Timeliness</u>

H5: There is a positive relationship between the timeliness of AI-driven feedback and assistance and student satisfaction in educational contexts.

Convenience

H6: The convenience of accessing educational content and support through AI technology is positively related to student satisfaction with their learning experience.

<u>Format</u>

H7: The format of educational materials and resources presented through AI technology is positively affected to student satisfaction with the learning process.

Summary

Gemini AI is a powerful tool with the potential to improve decision-making in various fields. It offers features like customizable prompts and model tuning, allowing users to tailor the AI for specific tasks. Research suggests that users find Gemini AI helpful in various tasks and businesses benefit from its ability to enhance marketing and customer interactions. This research proposes a framework to assess student satisfaction specifically for AI systems like Gemini. This framework includes seven constructs: completeness, accuracy, precision, reliability, timeliness, convenience, and format. By evaluating these constructs, researchers aim to understand how users interact with Gemini and identify areas for improvement. The research also proposes seven hypotheses predicting a positive relationship between each independent variable construct and student satisfaction with educational tools.

CHAPTER 3

RESEARCH METHOD

3.1 Introduction

This chapter covered the research methodology as well as the methods utilized for the investigation. The tools and strategies that the researcher used to conduct the research are referred to as Research Methods for Business Students (Saunders et al., 2023). The important thing in this study is to help customers to understand the AI technology in shaping student satisfaction on education and the main factor that contributes to student satisfaction with Gemini as educational tools. The research technique used is research design, methodology selection, data sources, research strategy, research location and time duration, which are all discussed in this chapter. Therefore, this chapter also focused on the design of questionnaires, survey results, and data analysis.

3.2 Research Approach

The examination approach alludes to a reasoning technique in the exploration cycle. Comprising of two methodologies, inductive and deductive. A deductive methodology is usually connected with quantitative exploration where it depends on information to evaluate the hypothesis while in inductive methodology, hypothesis is created from the information gathered (Saunders et al., 2023).

In this study, a deductive methodology is considered as the suitable technique for examination to clarify the difficult assertion as referenced in Chapter 1 due to the research objective and examination question that means to mathematically investigate the information. Consequently, this investigation will be done in quantitative strategy.

3.3 Research Design

This research project aims to investigate the relationship between AI technology (Gemini) and satisfaction at Universiti Teknikal Malaysia Melaka (UTeM). The research design provided a framework for obtaining and evaluating data to answer research questions and objectives, as well as a justification for data source selection, collection tactics, and analytical approaches (Saunders et al., 2023). Research design is vital because it facilitates the seamless navigation of various research techniques, resulting in professional research that provides maximum knowledge with little effort, time, and money (Innam, 2016). The research study discovered the association between independent variables such as seven user information satisfaction and the dependent variable was satisfaction that are appropriate to the research.

3.3.1 Exploratory Research

The explanatory research design examined the cause-and-effect relationship between the independent and dependent variables. Using explanatory research allows the researcher to better grasp the situation. This is due to the researcher's ability to adapt to new facts and insights discovered during the research process. Besides, for the research strategy researchers used web questionnaire to emphasize the research hypothesis. The purpose for using this online questionnaire is because web questionnaires are generally cheaper to conduct than in-person surveys. Thus, there is no need for travel or printing costs, making them a good choice for researchers with budget constraints. As this was an explanatory study, all secondary data from current and previous research would be examined, and the main data would be reviewed to determine the relationship between AI technology (Gemini) and student satisfaction on education.

3.4 Methodology Choice

Methodology choices are classified into three types: quantitative method, qualitative method, and mixed approach. In this study, the researcher believes that the quantitative approach is the most appropriate method for collecting data when compared to the qualitative and mixed methods. Quantitative research explored the phenomena by gathering numerical data evaluated using specific statistics based on mathematical methods (Alia and Gunderson, 2002). This method is used to measured numerical data from the web questionnaire and analysed the data using a range of statistical. The AI technology (Gemini) dimensions were tested, and the objective is to get understanding about how AI technology in shaping student satisfaction on education and the main factor that contributes to student satisfaction with Gemini as educational tools with huge amount numbers of users to simplify the results so that it can covered overall population. As a result, the information is more exact to use in the data analysis for this research to evaluate the relationship between AI technology (Gemini) and user Satisfaction in this study.

3.5 Data Source

There were two types of data and information to gather: primary and secondary data sources. The researcher used both data sources to conduct the study.

3.5.1 Primary Data

First-hand information gathered by the researcher especially for the study's goals is known as primary data (Burns and Bush, 2000) that targeted to solve the research problem. The study must guarantee that it will gather the exact information needed to address your research issue or questions and accomplish your goals. (Bell and Waters 2018). Through the use of an online questionnaire, the questionnaires were sent to each responder individually in order to gather the primary data for the study.

According to Saunders et al. (2023), the questionnaire is a tool to collect all data based on the requirements in this research. To make sure that the data was relevant to researchers, the questions were kept basic and straightforward so that respondents understood what they were asking about. The topic in the questionnaire contained the relationship between AI technology (Gemini) dimensions and user satisfaction. The respondents were requested to respond the prepared questionnaire in the closed-ended format and distribute through Google Form using online platform that including few statements to measure the several independent factors under study on a Likert scale. Furthermore, most respondents of the questionnaire were the user who experienced AI technology (Gemini) at Universiti Teknikal Malaysia Melaka (UTeM).

3.5.2 Secondary Data

Leveraging previously existing data is possible with secondary data. Existing data is compiled and summarized to increase the study's overall efficacy. Saunders et.

al. (2016) describe that the sources of the secondary data are websites (Scopus and Google Scholar), books and journal articles.

Secondary data offers researchers various advantages, including increased efficiency, the ability to improve on prior information, and the flexibility to conduct study in circumstances where primary research may not be viable or morally acceptable. The example of the referred journals was International Journal of Human–Computer Interaction by Hong, et al., (2022) and Academic Journal of Interdisciplinary Studies by Huang et al., (2021).

3.6 Research Strategy

Research strategy was important in research because it helped the researcher identify the research flow and structure. According to Saunders et al. (2023), A research strategy is a plan that helps researchers address research problems and achieve their objectives. This investigation recommended that the quantitative methodology should be utilized for the study. At that point, overview is an appropriate methodology to collect data from respondents. In order to complement the study's research question and aims, as well as research method and philosophy, the survey was selected as the research strategy.

3.6.1 Survey Strategy

This research was performed by using survey strategy that are frequently correlated with a deductive approached. The survey method was the method of the data collection from a simple of respondent through the questionnaire that had distributed through Google Form using online and answers by every respondent. Besides, the explanatory research was very important so that the researcher will have clearer image of the contemporary phenomenon with the data collected. Moreover, the benefit of implementing questionnaire form survey research is that data standardized from a broad population at a cheaper cost, and data can be simply compared. On the other hand, it enables the researcher to verify whether those characteristics will have an effect on user experiences. In survey research also recommend potential reasons for the specific correlation among variables such as investigate the impact of innovative self-service technology on user experience in this research.

3.6.2 Questionnaires Design

Web questionnaire was created in a well-structured way. Respondent can complete the questionnaire by their own which gives freedom to the respondents to answer the question based on their own perceptions. Furthermore, web questionnaires are data collection techniques for quantitative method that are used numerical data to measure and test the hypothesis. A web questionnaire was utilized to gather information about students' perceptions towards the AI technology (Gemini). Therefore, web questionnaires are less expensive because the researcher does not have to print the questionnaire or spend for transportation because everything can be done online. Aside from that, it saves time because the entire questionnaire was circulated through social media (Instagram) and text messenger and WhatsApp with a Link that had copied, pasted, and forwarded to connect with each responder geographically.

The questionnaire is divided into three sections. Respondents were asked to provide demographic data, including gender, race, and educational attainment, in Section A. This part consists of two multiple-choice questions and one dual-choice question that must be answered. In Section B, there were 35 statements that will focus on the independent variables of this research which was the factor that influence student satisfaction with Gemini as educational tool. Lastly, for Section C, there were used 5 statements to describe student satisfaction on AI technology (Gemini). The respondents then answered this question using a Likert range, which disclosed the answers by assigning marks on a range of 1 to 5, with the numbers representing strongly disagree, disagree, natural, agree, and strongly agree. The Likert scale is

frequently used to measure "attitude" in a scientifically acknowledged and allowed manner. Attitude can be characterized as preferable ways of behaving in specific situations entrenched in relatively 44 lasting system of confidence and beliefs established through social interaction. (Joshi et al., 2015).

	Section	Content
	А	Respondent background:
	MALAYSIA	• Gender
	A.	• Race
KN		• Educational level
F		• Faculty
14	<u>0</u>	
	BAINO	Assessment of independent variables: (Fu, Chung-Jen et
2		al.,2024)
	ليسيا ملالا	• Factor that influence student satisfaction with Gemini as
		educational tool (completeness, accuracy, precision, reliability,
J	NIVERSITI	timeliness, convenience, format)
	С	Assessment of dependent variables: (Fu, Chung-Jen et al., 2024)
		• AI technology (Gemini) in shaping student satisfaction on
		education

Table 3.2: Likert Scale

Source: (Restivo, A.1,2017)

Strongly Disagre	ee		St	rongly Agree
1	2	3	4	5

3.6.3 Operationalization Construct

Constructs	No of Items	Scale of Measurement
Completeness (C)	5	Likert Scale (1-5)
Accuracy (A)	5	Likert Scale (1-5)
Precision (P)	5	Likert Scale (1-5)
Reliability (R)	5	Likert Scale (1-5)
Timeliness (T)	5	Likert Scale (1-5)
Convenience (CV)	5	Likert Scale (1-5)
Format (F)	5	Likert Scale (1-5)
Satisfaction (S)	5	Likert Scale (1-5)

	Table 3.3:	Operationalization	Construct
--	------------	--------------------	-----------

Table 3.4: The variables

Independent Variables

Label	Items	Source	
С	Completeness		
I prefe	I prefer to use Gemini because;		
C1	Gemini provides me complete information	Laumer et al.	
C2	Gemini produces comprehensive information	(2017)	
C3	Gemini provides me with all the information	Wixom, B. H., & Todd,	
	I need	P. A. (2005)	
C4	Gemini provide sufficient information	Ashfaq, M., Yun, J., Yu,	
C5	Gemini has an excellent interface to	S., & Loureiro, S. M. C.	
	communicate my needs	(2020)	

Label	Items	Source
Α	Accuracy	
I prefe	r to use Gemini because;	
A1	Information from Gemini is correct	Foroughi et
A2	Information from Gemini is reliable	al. (2023)
A3	Information from Gemini is accurate	
A4	The information content is consistent with	Chen, C. W. (2010)
	my previous filing experience.	
A5	The information from the Gemini is clear	Ashfaq, M., Yun, J., Yu,
	AVO	S., & Loureiro, S. M. C.
AL MA	MA	(2020)

Label	Items	Source
Р	Precision	
I prefe	r to use Gemini because;	
P1	The responses from Gemini are generally	Ives et al.
	specific and directly address my questions	(1983)
P2	I rarely receive vague or ambiguous	او دوم~
	information from Gemini	
P3	I find Gemini's responses to be consistently	
	to the point	
P4	The Gemini provides the right solution to my	Ashfaq, M., Yun, J., Yu,
	request	S., & Loureiro, S. M. C.
		(2020)
P5	Information provided in the Gemini is	Ong, C. S., Day, M. Y., &
	relevant	Hsu, W. L. (2009).

Label	Items	Source
R	Reliability	
I prefe	r to use Gemini because;	
R1	Gemini rarely fails to deliver information I	Ives et al.
	can rely on	(1983)

R2	I trust Gemini as a dependable source of	
	information	
R3	Gemini information is accurate.	Lee, S., Shin, B., & Lee,
R4	Gemini information is trustworthy	H. (2009)
R5	Gemini information is reliable in serving my	
	needs.	

	Label	Items	Source
	Т	Timeliness	
	I prefe	r to use Gemini because;	
	T 1	The information provided by Gemini is up-	Laumer et al.
Nie		to-date	(2017)
EK	T2	The information provided by Gemini is	
11		received in a timely manner	
10	Т3	Through Gemini, I get the information I need	Ashfaq, M., Yun, J., Yu,
		on time.	S., & Loureiro, S. M. C.
5	T4	Using Gemini helps me to accomplish things	(2020)
		more quickly	اويور -
J	T5	Using Gemini increases my productivity.	MELAKA

Label	Items	Source
CV	Convenience	
I prefe	r to use Gemini because;	
CV1	Accessing Gemini is convenient and user-	Ives et al.
	friendly	(1983)
CV2	I find it easy to access Gemini on my	
	preferred devices.	
CV3	I experience no significant challenges in	
	accessing Gemini	
CV4	My interaction with Gemini is clear and	
	understandable.	

CV5	Interaction with the Gemini does not require	Ashfaq, M., Yun, J., Yu,
	a lot of my mental effort.	S., & Loureiro, S. M. C.
		(2020)

Label	Items	Source
F	Format	I
I prefe	r to use Gemini because;	
F1	The format in which Gemini presents	Laumer et al.
	information is clear and easy to understand	(2017)
F2	I find Gemini's information presentation	
N/ MA	format user-friendly	
F3	The information provided by Gemini is well	Wixom, B. H., & Todd,
Z	formatted.	P. A. (2005).
F4	The information provided by Gemini is well	
54.5	laid out.	
F5	The information provided by Gemini is	
	clearly presented on the screen	او نیف یا

UNIVERSITI TEKNIKAL MALAYSIA MELAKA Dependent Variable

Label	Items	Source				
S	Satisfaction					
How d	How do you feel about your overall experience of retrieving information from					
Gemin	i:					
S1	I enjoy using Gemini for my learning/assignment.	Cross et al. (2023)				
S2	Using Gemini makes it easier to do my assignment.					
S 3	I find Gemini easy to use.					
S4	I use Gemini frequently for my learning/assignment.					

S5	Using Gemini enhances my effectiveness at	
	doing assignment.	

3.6.4 Sampling Technique

According to Jemain et al. (2007), sampling is a strategy wherein inferences about the entire population are drawn from a little number of units within a given population. A sample is a portion of the population that has been chosen from it. (Al-Omari et al., 2008). The study's target population were University Teknikal Malaysia Melaka (UTeM) students who either used or were familiar with Gemini.

According to UTeM official website, the lastest population size of UTeM students in 2023 October is 13322 students. By referring to Krejcie and Morgan Table, the sample size can be found in the table below which is 370 sample students for the population 13322 students.

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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	346
	25	24	130	97	320	175	950	274	4000	351
-	30	28	140	103	340	181	1000	278	4500	354
-	35	32	150	108	360	186	1100	285	5000	357
4	40	36	160	113	380	191	1200	291	6000	361
4	45	40	170	118	400	196	1300	297	7000	364
	50	44	180	123	420	201	1400	302	8000	367
YS	55	48	190	127	440	205	1500	306	9000	368
(60	52	200	132	460	210	1600	310	10000	370
(65	56	210	136	480	214	1700	313	15000	375
	70	59	220	140	500	217	1800	317	20000	377
	75	63	> 230	144	550	226	1900	320	30000	379
	80	66	240	148	600	234	2000	322	40000	380
1	85	70	250	152	650	242	2200	327	50000	381
9	90	73	260	155	700	248	2400	331	75000	382
9	95	76	270	159	750	254	2600	335	1000000	384

 Table 3.5: Table for Determining Sample Size of a Known Population

For this research, a suitable sampling approach was employed to reach out to the public, and the researcher used a simple random sampling technique derived from probability sampling. The fundamental advantage of this system is that all members of the population have an equal chance of being chosen without bias. (Ross K. N., 2005). As a result, the questionnaire was sent online and respondents were chosen at random from among University Tekinikal Malaysia Melaka students. Since the questionnaire was created completely in English as the transmission channel, the researcher is also focusing on target respondents who understand the language.

3.7 Data analysis tools

Many data analysis tools were used in this study. Descriptive analysis, which is a frequency study of the samples to determine the respondents' demographic profile data, Pearson's correlation analysis, multiple regression analysis, and Cronbach's alpha. The data in this study were analyzed with the Statistical Package for Social Scientists (SPSS) software. The researcher used SPSS to analyze and evaluate a variety of data. This software can successfully manage vast amounts of data, simplifying the data collecting and processing for quantitative research. The data collected from the districts is then run through the software to obtain the results and the summaries of the information.

3.7.1 Pilot Test

According to Thabane et al. (2010), The pilot test can be described as a small study and the first step of research that helped design and shift the larger study. According to Bartlett (2013), The pilot test was carried out to demonstrate the reliability and validity of the questionnaire. Prior to gathering actual data, pilot testing can help determine whether any changes to the questionnaire design were required and ensure that the hypothesis testing study was conducted (Leon et al., 2011). The pilot test may expose mistakes and shortcomings in the questionnaire., allowing for modifications to ensure accuracy before sending it to the respondents. The recommendations and data from the respondents were acquired for the final survey questionnaire during the pilot test.

According to Jarina et al., (2019), the purpose of this pilot test was to determine whether the questionnaire could collect the necessary data from a small sample of respondents in the first phase. Due to time constraints, a minimum of 30 individuals who had previously utilized Gemini as an educational tool were selected for the pilot test to improve the validity and reliability of the questionnaire. Thus, the purpose of the pilot test was to evaluate the questionnaire's validity and reliability. In order to improve responder comprehension and obtain more precise data, the researcher revised the questionnaire after the data was gathered.

3.7.2 Reliability

Saunders et. al (2023) defined reliability as the "replication and consistency". Reliability was the assessment of a process that can produce reliable and stable outcomes. There are a few approaches available to measure reliability. To determine the reliability, the researchers utilized the Cronbach's alpha technique. Cronbach's Alpha is a statistic used to show whether the test and scales designed for a research are acceptable. It consists of an alpha coefficient with a value between 0 to 1 in Cronbach's Alpha. Table 3.6 displays the Cronbach's Alpha Coefficient Range and Strength of Association. Cronbach's Alpha values of equal to or greater than 0.7 were regarded acceptable. It is preferable if the Cronbach's Alpha exceeds 0.8, and 0.9 or more is regarded excellent. It was poor if the Cronbach's Alpha was less than 0.6, and unacceptable if it was less than 0.5. In this study, the reliability of seven independent variables and one dependent variable will be assessed.

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Table 3.6: Cronbach's Alpha Coefficient Range

Source: (Saunders, Lewis and Thornhill, 2016)

Cronbach's Alpha Coefficient Range	Strength of Association
$\alpha \ge 0.9$	Excellent
$0.9 > \alpha \ge 0.8$	Good
$0.8 > \alpha \ge 0.7$	Acceptable
$0.7 > \alpha \ge 0.6$	Questionable
$0.6 > \alpha \ge 0.5$	Poor
$0.5 > \alpha$	Unacceptable

3.7.3 Descriptive Analysis

In this study, a significant quantity of data was condensed into a brief summary using descriptive statistics. Chan et al. (2016) state that distribution, variation, and tendency are components of descriptive statistics. Descriptive statistics, which are typically employed for a controlled sort of quantitative description, can be utilized to establish the fundamentals of an investigation. Descriptive analysis in this study aims to characterize and contrast statistical variables. Descriptive analysis is a tool that the researcher can use to understand both numerical variables and variables that are based on the respondents' "demographic information." In descriptive statistics, Mode, Medium, and Medium are the most commonly shown data forms. Once upon a time, a population was assembled and divided into multiple categories using descriptive research. The researcher used the descriptive analysis which is frequency distribution to distinguish the gender, race, educational level among the UTeM's students.

3.7.4 Pearson's Correlation Coefficient

The Pearson Correlation Coefficient (r) is a measure of how strong the association is between two variables. In this study, the dependent variable was students' satisfaction with AI technology (Gemini). Pearson's Correlation Coefficient was used to assess the strength of the relationship between the independent variables (completeness, accuracy, precision, reliability, timeliness, convenience, and format) and the dependent variable to determine whether or not the correlation was significant.

According to Saunders et al. (2016), a perfect negative or perfect positive correlation is represented by a Pearson's correlation coefficient ranging from -1 to +1, but a wholly independent correlation has a value of 0. The closer r is to zero, the greater the variation from the line of best fit. Subsequently, the amount of deviation from the line of best fit decreases as r approaches +1 or -1. Figure 3.1 below displays the range of the correlation coefficient together with its meaning. The direction of the connection is indicated by the signs +ve and -ve. A variable's value increasing will cause other

values to grow as well, according to the positive linear correlation. If a variable is increased in a negative linear correlation, the correlation between other variables will decrease. There won't be any linear association between the variables if the correlation coefficient value is 0. 7 independent factors and 1 dependent variable were analyzed collectively in this study to look into the relationships between the variables.



3.7.5 Multiple Regression Analysis

Regression analysis is a statistical technique for detecting a correlation and relationship between variables (Uyanik and Guler, 2013). The primary goal of a regression analysis is to generate a linear equation that represents the relationship between one independent variable and one dependent variable. Multiple regression analysis is performed when there are several independent variables, whereas single regression analysis just considers one (Pandis, 2016).

Multiple regression analysis, as defined by Saunders et al. (2016), is a statistical tool that allows researchers to analyze the degree of cause-and-effect relationships between one independent variable and two or more independent variables. Students' satisfaction was the dependent variable, and MRA helped the researcher determine which independent variables (completeness, accuracy, precision, reliability,

timeliness, convenience, and format) had the greatest influence on this variable. In addition, the following multiple regression analysis equation was displayed:

Equation: Y = a + bX1 + cX2 + dX3 + eX4 + fX5 + gX6 + hX7

Table 3.7: Equation of Multiple Regression Analysis.

Source: (Saunders, Lewis and Thornhill, 2016).



Saunders et. al. (2023) defined the time horizon as the duration that taken to conduct the research. Cross-sectional studies and longitudinal studies are the two categories of time horizons. Because of the short timeframe for data analysis and conclusion, the researcher used a cross-sectional study design for this investigation. This is due to the researcher's restricted time, with only 8 months to finish the investigation. A cross-sectional study is one that investigates a phenomenon at a specific point in time. In general, most research projects in academic courses are time-constrained. (Saunders et. al., 2023).

Summary

In Chapter 3, the researcher defined the research technique by deciding on the research design, data gathering methods, and survey. For this study, the researcher used an explanatory research design and a quantitative approach. This study draws on both primary and secondary data sources. To collect responses for this investigation, a survey was utilized. The web questionnaire, which is a Google Form, and the sample size were mostly focused on clients at Universiti Teknikal Malaysia Melaka (UTeM), with approximately 370 respondents. In this study, the researcher did cross-sectional questionnaire design, sampling design, and pilot testing. In the data analysis part, the researchers analyzed the data using the Statistical Package for Social Science (SPSS), and Cronbach's Alpha, Validity Test, descriptive analysis, Multiple Regression Analysis, and Pearson's Correlation Coefficient were all described. Several methods were used to verify that this research study was credible.

CHAPTER 4

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The data and discussion for this study are presented in this chapter. It has proven that this research objective has been accomplished. The findings of the data analysis gathered from the responders to the title which is "AI technology in influencing student satisfaction in education" were given and examined in this chapter. A pilot testing was done to identify potential issues and make adjustments before the main study is launched. Descriptive, correlation, and regression analysis came after the pilot test. Using researcher-based surveys, 370 questionnaires were gathered for this study and randomly shared using an online Google Survey Form to students at Universiti Teknikal Malaysia Melaka (UTeM). Using the Statistical Package for Social Science (SPSS), the researcher examined all of the collected data and presented the results in tabular form.

4.2 Pilot Test

A pilot test with a small number of respondents is undertaken before sending questionnaires to a large group to validate the study issue. The pilot test aims to demonstrate the questionnaire's reliability (Saunders et al., 2016). It is critical to ensure that the survey questions are clear and do not confuse respondents. To collect responses

from respondents, the researcher produced 30 sets of questionnaires for the pilot test. The Cronbach's Alpha method was used to assess the data's reliability, and the researcher investigated the data's dependability with SPSS. Cronbach's Alpha values of 0.7 or above, according to Saunder et al. (2016), are regarded acceptable. While a Cronbach's Alpha of more than 0.8 is acceptable, 0.9 or more is considered excellent.

	Sour	rces: (SI	PSS Output)	
Case P	rocessing Su	ımmary	y	
		Ν	%	
Cases	Valid	30	100.0	
	Excluded ^a	0	.0	
	Total	30	100.0	
a. Listv	wise deletio	n base	d on all variab	les in the
procedu	ure.			
				<u></u>
	Reliat Cronb	oility St ach's	atistics SIA M	
	Alpha		N of Items	
		818	40	

Table 4.1 shows reliable statistics for all items. The questionnaire contains 40 items, and none of the 30 responders provided missing data. The Cronbach's Alpha score for All Items is 0.818, which is more than 0.7, indicating that the research data is reliable (Saunders et al., 2016). As a consequence, it indicates that it is highly reliable and that the questionnaire was trustworthy.

 Table 4.1: Reliability Statistics for All Items (Overall)

4.3 Reliability Analysis

A reliability study was used to determine the variable's internal validity. Above 0.7, the Cronbach Alpha coefficient is acceptable (De Vellis, 2003). Saunders, Lewis and Thornhill, (2016) backed up this claim, stating that the lowest acceptable reliability value is 0.7. The Cronbach Alpha's thumb guidelines are as follows:

Table 4.2: Cronbach's Alpha Coefficient Range

Source: (Saunders, Lewis and Thornhill, 2016)

Cronbach's Alpha Coefficient Range	Strength of Association
$\alpha \ge 0.9$	Excellent
$0.9 > \alpha \ge 0.8$	Good
$0.8 > \alpha \ge 0.7$	Acceptable
$0.7 > \alpha \ge 0.6$	Questionable
$0.6 > \alpha \ge 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Within this research, the overall Cronbach Alpha for the independent variables (Completeness, Accuracy, Precision, Reliability, Timeliness, Convenience and Format) is 0.799, while the overall alpha for dependent variable (Student Satisfaction) is 0.818. Both alpha readings for are acceptable and good respectively, based on the table 4.11 above.

4.4 Descriptive Statistics of Demographic Background

In this study, descriptive statistics were employed to examine the demographics of 370 respondents. The demographics of 370 respondents (N=370) were investigated using descriptive frequency analysis, and the results are shown in Table 4.3. In this section,

respondents' backgrounds are discussed, including gender, race, education level, and faculty.

Table 4.3: Total Respondents

Source: (SPSS output)

	Stati	stics				
					3. Education	nal
			1. Gender	2. Race	level	4. Faculty
	N	Valid	370	370	370	370
		Missing	0	0	0	0
4.4.1 G	ender	Table 4	.4: Frequen	icy and Pe e: (SPSS (ercentage of G	ender
	Gend	er		**		Cumulative
			Frequency	Percent	Valid Percent	Percent
	Valid	Female	195	52.7	52.7	52.7
		Male	175	47.3	47.3	100.0
		Total	370	100.0	100.0	



Figure 4.1: Gender of respondents

Figure 4.1 depicts the gender of all 370 respondents who answered the surveys. There was a total of 370 respondents, with 52.7% being female (195 respondents) and 47.3% being male (175 respondents). Female responses were somewhat higher than male responses.

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4.4.2 Race

Table 4.5: Frequency and Percentage of Race

Source: (SPSS Output)

Race

					Cumulative
		Frequency	Percent	Valid Percent	Percent
Valid	Chinese	99	26.8	26.8	26.8
	Indian	38	10.3	10.3	37.0
	Malay	220	59.5	59.5	96.5
	Others	13	3.5	3.5	100.0
	Total	370	100.0	100.0	



Figure 4.2 shows the statistics of the number of races. The highest proportion of race involved in this research is Malay which is 220 respondents or 59.5% and the lower respondents in this statistic of the race is others category which is 13 respondents or 3.5% of the percentage. Other than that, there were 99 respondents or 26.8% is Chinese and lastly follow by 38 respondents or 10.3% is from Indian race.

4.4.3 Educational level

Table 4.6: Frequency and Percentage of educational level Source: (SPSS Output)

Educational level

						Cumulative
			Frequency	Percent	Valid Percent	Percent
	Valid	Bachelor Degree	294	79.5	79.5	79.5
		Diploma	66	17.8	17.8	97.3
		Master or PhD	10	2.7	2.7	100.0
		Total	370	100.0	100.0	



Figure 4.3: Educational Level of respondents

Figure 4.3 depicts the education level of respondents. The majority of respondents (294) have a bachelor's degree, accounting for 79.5%. Diploma level respondents were in second place, accounting for 66 respondents (17.8%). Finally, there are only 10 responses, with 2.7% holding a Master's or PhD.

Table 4.7: Faculty

Source: (SPSS Output)

4. Faculty

				Valid	Cumulative
		Frequency	Percent	Percent	Percent
Valid	Faculty of Electrical	56	15.1	15.1	15.1
	Engineering Technology				
P. W	(FTKE)				
	Faculty of Electronics and	37	10.0	10.0	25.1
	Computer Engineering				
F	(FTKEK)				
CL B	Faculty of Industrial and	57	15.4	15.4	40.5
	Manufacturing Engineering				
	Technology (FTKIP)		in	اونت	
	Faculty of Information and	63 **	17.0	17.0	57.6
	Communications			LAKA	
	Technology (FTMK)				
	Faculty of Mechanical	53	14.3	14.3	71.9
	Engineering Technology				
	(FTKM)				
	Faculty of Technology	94	25.4	25.4	97.3
	Management and				
	Technopreneurship (FPTT)				
	Institute of Technology	10	2.7	2.7	100.0
	Management and				
	Entrepreneurship (IPTK)				
	Total	370	100.0	100.0	



Figure 4.4: Faculty of the respondents

The Table 4.7 shows the distribution of a total population of 370 respondents across various faculties and institutes. According to UTeM official website, the lastest population size of UTeM students in 2023 October is 13322 students. By referring to Krejcie and Morgan Table, the sample size can be found in the table below which is 370 sample students for the population 13322 students. The Faculty of Technology Management and Technopreneurship (FPTT) have the highest respondents, accounting for 94 respondents (25.4% of the total), highlighting its significant presence. In contrast, the Institute of Technology Management and Entrepreneurship (IPTK) has the smallest representation, with only 10 respondents (2.7%). The other faculties, including FTKE, FTKEK, FTKIP, FTMK, and FTKM, contribute moderately, with counts ranging from 37 to 63 respondents, forming a cumulative percentage that steadily rises from 15.1% to 71.9%. This indicates a balanced distribution among these middle-range contributors.

4.5 Descriptive Statistics on Independent Variables and Dependent Variable

The researcher used five-point Likert Scale to identify AI technology (Gemini) in influencing student satisfaction in education. The Likert Scale will be five points rating scale in which 1 represent strongly disagree, 2 represented disagree, 3 represented neutral, 4 represented agree and 5 represented strongly agree.

 Table 4.8: Descriptive Analysis Independent Variables and Dependent Variable

 Source: (SPSS output)

	Ν	Minimu	m Maximu	um Mean	Std. Devia
Independent					
Variables					
Completeness	370	1.00	5.00	3.8297	.82079
Accuracy	370	1.00	5.00	3.8611	.79077
Precision	370	1.00	5.00	3.8373	.78607
Reliability	370	1.00	5.00	3.8059	.79474
Timeliness	370	1.00	5.00	3.8411	.78856
Convenience	370	1.00	5.00	3.8189	.80336
Format	370	1.00	5.00	3.7108	.82845
Dependent					
Variable					
Satisfaction	370	1.00	5.00	3.9703	.67030

Table 4.8 displays the descriptive statistics for the independent and dependent variables obtained using SPSS. The independent variables in this analysis are Completeness, Accuracy, Precision, Reliability, Timeliness, Convenience, and Format, while the dependent variable is Satisfaction. Among the independent variables,
Accuracy scored the highest mean value of 3.8611, indicating that most respondents agreed that accuracy significantly influences the context of the study. This aligns with findings from Boucher, M. (2024), Gemini 1.5, in particular, boasts an impressive 99% accuracy in recalling vast amounts of information, showcasing the potential of AI models in information retrieval, thus improving overall satisfaction on education.

Timeliness followed closely with a mean value of 3.8411, underscoring its importance in meeting user expectations for prompt and efficient services. Precision (mean: 3.8373) and Completeness (mean: 3.8297) were also rated highly, suggesting these factors contribute substantially to perceived quality. Meanwhile, Convenience (mean: 3.8189) and Reliability (mean: 3.8059) were moderately rated, showing agreement that these elements are impactful but perhaps less critical than others. Lastly, Format had the lowest mean value of 3.7108, indicating it is seen as less influential, with some variability in responses suggesting differing opinions among respondents.

For the dependent variable, which reflects an outcome related to these factors, a strong mean value is expected based on the independent variables' high scores. This suggests that positive Student's satisfaction are significantly driven by attributes such as accuracy, timeliness, and precision, with format requiring targeted improvements. These findings reinforce the importance of optimizing these independent variables to enhance the overall satisfaction on education with the AI Technology(Gemini).

4.5.1 Descriptive Statistics of Independent Variables

Ν

Table 4.9: Descriptive Statistics of Completeness

Sources: (SPSS Output)

Descriptive Statistics

Minimum Maximum Mean Std. Deviation 58

C1- Gemini provides	370	1	5	3.85	1.094
me complete					
information					
C2- Gemini produces	370	1	5	3.87	1.090
comprehensive					
information					
C3- Gemini provides	370	1	5	3.79	1.141
me with all the					
information I need					
C4- Gemini provide	370	1	5	3.86	1.079
sufficient information					
C5- Gemini has an	370	1	5	3.77	1.172
excellent interface to					
communicate my					
needs					
	370				

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According to Table 4.9, the minimum rating for each item was 1 and the maximum was 5, representing the entire range of the Likert scale. The results showed that the item "Gemini produces comprehensive information" had the greatest mean value (M = 3.87) and a standard deviation of 1.090. On the other hand, the item "Gemini has an excellent interface to communicate my needs" had the lowest mean value (M = 3.77) and a standard deviation of 1.172. The largest standard deviation was 1.172, indicating that "Gemini has an excellent interface to communicate of completeness on AI Technology (Gemini) in molding student satisfaction with education.

Table 4.10: Descriptive Statistics of Accuracy

Sources: (SPSS Output)

T		• .•	C	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
	ACCE	infi	VA N	stati	CTICC
$\boldsymbol{\nu}$	USUI	ipu	VU N	Juan	SULLS

	Ν	Minimum	Maximum	Mean	Std. Deviation
A1- Information	370	1	5	3.86	1.085
correct					
A2- Information	370	1	5	3.85	1.090
from Gemini is reliable					
A3- Information	370	1	5	3.86	1.100
from Gemini is 🔗					
accurate					
A4- The	370	1	5	3.92	1.069
information content					
is consistent with					
my previous filing			يبي بي	ورم	
experience					
A5- The	370		5	3.82	1.114
information from					
the Gemini is clear					
Valid N (listwise)	370				

According to Table 4.10, the least rating for each item was 1 and the maximum was 5, encompassing the entire range of the Likert scale. The results showed that the item "The information content is consistent with my previous filing experience" had the greatest mean value (M = 3.92) and a standard deviation of 1.069. On the other side, the item "The information from the Gemini is clear" had the lowest mean value (M = 3.82) and standard deviation of 1.114. "The information from the Gemini is clear" had the greatest standard deviation score of 1.114. This demonstrates that respondents understand the significance of Accuracy on AI Technology (Gemini) in affecting student satisfaction with education.

Table 4.11: Descriptive Statistics of Precision

Sources: (SPSS Output)

	Ν	Minimum	Maximum	Mean	Std. Deviation
P1- The responses from	370	1	5	3.89	1.092
Gemini are generally					
specific and					
my questions	e				
P2- I rarely	370	1	5	3.83	1.086
receive vague or					
ambiguous					
information from	1				
Gemini					
P3- I find	370	1	5. 0	3.85	1.098
Gemini's	KNIK/		 AYSIA	MELA	KA
consistently to					
the point					
P4- The Gemini	370	1	5	3.78	1.156
provides the righ	t				
solution to my					
request	270	1	-	2.02	1.0(1
P5- Information	370	1	5	3.83	1.061
provided in the					
Gemini is					
relevant					
Valid N (listwise)370				

From Table 4.11, The minimum rating for each item was 1, and the maximum was 5, covering the full range of the Likert scale. The findings revealed that the item "The responses from Gemini are generally specific and directly address my questions" scored the highest mean value (M = 3.89) with a standard deviation of 1.092. On the other hand, the item "The Gemini provides the right solution to my request" scored the lowest mean value (M = 3.78) with the standard deviation of 1.156. The highest value of standard deviation was at 1.156, "The Gemini provides the right solution to my request". This exhibits that respondents are aware of the meaning of Precision on AI Technology (Gemini) in shaping student satisfaction on education.

Table 4.12: Descriptive Statistics of Reliability

Sources: (SPSS Output)

	N	Minimum	Maximum	Mean	Std. Deviation
R1- Gemini rarely	370	1	5. 5.	3.77	1.091
fails to deliver			••		
information I can	NIKA			MELA	
rely on					
R2- I trust Gemini	370	1	5	3.82	1.132
as a dependable					
source of					
information					
R3- Gemini	370	1	5	3.85	1.085
performs reliably					
R4- Gemini	370	1	5	3.77	1.135
information is					
trustworthy					

R5- Gemini	370	1	5	3.82	1.102
information is					
reliable in serving					
my needs					
Valid N (listwise)	370				

From Table 4.12, The minimum rating for each item was 1, and the maximum was 5, covering the full range of the Likert scale. The findings revealed that the item "Gemini performs reliably" scored the highest mean value (M = 3.85) with a standard deviation of 1.085. On the other hand, the items "Gemini rarely fails to deliver information I can rely on" and "Gemini information is trustworthy" scored the lowest mean value (M = 3.77) with the standard deviation of 1,091 and 1,135 respectively. The highest value of standard deviation was at 1.135, "Gemini information is trustworthy. This exhibits that respondents are aware of the meaning of Reliability on AI Technology (Gemini) in shaping student satisfaction on education.



Table 4.13: Descriptive Statistics of Timeliness

Sources: (SPSS Output)

	Ν	Minimum	Maximum	Mean	Std. Deviation
T1- The information	n370	1	5	3.85	1.097
provided by Gemini	i				
is up-to-date					
T2- The information	n370	1	5	3.86	1.099
provided by Gemini	i				
is received in a					
timely manner					

T3- It does not takes	370	1	5	3.82	1.121
too long for Gemini					
to respond to my					
requests					
T4- Using Gemini	370	1	5	3.78	1.127
helps me to					
accomplish things					
more quickly					
T5- Using Gemini	370	1	5	3.89	1.027
increases my					
productivity					
Valid N (listwise)	370				

From Table 4.13, The minimum rating for each item was 1, and the maximum was 5, covering the full range of the Likert scale. The findings revealed that the item "Using Gemini increases my productivity" scored the highest mean value (M = 3.89) with a standard deviation of 1.027. On the other hand, the items "Using Gemini helps me to accomplish things more quickly" scored the lowest mean value (M = 3.78) with the standard deviation of 1,127. The highest value of standard deviation was at 1.127, "Using Gemini helps me to accomplish things more quickly". This exhibits that respondents are aware of the meaning of Timeliness on AI Technology (Gemini) in shaping student satisfaction on education.

Table 4.14: Descriptive Statistics of Convenience

Sources: (SPSS Output)

Descriptive StatisticsNMinimumMaximumMeanStd. Deviation

C1- Accessing	370	1	5	3.82	1.123
Gemini is					
convenient and					
user-friendly					
C2- I find it easy	370	1	5	3.86	1.064
to access Gemini					
on my preferred					
devices					
C3- I experience	370	1	5	3.84	1.078
no significant					
challenges in					
accessing					
Gemini					
C4- My	370	1	5	3.79	1.128
interaction with					
Gemini is clear					
and					
understandable			سيبي م		.91
C5- Interaction	370			3.78	1.158
with the Gemini					
does not require					
a lot of my					
mental effort					
Valid N (listwise))370				

From Table 4.14, The minimum rating for each item was 1, and the maximum was 5, covering the full range of the Likert scale. The findings revealed that the item "I find it easy to access Gemini on my preferred devices" scored the highest mean value (M = 3.86) with a standard deviation of 1.064. On the other hand, the items "Interaction with the Gemini does not require a lot of my mental effort" scored the lowest mean value (M = 3.78) with the standard deviation of 1,158. The highest value of standard deviation was at 1.158, "Interaction with the Gemini does not require a lot

of my mental effort". This exhibits that respondents are aware of the meaning of Convenience on AI Technology (Gemini) in shaping student satisfaction on education.

Table 4.15: Descriptive Statistics of Format

Sources: (SPSS Output)

	N	Minimum	Maximum	Mean	Std. Deviation
F1- The format in	370	1	5	3.75	1.138
which Gemini 💊					
presents					
information is clear					
and easy to					
understand					
F2- I find Gemini's	370	1	5	3.68	1.199
information				وم	
presentation format			••		
user-friendly				MELA	KA
F3- The	370	1	5	3.65	1.184
information					
provided by					
Gemini is well					
formatted					
F4- The	370	1	5	3.69	1.196
information					
provided by					
Gemini is well laid					
out					

F5- The	370	1	5	3.79	1.111
information					
provided by					
Gemini is clearly					
presented on the					
screen					
Valid N (listwise)	370				

From Table 4.15, The minimum rating for each item was 1, and the maximum was 5, covering the full range of the Likert scale. The findings revealed that the item "The information provided by Gemini is clearly presented on the screen" scored the highest mean value (M = 3.79) with a standard deviation of 1.111. On the other hand, the items "The information provided by Gemini is well formatted" scored the lowest mean value (M = 3.65) with the standard deviation of 1,184. The highest value of standard deviation was at 1.199,"I find Gemini's information presentation format user-friendly". This exhibits that respondents are aware of the meaning of Format on AI Technology (Gemini) In shaping student satisfaction on education.

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4.5.2 Descriptive Statistics of Dependent Variable

Table 4.16: Descriptive Statistics of Satisfaction

Sources: (SPSS Output)

	Ν	Minimum	Maximum	Mean	Std. Deviation
S1- I enjoy using	370	1	5	4.01	.943
Gemini for my					
learning					
/assignment					

S2- Using Gemini makes it easier to do my assignment.	370	1	5	3.98	.970
S3- I find Gemini easy to use	370	1	5	3.97	.948
S4- I use Gemini frequently for my learning/assignmen t	370	1	5	3.92	.990
S5- Using Gemini enhances my effectiveness at doing assignment	370	1	5	3.97	.971
Valid N (listwise)	370				

From Table 4.16, The minimum rating for each item was 1, and the maximum was 5, covering the full range of the Likert scale. The findings revealed that the item "I enjoy using Gemini for my learning /assignment" scored the highest mean value (M = 4.01) with a standard deviation of 0.943. On the other hand, the items "I use Gemini frequently for my learning/assignment" scored the lowest mean value (M = 3.92) with the standard deviation of 0.990. The highest value of standard deviation was at 0.990, "I use Gemini frequently for my learning/assignment". This exhibits that respondents are aware of the meaning of Satisfaction by using AI Technology (Gemini) on education.

4.6 Normality test

The normality test determines whether our data has a normal distribution. According to Perry's book, a normal distribution is a symmetrical, bell-shaped distribution of data with attributes that is used as a benchmark for evaluating data distribution shapes. A test is considered normal if the results show that only a small percentage of participants are on the right and left tails, with most participants in the middle. It depicts the symmetry and one data cluster in the middle. For the larger samples the value of Skewness should be between -2 and +2 while for Kurtosis the value should be between -7 and +7. The researcher used the Skewness and Kurtosis to test using SPSS to explore normality testing.

Table 4.17: Results of Normality Test

Source: (Output from SPSS)

Descriptive S	tatisti	cs							
					Std.				
		Minim	Maxim		Deviatio	Skewnes			
	Ν	um	um	Mean	n	s	Kurto	osis	
	Statis	Statisti	Statisti	Statisti			Std.	Statisti	Std.
	tic	c	с	с	Statistic	Statistic	Error	с	Error
Completeness	370	1.00	5.00	3.8297	.82079	633	.127	495	.253
Accuracy	370	1.00	5.00	3.8611	.79077	679	.127	296	.253
Precision	370	1.00	5.00	3.8373	.78607	505	.127	506	.253
Reliability	370	1.00	5.00	3.8059	.79474	627	.127	446	.253
Timeliness	370	1.00	5.00	3.8411	.78856	694	.127	246	.253
Convenience	370	1.00	5.00	3.8189	.80336	733	.127	.065	.253
Format	370	1.00	5.00	3.7108	.82845	519	.127	494	.253
Satisfaction	370	1.00	5.00	3.9703	.67030	684	.127	.169	.253
Valid N	370								
(listwise)									

The researcher used the obtained value of Skewness and Kurtosis to test the normality of the variables. Based on the theory, the value of Skewness obtained between -2 and +2 and the value of Kurtosis value must be between -7 and +7. If any outputs from any variables are out of the range, the variables are non-normal. According to the table 4.20, the values of Skewness and Kurtosis were within the range

which indicated that all variables are normal. Below are the results of all variables in distribution curve.

4.7 Validity test

The validity test was conducted using Pearson Correlation, which is used to explain the relationship between independent and dependent variables. According to Saunders et al. (2016), the correlation coefficient is used to assess the strength of the relationship between independent and dependent variables. Table 4.20 shows the Pearson's Correlation Coefficients used to determine the correlation range of the R-Values.

 Table 4.18: Range of Pearson's Correlation Coefficients and the Interpretation

 Source: (Saunders et. al., 2016)

Pearson's Correlation Coefficient (R-values)	Interpretation
± 0.70 until ± 1.0	Very strong relationship
± 0.40 until ± 0.69	Strong relationship
± 0.30 until ± 0.39	Moderate relationship
± 0.20 until ± 0.29	Weak relationship
$\pm 0.01 \text{ until } \pm 0.19$	No relationship

Table 4.19: Correlations between variables

Source: (Output from SPSS)

(IV1) (IV2) (IV3) (IV4) (IV5) (IV6) (IV7) (DV)

Completeness	Pearson	1	.566**	.552**	.581**	.647**	.630**	.669**	.607**
(IV1)	Correlation								
	Sig. (2-tailed))	.000	.000	.000	.000	.000	.000	.000
	N	370	370	370	370	370	370	370	370
Accuracy	Pearson	.566**	1	.518**	.660**	.611**	.661**	.665**	.613**
(IV2)	Correlation								
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	370	370	370	370	370	370	370	370
Precision	Pearson	.552**	.518**	1	.563**	.671**	.547**	.618**	.580**
(IV3)	Correlation								
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	370	370	370	370	370	370	370	370
Reliability	Pearson	.581**	.660**	.563**	1	.620**	.628**	.677**	.597**
(IV4)	Correlation								
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
سيا ملاك	N	370	370	370	370	370	370	370	370
Timeliness	Pearson	.647**	.611**	.671**	.620**	1	.572**	.683**	.647**
(IV5)ERSI	Correlation			LAY	SIA I	MEL	AKA		
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	370	370	370	370	370	370	370	370
Convenience	Pearson	.630**	.661**	.547**	.628**	.572**	1	.724**	.636**
(IV6)	Correlation								
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	370	370	370	370	370	370	370	370
Format	Pearson	.669**	.665**	.618**	.677**	.683**	.724**	1	.663**
(IV7)	Correlation								
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
	N	370	370	370	370	370	370	370	370
Satisfaction	Pearson	.607**	.613**	.580**	.597**	.647**	.636**	.663**	1
(DV)	Correlation								

Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
N	370	370	370	370	370	370	370	370

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

Table 4.19 shows the correlation coefficients between the independent variables (completeness, accuracy, precision, reliability, timeliness, convenience, and format) and the dependent variable (satisfaction). All correlations are statistically significant at the 0.01 level, showing strong positive associations between the independent and dependent variables.

Among the independent variables, Format demonstrated the strongest correlation with Satisfaction, with a r value of 0.663, n=370, p<0.01, indicating that respondents perceive the format of the information as having a significant impact on their overall satisfaction. This was followed by Timeliness (r=0.647,n=370,p<0.01), Convenience (r=0.636,n=370,p<0.1), and Accuracy(r=0.613,n=370,p<0.01) which also exhibit strong associations with satisfaction. These findings suggest that attributes related to how information is presented, its timeliness, convenience and accuracy play a vital role in influencing student satisfaction.

On the lower end, Precision had the weakest correlation with Satisfaction (r=0.580, n=370, p<0.01), though it is still significant and positive. This indicates that while precision is important, it is less impactful compared to other factors like format and timeliness. Other variables such as Completeness (r=0.607, n=370, p<0.01) and Reliability (r=0.597, n=370, p<0.01) also showed strong positive relationships with satisfaction, highlighting their relevance but slightly lesser influence compared to the top-ranked variables.

In summary, all the independent variables positively impact satisfaction, with Format showing the strongest correlation and Precision the least. These results emphasize the importance of improving how information is structured and delivered to users to enhance overall satisfaction. Future analysis, including multiple regression, could provide deeper insights into the relative contribution of each independent variable to satisfaction.

4.8 Multiple Regression Analysis (Model Summary)

Regression analysis refers to a set of mathematical procedures for estimating and justifying the magnitude of a dependent variable using the values of one or more independent variables. Regression produces a figure that indicates the most likely estimate of a dependent variable from a set of independent variables. Multiple regression analysis was performed to assess the strength and significance of the relationship between variables (both independent and dependent).

اونور سبنی نیک Model Summary	Table 4.20:	Model Summ Source: (Out _j	ary of Mult	tiple Regression
Adjusted RStd. Error o	Model Summa	ry	Adjusted	RStd. Error of
Model R R Square Square the Estimate	Model R	R Square	Square	the Estimate
1 .757 ^a .572 .564 .44256	1 .757ª	.572	.564	.44256

Completeness, Reliability, Convenience, Timeliness

According to table 4.20, the R value was positive as an outcome of the model summary of multiple regression analysis. R = 0.757 for multiple coefficients of regression, indicating a strong and positive relationship between the independent and dependent variables. R was referring to the framework's strong connections. As a result, the value of R is greater than ± 0.70 , indicating that it has a positive and good association. Besides, the value of R square is 0.572. This suggests that the student satisfaction (dependent variable) is influenced by an independent variable of 57.2% (completeness, accuracy, precision, reliability, timeliness, convenience, format), while the rest (100% - 57.2% = 42.8%) is influenced by other factors or causes was not mentioned in this research.

4.8.1 ANOVA

Table 4.21: ANOVA Table

Source: (Output from SPSS)

ANOVA^a

		Sum	o	f			
Model		Squares		df	Mean Square	F	Sig.
1	Regression	94.890		7	13.556	69.210	.000 ^b
	Residual	70.902		362	.196		
52.1	Total	165.793		369			

a. Dependent Variable: Satisfaction

b. Predictors: (Constant), Format, Precision, Accuracy, Completeness, Reliability, Convenience, Timeliness

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The F-test is used to check whether the model accurately matches the data. Significant study is used to determine the relationship between variables, and the effects of the important value will reveal whether there is a statistically significant association between variables. Table 4.30 shows that the F-test value was 69.210, with a significant level of p=0.000 (p<0.05). The F-test score was 69.210, which indicates that the overall regression is a good fit for the data and that there is a significant link between the independent factors and the dependent variable. It was evident that each independent variable had a statistically significant effect on the dependent variable. Therefore, the factor of independent variables of completeness, accuracy, precision, reliability, timeliness, convenience, format impacted towards student satisfaction.

4.9 Hypothesis Testing

Hypothesis testing is essential in this study to determine whether the developed hypothesis is accepted or rejected. Regression analysis was used to test the hypothesis by evaluating the outcomes of independent variables. Hypothesis testing is sometimes used to examine whether a survey or experiment's results are relevant. That is either accepted or rejected. In the regression analysis, the variables that were independent of this study were completeness, accuracy, precision, reliability, timeliness, convenience, and format, whereas the dependent variable was student satisfaction. Table 4.22 shows the results of the hypothesis tests. If the p-value is less than 0.05, the two variables have a positive connection. However, if the significance level is p > 0.05, there is no positive link between the independent variable and the dependent variable. To attain a level of significance of 0.05 for a two-sided test, t must be greater than 1.96 (Puri & Treasaden, 2010).

Table 4.22: Coefficients Table

Source: (Output from SPSS)

Coefficients^a TEKNIKAL MALAYSIA MELAKA

		Unstandardized		Standardized		
		Coefficients		Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	1.051	.139		7.579	.000
	Completeness	.093	.042	.114	2.218	.027
	Accuracy	.109	.045	.128	2.435	.015
	Precision	.092	.042	.108	2.184	.030
	Reliability	.059	.044	.070	1.334	.183
	Timeliness	.161	.048	.189	3.380	.001
	Convenience	.142	.046	.170	3.078	.002
	Format	.109	.050	.135	2.205	.028

a. Dependent Variable: Satisfaction

Table 4.22 above indicates that the result of the Coefficient for multiple regression analysis. The beta value of Completeness was 0.114 with the significant value of 0.027, while the beta value of Accuracy was 0.128 with significant value of 0.015, the beta value of Precision was 0.108 with significant value of 0.03 and the beta value Reliability was 0.070 with the significant value of 0.183. Next, beta value of Timeliness was 0.189 with the significance value of 0.001. Then, the beta value of Convenience was 0.170 with significance value of 0.002. Lastly, the beta value f format was 0.135 with significance value 0.028. The Timeliness has the highest beta value compare with other six variables, so it shows that Timeliness is the main factor that AI technology (Gemini) in shaping student satisfaction on education.

The linear equation was developed as below according to Table 4.22

Equation: $Y = 1.051 + 0.093X_1 + 0.109X_2 + 0.092X_3 + 0.059X_4 + 0.161X_5 + 0.142X_6 + 0.109X_7$

Where:

Y = Student Satisfaction X1 = Completeness X2 = Accuracy X3 = Precision X4 = Reliability X5 = Timeliness X6 = Convenience X7 = Format

According to the linear equation above, there was a strong relationship between completeness, Accuracy, precision, reliability, timeliness, convenience, and format when employing AI technology to shape student satisfaction in education. The researcher developed seven hypotheses to determine which aspects were most successful on user experience, as indicated below:

Hypothesis 1:

H1: There is a positive relationship between the completeness of information provided through AI technology and student satisfaction in educational settings.

Table 4.22 showed the results of regression with the completeness factor as the independent variable and student satisfaction as the dependent variable. The significant value of completeness (p=0.027, less than 0.05) demonstrates a positive relationship with student satisfaction. Thus, the researcher accepted the H1 because the hypotheses significant and positive impact.

Hypothesis 2:

H2: A positive relationship exists between the accuracy of AI-generated content and student satisfaction with educational resources and materials.

Table 4.22 showed the results of regression with the accuracy factor as the independent variable and student satisfaction as the dependent variable. The significant value of completeness, p=0.015, less than 0.05, shows that it has a positive relationship with the satisfaction of students. Thus, the researcher accepted the H2 because the hypotheses significant and positive impact.

Hypothesis 3:

H3: The precision of AI technology in delivering personalized learning experiences is positively associated with student satisfaction in education.

Table 4.22 showed the results of regression with the precision factor as the independent variable and student satisfaction as the dependent variable. The significant value of completeness (p=0.030, less than 0.05) demonstrates a positive associated with student satisfaction. Thus, the researcher accepted the H3 because the hypotheses significant and positive impact.

Hypothesis 4:

H4: The reliability of AI technology in delivering consistent and dependable support is positively affected to the student satisfaction with educational resources.

Table 4.22 shows the results of the regression analysis, with reliability as the independent variable and student satisfaction as the dependent variable. The p-value for dependability was 0.183, which is greater than 0.05. This suggests that there is no statistically significant correlation between reliability and student satisfaction. Therefore, the researcher rejected H4, as the hypothesis does not show a significant and positive impact.

Hypothesis 5:

H5: There is a positive relationship between the timeliness of AI-driven feedback and assistance and student satisfaction in educational contexts.

Table 4.22 displayed the results of regression with the timeliness factor as the independent variable and student satisfaction as the dependent variable. The significant value of completeness, p=0.001 (less than 0.05), suggests that it has a positive relationship with student satisfaction. Thus, the researcher accepted the H5 because the hypotheses significant and positive impact.

Hypothesis 6:

H6: The convenience of accessing educational content and support through AI technology is positively related to student satisfaction with their learning experience.

Table 4.22 showed the results of regression with the convenience factor as the independent variable and student satisfaction as the dependent variable. The significant value of completeness (p=0.002, less than 0.05) demonstrates a positive relationship with student satisfaction. Thus, the researcher accepted the H6 because the hypotheses significant and positive impact.

Hypothesis 7:

H7: The format of educational materials and resources presented through AI technology is positively affected to student satisfaction with the learning process.

Table 4.22 displayed the results of a regression with format factor as the independent variable and student satisfaction as the dependent variable. The significant value of completeness, p=0.028, which is smaller than 0.05, suggests that it has a positively affected on student satisfaction. Thus, the researcher accepted the H7 because the hypotheses significant and positive impact.

4.10 Summary

This chapter presents the analysis of data collected from respondents through questionnaires, utilizing various statistical tests, including reliability analysis, descriptive analysis, validity testing, Pearson correlation analysis, and multiple regression analysis. The data was analyzed using SPSS software, and the reliability of the questionnaires was found to be high. The findings indicate that timeliness is the key factor in how AI technology (Gemini) influences student satisfaction in education. Additionally, all examined factors significantly impact student satisfaction, except for reliability, as its hypothesis was rejected. The discussions, conclusions, and recommendations will be addressed in the following chapter.

CHAPTER 5

DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

In this chapter, the results of the data analysis from Chapter 4 were discussed. The data and results of the research study that had been analysed were described by the researcher. This chapter will include the demographics, study objectives, implications of the study, limitations of the study, and future study recommendations.

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5.2 Summary of Study

The purpose of this researcher was to examine AI Technology in Shaping Student Satisfaction on Education in Universiti Teknikal Malaysia Melaka. In this research, there were seven independent variables which are completeness, accuracy, precision, reliability, timeliness, convenience, and format which effects toward student satisfaction by using AI technology (Gemini) for educational learning purpose.

5.3 Discussion on the Demographic Background

This study has a total of 370 respondents who completed questionnaires. There were 370 responders, with 52.7% (195) being female and 47.3% (175) being male. Female responses were somewhat higher than male responses.

Next, there are four categories of race which are Malay, Chinese, Indian, and Others who has participated in this survey The higher proportion of race involved in this research is Malay which is 220 respondents or 59.5% and the lower respondents in this statistic of the race was others category which is 13 respondents or 3.5% of the percentage. Other than that, there were 99 respondents or 26.8% is Chinese and lastly follow by 38 respondents or 10.3% is from Indian race.

Furthermore, this research has studied the education level of the respondent which are from Bachelor's degree, Diploma and Master or PhD. The majority of respondents (294) have a bachelor's degree, accounting for 79.5%. Diploma level respondents were in second place, accounting for 66 respondents (17.8%). Finally, there are only 10 responses, with 2.7% holding a Master or PhD.

Lastly, the researcher has also study Faculty of the respondents in this research which are those from FPTT,FTKE,FTKEK,FTKIP,FTMK,FTMK and IPTK. The Faculty of Technology Management and Technopreneurship (FPTT) have the highest respondents, accounting for 94 respondents (25.4% of the total), highlighting its significant presence. In contrast, the Institute of Technology Management and Entrepreneurship (IPTK) has the smallest representation, with only 10 respondents (2.7%). The other faculties, including FTKE, FTKEK, FTKIP, FTMK, and FTKM, contribute moderately, with counts ranging from 37 to 63 respondents, forming a cumulative percentage that steadily rises from 15.1% to 71.9%. This indicates a balanced distribution among these middle-range contributors.

5.4 Discussion on Research Objectives

The research objectives were stated as below:

1. To identify the factors that contribute to student satisfaction with Gemini as educational tools.

2. To identify the main factor that contribute to student satisfaction with Gemini as educational tools.

3. To examine the most significant positive effect of Gemini on student satisfaction in education.

5.4.1 Objective 1: To identify the factors that contribute to student satisfaction with Gemini as educational tools.

The research objective 1 achieved with regression analysis was chosen to evaluate the outcome of independent variables to test the hypothesis and Pearson Correlation was used to conduct the validity test.

5.4.1.1 Completeness

According to the findings in Chapter 4 (Data Analysis), the researcher discovered that Completeness has a significant value of p=0.027, which is less than 0.05, indicating a positive relationship with student satisfaction. The researcher accepted hypothesis 1 since the completeness factor is an important and positive hypothesis. As a result, there is a favorable association between the completeness of information delivered by AI technology and student satisfaction in educational

environments.. In addition, the researcher also found out that the correlation value of Completeness is 0.607 which shows a strong relationship toward dependent variable which is student satisfaction.

In the realm of Gemini's responses, 'completeness' refers to the depth and breadth with which user inquiries are addressed. Studies, such as those by Gupta et al. (2020), indicate that users value detailed and comprehensive answers, as they contribute to a fuller understanding of the subject matter. A Gemini system that responds to complex user questions with complete, adequate, and specific information demonstrates a more thorough comprehension (Cheung & Lee, 2009). Particularly noteworthy is Gemini's ability to identify and comprehend the implicit questions posed by users, generating responses that are both comprehensive and relevant. Additionally, Gemini's capacity to present updated and current knowledge stands out as an added value. This correlation suggests that the more complete the responses provided by Gemini, the higher the likelihood of student satisfaction, underscoring the significance of depth and breadth in the delivery of information.

JNVERSITI TEKNIKAL MALAYSIA MELAKA 5.4.1.2 Accuracy

Based on the findings in Chapter 4 (Data Analysis), the researcher discovered that the significant value of Accuracy, p=0.015, is less than 0.05, indicating that Accuracy has a positive relationship with student satisfaction. The researcher accepted hypothesis 2 because Accuracy is a significant and positive hypothesis. Therefore, A positive relationship exists between the accuracy of AI-generated content and student satisfaction with educational resources and materials. Moreover, the researcher also found out that the correlation value of Accuracy is 0.613 which shows a strong relationship toward dependent variable which is student satisfaction.

The support for hypothesis 2 from the previous study by Kim et al., 2023 point out accuracy is conceptualized as the truthfulness and correctness of Gemini's responses. Personalized information, when provided in ample and relevant quantities, is typically perceived as delivering accurate information recommendations to users (Kim et al., 2023). This perspective is informed by the accuracy of textual outputs such as language modeling, text categorization, or the question-and-answer formats generated by Gemini (Saka et al., 2023). Gemini's capability to comprehend and interpret complex queries to produce answers reflecting the veracity of information contributes to student satisfaction (Raj et al., 2023). Prior research emphasizes the criticality of accurate information for users, especially in decision-making contexts (Foroughi et al., 2023). This study posits a direct positive relationship between the accuracy of provided information and student satisfaction levels, highlighting the importance of delivering truthful and reliable answers to enhance the student satisfaction.

5.4.1.3 Precision

Based on the findings in Chapter 4 (Data Analysis), the researcher discovered that the significant value of Precision, p=0.03, is less than 0.05, indicating that precision has a positive relationship with student satisfaction. The researcher accepted hypothesis 3 since the precision factor is a significant and positive hypothesis. Therefore, the precision of AI technology in delivering personalized learning experiences is positively associated with student satisfaction in education. Besides that, the researcher also found out that the correlation value of Precision is 0.580 which shows a strong relationship toward dependent variable which is student satisfaction.

Precision in Gemini's responses, which focuses on the relevance and specificity of user queries, is crucial. Research indicates that users favor targeted answers that directly address their specific issues (Reinecke & Bernstein, 2013). These responses provide information that aligns closely with the user's needs, offering specific solutions to their presented problems. Consequently, users perceive that the Gemini system understands their requirements through precise and thorough responses that meet or even exceed their expectations (Roumeliotis et al., 2024). This suggests

that the more precise the information provided, the greater the student satisfaction, underscoring the importance of contextually specific and tailored responses.

5.4.1.4 Reliability

According to the findings in Chapter 4 (Data Analysis), the researcher discovered that the significant value of reliability, p=0.183, is greater than 0.05, indicating that reliability has a negative relationship with student satisfaction. The researcher rejected the hypothesis 4 as the reliability factor is a not significant and negative hypothesis. Therefore, the reliability of AI technology in delivering consistent and dependable support is not positively affected to the student satisfaction with educational resources. However, the researcher found out that the correlation value of reliability is 0.597 which shows a strong relationship toward dependent variable which is student satisfaction.

Prior research done by García-Porta, (2024), point out It is crucial to recognize that the quality of information provided online may not always be credible or match to academic or peer review standards. As a result, the restrictions are due to the datasets utilized to input into the AI chatbots, as well as the quality of the internet information sources. According to Limna et al., (2023), the users of chatbots raised worries about the chatbot's reliability. They were concerned that Gemini could deliver inaccurate or partial information, thus impacting students' learning outcomes. Participants reported that Gemini's pre-programmed algorithms may not always capture the complicated details of a question or topic. Therefore, reliability does not have a significance influence student satisfaction.

5.4.1.5 Timeliness

According to the findings in Chapter 4 (Data Analysis), the researcher determined that the significant value of Timeliness, p=0.001, is greater than 0.05, indicating that timeliness has a positive relationship with student satisfaction. The researcher accepted the hypothesis 5 as the Timeliness factor is a significant and positive hypothesis. Therefore, there is a positive relationship between the timeliness of AI-driven feedback and assistance and student satisfaction in educational contexts. Furthermore, the researcher also found out that the correlation value of Timeliness is 0.647 which shows a strong relationship toward dependent variable which is student satisfaction.

Timeliness in the context of Gemini's responses emphasizes the speed at which it delivers information. Gemini's ability to provide instant and prompt responses is instrumental in enhancing interaction efficiency and fulfilling student expectations (Niu & Mvondo, 2024). When users pose questions and receive accurate responses from Gemini promptly, it aids them in resolving their issues more effectively. Additionally, the responsive nature of the Gemini system facilitates interactions that lead users to rely on it (Akiba & Fraboni, 2023), casting a positive light on the quality and responsiveness of Gemini's performance. Rapid and accurate replies are posited to increase student satisfaction (Petter & Fruhling, 2011). In the realm of digital communication, timeliness is highly valued. Students often equate quick responses with efficiency and effective service, thereby enhancing their overall satisfaction with the tool.

5.4.1.6 Convenience

Based on the findings in Chapter 4 (Data Analysis), the researcher found out that the significant value of Convenience, p=0.002 which is more than 0.05 indicates that convenience has a positive relationship on student satisfaction. The researcher accepted the hypothesis 6 as the Convenience factor is a significant and positive

hypothesis. Therefore, the convenience of accessing educational content and support through AI technology is positively related to student satisfaction with their learning experience. In addition, the researcher also found out that the correlation value of Convenience is 0.636 which shows a strong relationship toward dependent variable which is student satisfaction.

Convenience in the utilization of Gemini encompasses factors such as ease of use and accessibility. The system's ability to comprehend commands or queries translates into user-friendly experiences (Saif et al., 2024). According previous research by Qi et al., (2024), a simplistic design that facilitates user-system communication fosters a more comfortable interaction experience. Moreover, the provision of clear and timely responses helps users avoid confusion and feel more in command of the interaction. High levels of convenience generate positive user experiences and lead to greater satisfaction. This study posits that convenience plays a crucial role in student satisfaction. Human-computer interaction research indicates that tools that are easy to use and accessible significantly enhance student satisfaction (R, P., et al 2023). This implies that the more user-friendly and accessible Gemini is, the higher the user satisfaction.

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5.4.1.7 Format

Based on the findings in Chapter 4 (Data Analysis), the researcher found out that the significant value of Format, p=0.028 which is lower than 0.05 indicates that that Format has a positive relationship on student satisfaction. So, hypothesis 7 is accepted as the Format factor is a significant and positive hypothesis. Therefore, the format of educational materials and resources presented through AI technology is positively affected to student satisfaction with the learning process. Moreover, the researcher also found out that the correlation value of Format is 0.663 which shows a strong relationship toward dependent variable which is student satisfaction. The formatting of information delivered by Gemini, including its clarity, organization, and presentation, is posited to influence student satisfaction. Responses that are well-structured, employing clear paragraphing, bullet points, and other visual aids, facilitate users' ability to quickly locate and comprehend information (Jin & Kim, 2023). Information that is neatly organized acts as a guide for users to grasp the context and inspect specific sections of the response in detail. Research suggests that well-structured information, presented in a clear and coherent manner, enhances user understanding and satisfaction (Park et al., 2011). The correlation here is that user-friendly and well-organized response formats are likely to positively impact student satisfaction levels, as they enable easier comprehension and interaction.

Overall, the study identifies six key factors which are completeness, accuracy, precision, timeliness, convenience, and format that contribute significantly to student satisfaction. These results provide valuable insights into how Gemini meets students' needs and highlight areas for potential improvement, such as enhancing reliability.

5.4.2 Objective 2: To identify the main factor that contribute to student satisfaction with Gemini as educational tools.

The study successfully achieves the objective of identifying the main factors contributing to student satisfaction with Gemini as an educational tool. The data highlights the importance of several factors while identifying the most impactful among them.

Items	Beta value	Rank
Timeliness	0.161	1
Convenience	0.142	2
Accuracy, Format	0.109	3
Completeness	0.093	4

Table 5.1: Ranking of Factor

Precision	0.092	5
Reliability	0.059	6

According to the data analysis in Chapter 4, it indicated Timeliness was the main factor that contribute to student satisfaction with Gemini as educational tools, with the highest beta value (0.161) and the top-ranking position. This highlights the crucial importance of ensuring that educational resources and support are delivered promptly. By leveraging AI tools like Gemini, learning tools can automate processes such as real-time feedback on assignments, and immediate responses to student inquiries. These capabilities significantly enhance the perception of efficiency and responsiveness, ensuring that students receive timely support and guidance to facilitate their learning journey. Gemini helps users solve their problems more successfully when they ask inquiries and get precise answers in a timely manner. Furthermore, the system's responsiveness makes it easier for users to communicate with it, which makes them rely on it (Akiba & Fraboni, 2023). This speaks well of Gemini's performance quality and responsiveness. It is suggested that prompt and precise responses will boost student satisfaction (Petter & Fruhling, 2011).

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5.4.3 Objective 3: To examine the most significant positive effect of Gemini on student satisfaction in education.

The data in Table 4.25 supports the objective of examining the most significant positive effect of Gemini on student satisfaction in education. The findings show that students generally enjoy using Gemini, as indicated by the highest mean score (M=4.01) for the statement "I enjoy using Gemini for my learning/assignment." The interactive and conversational features of Gemini can increase students' motivation and engagement, making learning more pleasurable and individualized (Kasneci et al., 2023). According to Khan et al., (2023) investigate how Gemini affects clinical management and medical education, emphasizing how it might provide students with individualized learning experiences.

The standard deviation values (0.943) indicate moderate consistency in responses, showing that most students agree on their satisfaction with Gemini. The higher variability in the frequency of use might reflect differences in individual needs or preferences. Despite this, the overall responses cover the full range of the Likert scale, showing that students thoughtfully evaluated their satisfaction with Gemini. These findings highlight that Gemini enhances the learning experience by making it enjoyable and useful, which positively impacts student satisfaction. Overall, Gemini plays a significant role in improving students' educational experiences, aligning with the study's objective.

5.5 Implication of the Study

In this study, the finding was analysed to determine and help in understanding the adoption of AI technology (Gemini) and factors of AI technology(Gemini) in shaping student Satisfaction on education . Through the analysis from the findings, the researcher had found that these seven factors which were Completeness, Accuracy, Precision, Reliability, Timeliness, Convenience, and Format. All of them had the significant relationship towards student satisfaction except the Reliability. As a result of this understanding of study, Timeliness was the main factor that shaping student satisfaction on education for their learning purpose.

This research marks a significant advancement in the theoretical framework of Measuring Student Satisfaction with Gemini on education, scrutinizing the traditionally emphasized roles of accuracy and reliability that Ives et al. (1983) posited as central to student satisfaction. By exploring the use of Gemini, findings indicate that these long-valued factors may not hold as much influence over student satisfaction in the rapidly evolving landscape of generative AI technology. This crucial study reveals that the student satisfaction paradigm is changing, requiring a reevaluation of what defines student satisfaction. The investigation reveals that users of AI interfaces might place greater importance on how information is provided to them, rather than just its correctness or dependability. Aspects such as how complete the information is, how user friendly the format is, how precisely it meets the user's needs, and how quickly it is delivered, have emerged as critical to satisfaction. Building on these insights, the study broadens the narrative of student satisfaction by incorporating additional determinants that resonate with the digital era's user interaction dynamics. In doing so, it echoes and expands upon the research by Laumer et al. (2010), who also recognized the need to adapt student satisfaction measures to reflect modern digital interaction patterns. The research delineates a more nuanced comprehension of student satisfaction, one that encapsulates the diverse priorities of users as they engage with sophisticated AI technologies. The inclusion of completeness, convenience, format, precision, and timeliness in the student satisfaction framework represents a shift towards a more broader approach to understanding student satisfaction, acknowledging the multifaceted nature of student experience in the context of contemporary information systems. This enhancement of the student satisfaction framework is not just an academic exercise; it has practical implications for the design and development of user-centric AI systems that can meet and exceed the evolving expectations of users in an increasingly digital world.

This research provides a analysis of Gemini's application, significantly enriching the discourse on how organizations can optimize the use of generative AI. It challenges the longstanding precept that the primary focus should be on the reliability of information systems, a principle traditionally held by scholars like Ives et al. (1983). Instead, our findings suggest organizations should pivot toward aspects such as completeness, accuracy, convenience, format, precision, and timeliness (Laumer et al., 2017). Such a recalibration can lead to more user-centric interfaces, potentially increasing engagement and satisfaction with AI tools, which in turn may enhance organizational efficiency and improve the return on investment in AI technologies (Fraisse & Laporte, 2022). At the organizational level, the implications of this study are profound. Entities that prioritize these newly identified factors in their AI systems can expect to develop interfaces that resonate more effectively with their users' needs. By creating systems that users find more intuitive and efficient, organizations stand to benefit from higher levels of user interaction and satisfaction, which can translate into increased productivity and better utilization of AI technologies (Williams et al., 2023). These outcomes underscore the importance of aligning system design with evolving

user expectations, as highlighted by the progressive nature of user engagement in the digital realm (Anderson et al., 2018).

For individuals, especially those frequently interacting with AI technologies like Gemini, the study underscores the importance of becoming proficient in features that enhance the utility of these systems. User education should shift focus towards empowering individuals to effectively engage with and extract value from AI. As users become more skilled in leveraging the streamlined functionalities of these systems, they can bolster their efficiency and productivity, which are essential in a rapidly digitizing world (Lu, 2019). This education is not just about functionality but also about setting appropriate expectations and maximizing the benefits of AI in diverse contexts like work and learning (Davis, 2017).

Finally, by equipping users with the knowledge to fully utilize AI tools, this study reinforces the importance of user competency in the digital age. Individuals who understand and utilize the advanced features of systems like Gemini can enhance their own technological literacy and efficacy. This empowerment is critical as it allows users to harness the full potential of AI in their professional and educational pursuits, establishing them as savvy operators within an increasingly complex technological ecosystem (Martin & Ertzberger, 2016). This user-centric approach to AI utilization not only benefits the individual but also contributes to the broader goal of integrating these advanced tools into society in a manner that maximizes their utility and facilitates growth and innovation.

5.6 Limitations of research

In this research, there is limitation for understanding the factors of AI Technology (Gemini) In Shaping Student Satisfaction On Education at Universiti Teknikal Malaysia Melaka because of limitation of area where only at Universiti Tekinikal Malaysia Melaka being on research. this study has limitations that open avenues for future research. The investigation was constrained by its focus on Gemini, which, while representative of generative AI, may not condense the full spectrum of user interactions across different AI platforms. Furthermore, the study's emphasis on self-reported satisfaction metrics may introduce response biases that do not fully represent users' nuanced reactions to AI interfaces. Subsequent research could broaden the scope of the study to encompass a wider range of AI tools and technologies, improving the findings' generalizability. Incorporating objective usage data could also provide a more full knowledge of student satisfaction and behavior, allowing for a more holistic view of how individuals and organizations engage with AI.

5.7 Recommendations for Future Research

Future research on AI technology like Gemini can explore its long-term impact on education. Conducting longitudinal studies would help determine how AI influences student satisfaction and learning outcomes over extended periods. This research could examine whether the benefits of AI, such as personalized learning and instant feedback, remain effective and relevant as students progress through different stages of their education. By tracking changes over time, educators and policymakers could better understand how to integrate AI sustainably into educational systems.

Another critical area of research is how AI affects students in different cultural and socio-economic settings. Education systems vary significantly worldwide, and what works in one region may not be as effective in another. Exploring how AI technologies like Gemini adapt to these diverse contexts can provide insights into their global applicability. This research could also highlight challenges, such as language barriers or unequal access to technology, which need to be addressed to make AI tools more inclusive and equitable.

A key question for future research is the balance between personalization and standardization in AI-driven education. Personalized learning, where AI tailors content to individual needs, has shown promise in improving engagement and satisfaction. However, education must also meet standardized curriculum requirements to ensure
students acquire essential knowledge and skills. Research could explore how to optimize this balance, ensuring students benefit from personalized experiences without compromising the broader educational goals.

The ethical implications of using AI in education also require further investigation. Issues such as data privacy, algorithmic bias, and the psychological impact of AI interactions on students are critical to consider. For example, biased algorithms might favor certain groups of students, leading to unequal learning opportunities. Additionally, the constant monitoring of students by AI systems could raise concerns about data security and student autonomy. Future research should focus on addressing these ethical challenges to ensure AI is used responsibly in education.

Finally, comparative studies between Gemini and other AI technologies could provide valuable insights. By analyzing the strengths and weaknesses of different AI tools, researchers can identify what makes Gemini unique and what aspects might need improvement. This research could also help educators choose the best AI technologies for specific educational goals. For instance, comparing Gemini's capabilities in adaptive learning with other tools could highlight areas where it excels and where additional development is needed. Such comparisons would guide future innovation and improve the overall effectiveness of AI in education.

5.8 Summary

In summary, This study investigated the role of AI technology, Gemini, in shaping student satisfaction in education by examining the relationship between seven independent variables which are completeness, accuracy, precision, reliability, timeliness, convenience, and format and the dependent variable, satisfaction. The findings demonstrate that all independent variables significantly contribute to student satisfaction except the factor Reliability.

The regression analysis revealed a strong positive relationship between the independent variables and satisfaction (R=0.757), with 57.2% of the variation in student satisfaction explained by these factors. This confirms that AI technology like Gemini is effective in addressing key aspects of the learning process, enhancing the overall student experience.

This study demonstrates that Gemini positively influences student satisfaction through its ability to deliver complete, accurate, timely, convenient, and wellformatted information. These insights provide valuable guidance for optimizing AI tools to better meet the needs of students and improve their educational outcomes. Future research could explore other unexamined factors contributing to satisfaction and further refine the application of AI in education.

The questionnaire survey approach was used to meet all the 3 objectives of the research title AI Technology In Shaping Student Satisfaction On Education. In this research, it was found that all the factors, completeness, accuracy, precision, timeliness, convenience, and format have significant impact on student satisfaction except reliability. Among the seven independent variables, the research findings indicate that timeliness is the most influential factor in the impact of AI technology (Gemini) on student satisfaction. Additionally, the study explores its implications and acknowledges certain limitations. The researcher also provides recommendations for future studies, suggesting a larger number of high-quality research efforts to further explore this topic.

References

Abbas, A. (2024). Enhancing Student Engagement through AI-driven Analytics in Higher Education Institutions. ResearchGate. https://doi.org/10.13140/RG.2.2.28982.47682

Abdel-Wahab, A. G. (2008). Modeling students' intention to adopt e-learning:A case from Egypt. The Electronic Journal of Information Systems in DevelopingCountries,34.Retrievedfromhttps://144.214.55.140/Ojs2/index.php/ejisdc/article/view/355

Abdul Sami, M., Abdul Samad, M., Parekh, K., & Suthar, P. P. (2024). Comparative Accuracy of ChatGPT 4.0 and Google Gemini in Answering Pediatric Radiology Text-Based Questions. Cureus, 16(10), e70897. <u>https://doi.org/10.7759/cureus.70897</u>

Alshamsi, A., Zahavich, A., & El-Farra, S. (2021). Why Graded Assessment for Undergraduates During the COVID-19 Lockdown? An Experience Introspection, 9(2). <u>https://doi.org/10.22492/ije.9.2.04</u>

Accenture and Google Cloud Launch Joint Generative AI Center of Excellence to Help Enterprises Harness the Value of Generative AI. (2023). <u>https://newsroom.accenture.com/news/2023/accenture-and-google-cloud-launch-joint-generative-ai-center-of-excellence-to-help-enterprises-harness-the-value-of-generative-ai</u>

Agazaryan, N., Chow, P., Lamb, J., Cao, M., Raldow, A., Beron, P., Hegde, J., & Steinberg, M. (2020). The Timeliness Initiative: Continuous Process Improvement for Prompt Initiation of Radiation Therapy Treatment. Advances in Radiation Oncology, 5(5), 1014–1021. https://doi.org/10.1016/j.adro.2020.01.007

Ahmed, W. M., Azhari, A. A., Alfaraj, A., Alhamadani, A., Zhang, M., & Lu, C. T. (2024). The quality of dental caries-related multiple-choice questions and

answers generated by ChatGPT and Bard language models. Heliyon, 10(7), e28198. https://doi.org/10.1016/j.heliyon.2024.e28198

AI Quality Cultivation and Application Ability Training for Normal University Students. (2021, July 1). IEEE Conference Publication | IEEE Xplore. https://ieeexplore.ieee.org/document/9603886

Ajevski, M., Barker, K., Gilbert, A., Hardie, L., & Ryan, F. (2023). ChatGPT and the future of legal education and practice. Law Teacher/

the
Law Teacher, 57(3), 352–364. https://doi.org/10.1080/03069400.2023.2207426

Alam, L., & Mueller, S. T. (2021). Examining the effect of explanation on satisfaction and trust in AI diagnostic systems. BMC Medical Informatics and Decision Making, 21(1). <u>https://doi.org/10.1186/s12911-021-01542-6</u>

Alhur A (April 07, 2024) Redefining Healthcare With Artificial Intelligence (AI): The Contributions of ChatGPT, Gemini, and Co-pilot. Cureus 16(4): e57795. doi:10.7759/cureus.57795 <u>https://doi.org/10.7759/cureus.243466</u>

Alhur, A. (2024). Redefining Healthcare With Artificial Intelligence (AI): TheContributionsofChatGPT,Gemini,andCo-pilot.Curēus.https://doi.org/10.7759/cureus.57795

Alhur, A. (2024). Redefining Healthcare With Artificial Intelligence (AI): The Contributions of ChatGPT, Gemini, and Co-pilot. Curēus. https://doi.org/10.7759/cureus.57795

Alshahrani, A. (2023). The impact of ChatGPT on blended learning: Current trends and future research directions. <u>https://www.semanticscholar.org/paper/The-impact-of-ChatGPT-on-blended-learning%3A-Current-</u>

Alshahrani/b155b933ab9b62b0f3da3018e545decbe546273f#citing-papers

Architect, A. K. M. C. (2024, February 10). Bard is Now Gemini: A Complete Technical Breakdown - ANIL KUMAR | Multi-Cloud Architect - Medium. Medium. <u>https://medium.com/@gcp.akp/bard-is-now-gemini-a-complete-technical-</u> <u>breakdown-1e4eb5f3b213</u>

Ashfaq, M., Yun, J., Yu, S., & Loureiro, S. M. C. (2020). I, Chatbot: Modeling the determinants of users' satisfaction and continuance intention of AI-powered service agents. Telematics and Informatics, 54, 101473. <u>https://doi.org/10.1016/j.tele.2020.101473</u> Assareh, E., & Ghafouri, A. (2023). An innovative compressed air energy storage (CAES) using hydrogen energy integrated with geothermal and solar energy technologies: A comprehensive techno-economic analysis - different climate areasusing artificial intelligent (AI). International Journal of Hydrogen Energy, 48(34), 12600–12621. https://doi.org/10.1016/j.ijhydene.2022.11.233

Aydin, G., & Burnaz, S. (2016). Adoption of mobile payment systems: a study on mobile wallets. Journal of Business, Economics and Finance, 5(1), 73. https://doi.org/10.17261/pressacademia.2016116555

Barsha, S., & Munshi, S. A. (2023). Implementing artificial intelligence in library services: a review of current prospects and challenges of developing countries. Library Hi Tech News, 41(1), 7–10. <u>https://doi.org/10.1108/lhtn-07-2023-0126</u>

Boucher, M. (2024, February 21). Revolutionizing recall: How AI's new frontier with Gemini 1.5 transforms data retention. O3. https://www.o3world.com/perspectives/revolutionizing-recall-how-ais-new-frontier-with-gemini-1-5-transforms-data-retention/

Busch, F., Adams, L. C., & Bressem, K. K. (2023). Biomedical Ethical Aspects Towards the Implementation of Artificial Intelligence in Medical Education. Medical Science Educator, 33(4), 1007–1012. <u>https://doi.org/10.1007/s40670-023-01815-x</u>

Buzzaccarini, G., Degliuomini, R. S., & Borin, M. (2023). The Artificial Intelligence application in Aesthetic Medicine: How ChatGPT can Revolutionize the Aesthetic World. Aesthetic Plastic Surgery, 47(5), 2211–2212. https://doi.org/10.1007/s00266-023-03416-w

Carroll, J. M. (2009). Human computer interaction (HCI). Interaction Design Encyclopedia. Retrieved on June, 6, 2010. https://snoopedu.com/app/uploads/2022/03/Reading1_HCI.pdf

Chakrabarti, S., Chakrabarti, S., & Swetapadma, A. (2018). A Review on Various Artificial Intelligence Techniques Used for Transmission Line Fault Location. <u>https://doi.org/10.1109/icict43934.2018.9034333</u>

Chao, N. H. (2005). The Non-Specific Intelligent Guided-View System Based on RFID Technology. <u>https://doi.org/10.1109/aina.2005.327</u>

Chatterjee, S., & Bhattacharjee, K. K. (2020). Adoption of artificial intelligence in higher education: a quantitative analysis using structural equation

modelling. Education and Information Technologies, 25(5), 3443–3463. https://doi.org/10.1007/s10639-020-10159-7

Chaudhry, M. A., Cukurova, M., & Luckin, R. (2022). A Transparency Index Framework for AI in Education. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2206.03220

Chen, C. W. (2010). Impact of quality antecedents on taxpayer satisfaction with online tax-filing systems—An empirical study. Information & Management, 47(5–6), 308–315. https://doi.org/10.1016/j.im.2010.06.005

Chen, H., Wang, J., & Meng, M. Q. H. (2022). Kinova Gemini: Interactive Robot Grasping with Visual Reasoning and Conversational AI. arXiv (Cornell University). <u>https://doi.org/10.48550/arxiv.2209.01319</u>

Chen, J., Hu, S., Zhu, S., & Li, T. (2022). Metamaterials: From fundamental physics to intelligent design. Interdisciplinary Materials, 2(1), 5–29. https://doi.org/10.1002/idm2.12049

Chen, S. C., & Shang, S. S. C. (2021). Sustaining User Experience in a Smart System in the Retail Industry. Sustainability, 13(9), 5090. https://doi.org/10.3390/su13095090

Chen, S. Y., Su, Y. S., Ku, Y. Y., Lai, C. F., & Hsiao, K. L. (2022). Exploring the factors of students' intention to participate in AI software development. Library Hi Tech. https://doi.org/10.1108/lht-12-2021-0480

Chen, T., Guo, W., Gao, X., & Liang, Z. (2021). AI-based self-service technology in public service delivery: User experience and influencing factors. Government Information Quarterly, 38(4), 101520. https://doi.org/10.1016/j.giq.2020.101520

Chi, E. A., Chi, G., Tsui, C. T., Jiang, Y., Jarr, K., Kulkarni, C. V., Zhang, M., Long, J., Ng, A. Y., Rajpurkar, P., & Sinha, S. R. (2021). Development and Validation of an Artificial Intelligence System to Optimize Clinician Review of Patient Records. JAMA Network Open, 4(7), e2117391. https://doi.org/10.1001/jamanetworkopen.2021.17391

Chu, C. H., Nyrup, R., Leslie, K., Shi, J., Bianchi, A., Lyn, A., McNicholl, M., Khan, S., Rahimi, S., & Grenier, A. (2022). Digital Ageism: Challenges and Opportunities in Artificial Intelligence for Older Adults. the Gerontologist/theGerontologist, 62(7), 947–955. https://doi.org/10.1093/geront/gnab167

Chuttur, Mohammad. (2009). Overview of the Technology Acceptance Model: Origins, Developments and Future Directions. Sprouts: Working Papers on Information Systems. 9. <u>https://www.researchgate.net/publication/277766395_Overview_of_the_Technology</u> <u>Acceptance_Model_Origins_Developments_and_Future_Directions/citation/downl</u> oad

COMPREHENSIVEREVIEWOFENHANCINGLEARNINGEXPERIENCESfile:///C:/Users/User/Downloads/1011-Article%20Text-2494-1-10-20240409.pdf

Cornwall, J., Hildebrandt, S., Champney, T. H., & Goodman, K. (2023). Ethical concerns surrounding artificial intelligence in anatomy education: Should AI human body simulations replace donors in the dissection room? Anatomical Sciences Education. <u>https://doi.org/10.1002/ase.2335</u>

Cukurova, M., Kent, C., & Luckin, R. (2019). Artificial intelligence and multimodal data in the service of human decision-making: A case study in debate tutoring. British Journal of Educational Technology, 50(6), 3032–3046. https://doi.org/10.1111/bjet.12829

Datacenters.com Artificial Intelligence (17 May 2024), Google Unveils Next Era of AI Advancements. <u>https://www.datacenters.com/news/google-unveils-next-era-of-ai-advancements</u>

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. Management Information Systems Quarterly, 13(3), 319. <u>https://doi.org/10.2307/249008</u>

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. Management Science, 35(8), 982–1003. <u>https://doi.org/10.1287/mnsc.35.8.982</u>

Davydov Consulting (2023, December 12). Google Unveils Revolutionary AI:Geminiin2023.(2023, Decemberhttps://www.davydovconsulting.com/post/google-unveils-revolutionary-ai-gemini-in-2023

De Oliveira Santini, F., Ladeira, W. J., Sampaio, C. H., & Da Silva Costa, G. (2017). Student satisfaction in higher education: a meta-analytic study. Journal of Marketing for Higher Education, 27(1), 1–18. https://doi.org/10.1080/08841241.2017.1311980

De Oliveira Silva, A., & Janes, D. D. S. (2020). Exploring the Role of Artificial Intelligence in Education: A Comprehensive Perspective. Review of Artificial Intelligence in Education, 1(00), e05. <u>https://doi.org/10.37497/rev.artif.intell.education.v1i00.5</u>

De Oliveira Silva, A., & Janes, D. D. S. (2021). The Emergence of ChatGPT and its Implications for Education and Academic Research in the 21st Century. https://www.semanticscholar.org/paper/The-Emergence-of-ChatGPT-and-its-Implications-for-Silva-Janes/ab2100438bd991f2728d3307d2b9ae0e776ebe43

Dempere, J., Modugu, K., Kumar, A. L., & Ramasamy, H. (2023). The impact of ChatGPT on higher education. Frontiers in Education, 8, 1206936. https://www.frontiersin.org/articles/10.3389/feduc.2024.1354929

Diaz, M. (2024, June 13). ChatGPT vs. Microsoft Copilot vs. Gemini: Which is the best AI chatbot? ZDNET. <u>https://www.zdnet.com/article/chatgpt-vs-microsoft-</u> copilot-vs-gemini-which-is-the-best-ai-chatbot/

Doyle, D. T. (2021). TOWARDS OPERATIONALIZING WHITE MALE ACCOUNTABILITY IN ARTIFICIAL INTELLIGENCE DEVELOPMENT INTERROGATING IMPACTS OF AND SOLUTIONS TO OVERREPRESENTATION UTILIZING RELATIONAL ETHICS FRAMEWORKS. Selected Papers of Internet Research. <u>https://doi.org/10.5210/spir.v2021i0.11902</u>

Ennals, R. (1990). Practical Applications of Artificial Intelligence in Education and Training. In Artificial intelligence and society (pp. 205–211). https://doi.org/10.1007/978-1-4471-1729-2 22

Farid, Y., Gutierrez, L. F. B., Ortiz, S., Gallego, S., Zambrano, J. C., Morrelli, H. U., & Patron, A. (2024). Artificial Intelligence in Plastic Surgery: Insights from Plastic Surgeons, Education Integration, ChatGPT's Survey Predictions, and the Path Forward. Plastic and Reconstructive Surgery. Global Open, 12(1), e5515. https://doi.org/10.1097/gox.00000000005515 Farrelly, T., & Baker, N. (2023). Generative Artificial Intelligence: Implications and Considerations for Higher Education Practice. Education Sciences, 13(11), 1109. <u>https://doi.org/10.3390/educsci13111109</u>

Frair, K., & Froyd, J. (2020). Theoretical Foundations For The Foundation Coalition Core Competencies. <u>https://doi.org/10.18260/1-2--8860</u>

Francois St-Hilaire; Dung D. Vu; Antoine Frau; Nathan Burns; Farid Faraji; Joseph Potochny; Stephane Robert; Arnaud Roussel; Selene Zheng; Taylor Glazier; Junfel Vincent Romano; Robert Belfer; Muhammad Shayan; Ariella Smofsky; Tommy Delarosbil; Seulmin Ahn; Simon Eden-Walker; Kritika Sony; Ansona Onyi Ching; Sabina Elkins; A. Stepanyan; Adéla Matajová; Victor Chen; Hossein Sahraei; Robert Larson; N. Markova; Andrew Barkett; Laurent Charlin; Y. Bengio; Iulian Serban; E. Kochmar (2022); "A New Era: Intelligent Tutoring Systems Will Transform Online Learning for Millions", ARXIV. <u>https://ar5iv.labs.arxiv.org/html/2203.03724</u>

Fu, Chung-Jen & Silalahi, Andri & Shih, I-Tung & Phuong, Do & Eunike, Ixora Javanisa & Jargalsaikhan, Shinetsetseg. (2024). Balancing Satisfaction and Clarity: Enhancing User Information Satisfaction with AI-Powered ChatGPT in Higher Education. <u>http://dx.doi.org/10.20944/preprints202402.0040.v1</u>

Gao, B., & Huang, L. (2019). Understanding interactive user behavior in smart media content service: An integration of TAM and smart service belief factors. Heliyon, 5(12), e02983. <u>https://doi.org/10.1016/j.heliyon.2019.e02983</u>

García-Porta, N., Vaughan, M., Rendo-González, S., Gómez-Varela, A. I., O'Donnell, A., De-Moura, J., Novo-Bujan, J., & Ortega-Hortas, M. (2024). Are artificial intelligence chatbots a reliable source of information about contact lenses? Contact Lens and Anterior Eye, 47(2), 102130. https://doi.org/10.1016/j.clae.2024.102130

Garrett, N., Beard, N., & Fiesler, C. (2020). More Than "If Time Allows." https://doi.org/10.1145/3375627.3375868

Gates, B. (2023, March 21). The Age of AI has begun. gatesnotes.com. <u>https://www.gatesnotes.com/The-Age-of-AI-Has-Begun</u>

Graesser, A. C., VanLehn, K., Rosé, C. P., Jordan, P. W., & Harter, D. (2001). Intelligent tutoring systems with conversational dialogue. 22(4), 39–51. <u>https://doi.org/10.1609/aimag.v22i4.1591</u> Haidar, Ahmad. (2024). ChatGPT and Generative AI in Educational Ecosystems: Transforming Student Engagement and Ensuring Digital Safety. 10.4018/979-8-3693-1536-1.ch004.

Harati, H., Sujo-Montes, L., Tu, C. H., Armfield, S. J., & Yen, C. J. (2021). Assessment and Learning in Knowledge Spaces (ALEKS) Adaptive System Impact on Students' Perception and Self-Regulated Learning Skills. Education Sciences, 11(10), 603. <u>https://doi.org/10.3390/educsci11100603</u>

Hassan, L. H., Moghavvemi, M., & Mohamed, H. A. (2009). Power system stabilization based on artificial intelligent techniques; A review. https://doi.org/10.1109/techpos.2009.5412107

Hegarty C (1996) 'Statutor: Intelligent Tutoring System?', BILETA '96 Conference Proceedings, 1996 (3) The Journal of Information, Law and Technology (JILT). <http://elj.warwick.ac.uk/elj/jilt/bileta/1996/3hegarty/>. New citation as at 1/1/04: <u>http://www2.warwick.ac.uk/fac/soc/law/elj/jilt/1996_3/special/hegarty/</u>

Ho, I. M. K., Cheong, K. Y., & Weldon, A. (2021). Predicting student satisfaction of emergency remote learning in higher education during COVID-19 using machine learning techniques. PloS One, 16(4), e0249423. https://doi.org/10.1371/journal.pone.0249423

Hoeschl, M. B., Bueno, T. C., & Hoeschl, H. C. (2017). Fourth IndustrialRevolution and the future of Engineering: Could Robots Replace Human Jobs? HowEthical Recommendations can Help Engineers Rule on Artificial Intelligence. 20177thWorldEngineeringEducationForum(WEEF).https://doi.org/10.1109/weef.2017.8466973

Holstein, K., McLaren, B. M., & Aleven, V. (n.d.). Co-Designing a Real-Time Classroom Orchestration Tool to Support Teacher-AI Complementarity. <u>https://eric.ed.gov/?id=ED618924</u>

Hong, D., & Cho, C. H. (2022). Factors Affecting Innovation Resistance of Smartphone AI Voice Assistants. International Journal of Human-computer Interaction, 39(13), 2557–2572. <u>https://doi.org/10.1080/10447318.2022.2080899</u>

Huang, J., Saleh, S., & Liu, Y. (2021). A Review on Artificial Intelligence in Education. Academic Journal of Interdisciplinary Studies, 10(3), 206. https://doi.org/10.36941/ajis-2021-0077 Hudson, A. (2024, February 18). Which Generative AI Is the Best? ChatGPT vs. Gemini vs. Pi vs. Claude 2. <u>https://www.linkedin.com/pulse/which-generative-ai-best-chatgpt-vs-gemini-pi-claude-2-alena-gorb-z6nhe</u>

Hwang, R. C., Chen, Y. J., & Huang, H. C. (2010). Artificial intelligentanalyzer for mechanical properties of rolled steel bar by using neural networks. ExpertSystemsWithApplications,37(4),3136–3139.https://doi.org/10.1016/j.eswa.2009.09.069

IEEE Global Initiative. (2016). Ethically Aligned Design (EAD) v1. https://standards.ieee.org/wp-content/uploads/import/documents/other/ead_v1.pdf

International Baccalaureate®. (2023, June 06). Our mission. https://www.ibo.org/about-the-ib/mission/

International Forum of Educational Technology & Society (2012, July), Journal Education

Ioan-Andrei Cursaru & Laura Léger (2024, March 1). The Challenge of Crafting Ethical, Diverse, and Accurate AI: A Case Study on Google's Gemini. CYIS. <u>https://www.cyis.org/post/the-challenge-of-crafting-ethical-diverse-and-accurate-ai-a-case-study-on-google-s-gemini</u>

Iyer, S. S. (2022). Adopting a Student Centric Education Blockchain System. International Journal of Information and Communication Sciences, 7(3), 48–65. <u>https://doi.org/10.11648/j.ijics.20220703.11</u>

Jahic, J., Roitsch, R., & Grzymkowski, L. (2021). Knowledge-based Adequacy assessment Approach to support AI adoption. <u>https://doi.org/10.1109/icsa-c52384.2021.00008</u>

Jarina, Nur Izzatysyafiqa, Puteri Nurafilah & Mizaria (2019), Customer Acceptance Towards Self-Service Technology At Mcdonald 'S, Journal of Politeknik Malaysia, issues December, pp 13.

Jayakumar, P., Moore, M. G., Furlough, K. A., Uhler, L. M., Andrawis, J. P., Koenig, K. M., Aksan, N., Rathouz, P. J., & Bozic, K. J. (2021). Comparison of an Artificial Intelligence–Enabled Patient Decision Aid vs Educational Material on Decision Quality, Shared Decision-Making, Patient Experience, and Functional Outcomes in Adults With Knee Osteoarthritis. JAMA Network Open, 4(2), e2037107. https://doi.org/10.1001/jamanetworkopen.2020.37107 Jiang, H., Islam, A. Y. M. A., Gu, X., & Spector, J. M. (2021). Online learning satisfaction in higher education during the COVID-19 pandemic: A regional comparison between Eastern and Western Chinese universities. Education and Information Technologies, 26(6), 6747–6769. <u>https://doi.org/10.1007/s10639-021-10519-x</u>

Jung, S. (2023). Challenges for future directions for artificial intelligence integrated nursing simulation education. Korean Journal of Women Health Nursing/Yeoseong Geon'gang Ganho Hag'hoeji/Yeoseong Geon-gang Ganho Hakoeji, 29(3), 239–242. <u>https://doi.org/10.4069/kjwhn.2023.09.06.1</u>

K, C. (2024, April 22). Getting Started with Gemini 1.5 Pro and Google AI Studio: Medium. <u>https://medium.com/the-ai-archives/getting-started-with-gemini-1-5-pro-and-google-ai-studio-8f0064050ecf</u>

Kaftan, A. N., Hussain, M. K., & Naser, F. H. (2024). Response accuracy of ChatGPT 3.5 Copilot and Gemini in interpreting biochemical laboratory data a pilot study. Scientific Reports, 14(1). <u>https://doi.org/10.1038/s41598-024-58964-1</u>

Kaledio, P., Robert, A., & Frank, L. (2024). The Impact of Artificial Intelligence on Students' Learning Experience. Social Science Research Network. https://doi.org/10.2139/ssrn.4716747

Karthik. (2023, December 8). Gemini 1.0: Transforming Possibilities in AI — The Complete Breakdown. Medium. <u>https://karthikvegeta.medium.com/gemini-1-0-</u> <u>transforming-possibilities-in-ai-the-complete-breakdown-e160f7e314b3</u>

Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., . . . Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Khan, R. A., Jawaid, M., Khan, A. R., & Sajjad, M. (2023). ChatGPT -Reshaping medical education and clinical management. Pakistan Journal of Medical Sciences, 39(2). <u>https://doi.org/10.12669/pjms.39.2.7653</u>

Kim, W. (2021, June 1). A Design-Based Research on Application of Artificial Intelligence(AI) Teaching- Learning Model in Elementary School. earticle. <u>https://m.earticle.net/Article/A397203</u>

Kraus, S., Azaria, A., Fiosina, J., Greve, M., Hazon, N., Kolbe, L. M., Lembcke, T. B., Müller, J. P., Schleibaum, S., & Vollrath, M. (2020). AI for Explaining Decisions in Multi-Agent Environments. Proceedings of the . . . AAAI Conference on Artificial Intelligence, 34(09), 13534–13538. <u>https://doi.org/10.1609/aaai.v34i09.7077</u>

Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, O. M. D., Păun, D., & Mihoreanu, L. (2021). Exploring Opportunities and Challenges of Artificial Intelligence and Machine Learning in Higher Education Institutions. Sustainability, 13(18), 10424. <u>https://doi.org/10.3390/su131810424</u>

Kuleto, Valentin & Ilić, Milena & Dumangiu, Mihail & Ranković, Marko & Martins, Oliva & Păun, Dan & Mihoreanu, Larisa. (2021). Exploring Opportunities and Challenges of Artificial Intelligence and Machine Learning in Higher Education Institutions. Sustainability. 13. 10424. 10.3390/su131810424.

Kumar, D., Haque, A., Mishra, K., Islam, F., Mishra, B. K., & Ahmad, S. (2023). Exploring the Transformative Role of Artificial Intelligence and Metaverse in Education: A Comprehensive Review. Metaverse Basic Appl. Res., 2, 55. https://doi.org/10.56294/mr202355

Kunda, M. (2021). The AI Triplet: Computational, Conceptual, and Mathematical Knowledge in AI Education. arXiv (Cornell University). <u>https://doi.org/10.48550/arxiv.2110.09290</u>

Kurian, T. (2024, April 9). Welcome to Google Cloud Next '24. Google Cloud Blog. <u>https://cloud.google.com/blog/topics/google-cloud-next/welcome-to-google-cloud-next24</u>

Lau, J. (2024, June 3). Gemini vs. ChatGPT: What's the difference? https://zapier.com/blog/gemini-vs-chatgpt/

Learn how to Use AI for Your Business. (2024, May 13). TechRepublic. https://www.techrepublic.com/article/chatgpt-gemini-ai-advanced-e-degree/

Lee, B. C., Yoon, J. O., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: Theories and results. Computers and Education/Computers & Education, 53(4), 1320–1329. <u>https://doi.org/10.1016/j.compedu.2009.06.014</u>

Lee, S., Shin, B., & Lee, H. (2009). Understanding Post-adoption Usage of Mobile Data Services: The Role of Supplier-side Variables. Journal of the Association for Information Systems, 10(12), 860–888. <u>https://doi.org/10.17705/1jais.00217</u> Lee, T. J., Campbell, D. J., Patel, S., Hossain, A., Radfar, N., Siddiqui, E., & Gardin, J. M. (2024). Unlocking Health Literacy: The Ultimate Guide to Hypertension Education From ChatGPT Versus Google Gemini. Curēus. https://doi.org/10.7759/cureus.59898

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. Information & Management, 40(3), 191–204. <u>https://doi.org/10.1016/s0378-7206(01)00143-4</u>

Li, Y., & Vanapalli, S. K. (2021). Prediction of soil-water characteristic curves using two artificial intelligence (AI) models and AI aid design method for sands. Canadian Geotechnical Journal, 59(1), 129–143. <u>https://doi.org/10.1139/cgj-2020-0562</u>

Li, Y., Zhong, Z., Zhang, F., & Zhao, X. (2022). Artificial Intelligence-Based Human–Computer Interaction Technology Applied in Consumer Behavior Analysis and Experiential Education. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.784311

Limna, P., Kraiwanit, T., Jangjarat, K., Klayklung, P., & Chocksathaporn, P. (2023). The use of ChatGPT in the digital era: Perspectives on chatbot implementation. Journal of Applied Learning & Teaching, 6(1). https://doi.org/10.37074/jalt.2023.6.1.32

Liu, N. F., Ping, N., & Yang, N. M. (2005). A validation methodology for AI simulation models. <u>https://doi.org/10.1109/icmlc.2005.1527652</u>

Livemint. (2024, March 4). Google issues apology to India over AI controversy; Gemini's reliability questioned: Report | Mint. Mint. <u>https://www.livemint.com/technology/tech-news/google-issues-apology-to-india-</u> over-ai-controversy-geminis-reliability-questioned-report-11709538187976.html

Lu, C., Morton, D., Myler, P., & Wu, M. (1995). An artificial intelligent (AI) inspection path management for multiple tasks measurement on co-ordinate measuring machine (CMM): an application of neural network technology. https://doi.org/10.1109/iemc.1995.524608

Masalkhi, M., Ong, J., Waisberg, E., & Lee, A. G. (2024). Google DeepMind's gemini AI versus ChatGPT: a comparative analysis in ophthalmology. Eye. https://doi.org/10.1038/s41433-024-02958-w Maureira, C., Pinto, H., Yepes, V., & Garcia, J. (2021). Towards an AEC-AI Industry Optimization Algorithmic Knowledge Mapping: An Adaptive Methodology for Macroscopic Conceptual Analysis. IEEE Access, 9, 110842–110879. https://doi.org/10.1109/access.2021.3102215

McClure, P. (2024, May 6). Google's medical AI destroys GPT's benchmark and outperforms doctors. New Atlas. <u>https://newatlas.com/technology/google-med-gemini-ai/</u>

McIntosh, T. R., Susnjak, T., Liu, T., Watters, P., & Halgamuge, M. N. (2023). From Google Gemini to OpenAI Q* (Q-Star): A Survey of Reshaping the Generative Artificial Intelligence (AI) Research Landscape. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2312.10868

Meral, G., Ateş, S., Günay, S., Öztürk, A., & Kuşdoğan, M. (2024). Comparative analysis of ChatGPT, Gemini and emergency medicine specialist in ESI triage assessment. the American Journal of Emergency Medicine, 81, 146–150. https://doi.org/10.1016/j.ajem.2024.05.001

Merchant, S. (2024, March 20). Google's Gemini vs ChatGPT. Alumio. https://www.alumio.com/blog/googles-gemini-vs-chatgpt.

Merrill, D. C., Reiser, B. J., Ranney, M., & Trafton, J. G. (1992). Effective Tutoring Techniques: A Comparison of Human Tutors and Intelligent Tutoring Systems. The Journal of the Learning Sciences, 2(3), 277–305. <u>http://www.jstor.org/stable/1466610</u>

Meuter, M. L., Bitner, M. J., Ostrom, A. L., & Brown, S. W. (2005). Choosing among alternative service delivery modes: An investigation of customer trial of selfservice technologies. Journal of marketing, Vol 69(2), pp 61-83. Retrieved from http://dx.doi.org/10.1509/jmkg.69.2.61.60759

Miller, J., & Khera, O. (2010). Digital Library Adoption and the Technology Acceptance Model: A Cross-Country Analysis. the Electronic Journal on Information Systems in Developing Countries, 40(1), 1–19. <u>https://doi.org/10.1002/j.1681-</u> <u>4835.2010.tb00288.x</u>

Monica Ciolacu; Ali Fallah Tehrani; Leon Binder; Paul Mugur Svasta (2018). "Education 4.0 - Artificial Intelligence Assisted Higher Education: Early Recognition System with Machine Learning to Support Students' Success. IEEE Conference Publication | IEEE Xplore. https://ieeexplore.ieee.org/document/8599203 Narayan, R., Gehlot, A., Singh, R., Akram, S. V., Priyadarshi, N., & Twala, B. (2022). Hospitality Feedback System 4.0: Digitalization of Feedback System with Integration of Industry 4.0 Enabling Technologies. Sustainability, 14(19), 12158. https://doi.org/10.3390/su141912158

Nazaretsky, T., Bar, C., Walter, M., & Alexandron, G. (2022). Empowering Teachers with AI: Co-Designing a Learning Analytics Tool for Personalized Instruction in the Science Classroom. <u>https://doi.org/10.1145/3506860.3506861</u>

Ng, D. T. K., Chu, S. K. W., Shen, M. Q., & Leung, J. K. L. (2021). AI Literacy: Definition, Teaching, Evaluation and Ethical Issues. ResearchGate. <u>https://www.researchgate.net/publication/352899612_AI_Literacy_Definition_Teaching_Evaluation_and_Ethical_Issues</u>

Nguyen, T., & Malik, A. (2021). A Two-Wave Cross-Lagged Study on AI Service Quality: The Moderating Effects of the Job Level and Job Role. British Journal of Management, 33(3), 1221–1237. <u>https://doi.org/10.1111/1467-8551.12540</u>

 NSF - National Science Foundation (2024 March 04) Artificial Intelligence,

 Formal
 Methods,
 and
 Mathematical
 Reasoning.

 https://new.nsf.gov/funding/opportunities/artificial-intelligence-formal methods/nsf24-554/solicitation
 Hethods

Ohlsson, S. (1986). Some principles of intelligent tutoring. Instructional Science, 14(3–4), 293–326. <u>https://doi.org/10.1007/bf00051825</u>

Oladele, J. I., & Ndlovu, M. (2021, June 26). A Review of Standardised Assessment Development Procedure and Algorithms for Computer Adaptive Testing: Applications and Relevance for Fourth Industrial Revolution. Oladele | International Journal of Learning, Teaching and Educational Research. <u>https://www.ijlter.org/index.php/ijlter/article/view/3551</u>

Oliver, R. L., & Swan, J. E. (1989). Consumer Perceptions of Interpersonal Equity and Satisfaction in Transactions: A Field Survey Approach. Journal of Marketing, 53(2), 21–35. <u>https://doi.org/10.1177/002224298905300202</u>

Ong, C. S., Day, M. Y., & Hsu, W. L. (2009). The measurement of user satisfaction with question answering systems. Information & Management, 46(7), 397–403. <u>https://doi.org/10.1016/j.im.2009.07.004</u>

Onesi-Ozigagun, N. O., Ololade, N. Y. J., Eyo-Udo, N. N. L., & Ogundipe, N. D. O. (2024). REVOLUTIONIZING EDUCATION THROUGH AI: a

COMPREHENSIVE REVIEW OF ENHANCING LEARNING EXPERIENCES. International Journal of Applied Research in Social Sciences, 6(4), 589–607. https://doi.org/10.51594/ijarss.v6i4.1011

Owens, E., Sheehan, B., Mullins, M., Cunneen, M., Ressel, J., & Castignani, G. (2022). Explainable Artificial Intelligence (XAI) in Insurance. Risks, 10(12), 230. https://doi.org/10.3390/risks10120230

Panigrahi, A. (2020). Role of Artificial Intelligence in Education. Social Science Research Network. <u>https://doi.org/10.2139/ssrn.3666702</u>

Parmar, S. (2023, December 11). How Will Gemini AI Benefit Salesforce Professionals? SaaS Guru. <u>https://www.saasguru.co/how-will-gemini-ai-benefit-</u> salesforce-professionals/

Perera, P., & Lankathilake, M. (2023). Preparing to Revolutionize Education with the Multi-Model GenAI Tool Google Gemini? A Journey towards Effective Policy Making. Journal of Advances in Education and Philosophy, 7(08), 246–253. https://doi.org/10.36348/jaep.2023.v07i08.001

Plitnichenko, L. (2021, May 12). 5 Main Roles Of Artificial Intelligence In Education. eLearning Industry. <u>https://elearningindustry.com/5-main-roles-artificial-intelligence-in-education</u>

Pogla, M. (2024, March 1). Elevate Your Game with Google Gemini AI: A Comprehensive Overview. AutoGPT Official. <u>https://autogpt.net/elevate-your-game-with-google-gemini-ai-a-comprehensive-overview/</u>

Polson, M. C., Richardson, J. J., & Soloway, E. (1988). Foundations of Intelligent Tutoring Systems. Psychology Press. http://books.google.ie/books?id=vOxGYQ-

N3egC&printsec=frontcover&dq=Martha+C.+Polson%3B+J.+J.+Richardson%3B++ %22Foundations+of+Intelligent+Tutoring+Systems%22,++1988.&hl=&cd=1&sourc e=gbs_api

Qi, Y., & Xu, R. (2024). Research on User Interface Design and Interaction Experience: A Case Study from "Duolingo" Platform. ICST Transactions on Scalable Information Systems, 11(5). <u>https://doi.org/10.4108/eetsis.5461</u>

Qian Yang; Aaron Steinfeld; John Zimmerman (2019. "Unremarkable AI: Fitting Intelligent Decision Support Into Critical, Clinical Decision-Making Processes",

ARXIV-CS.HC.

chrome-

extension://efaidnbmnnnibpcajpcglclefindmkaj/https://arxiv.org/pdf/1904.09612

R, P., Sanjaya, K., Rathika, S., Alawadi, A. H., Makhzuna, K., Venkatesh, S., & Rajalakshmi, B. (2023). Human-Computer Interaction: Enhancing User Experience in Interactive Systems. E3S Web of Conferences, 399, 04037. https://doi.org/10.1051/e3sconf/202339904037

Renz, A., & Hilbig, R. (2020). Prerequisites for artificial intelligence in further education: identification of drivers, barriers, and business models of educational technology companies. International Journal of Educational Technology in Higher Education, 17(1). https://doi.org/10.1186/s41239-020-00193-3

Richard. L. (2023). Google admits that a Gemini AI demo video was staged : r/technology <u>https://www.engadget.com/google-admits-that-a-gemini-ai-demo-video-</u> was-staged-055718855.html? fsig=x7XFBZh0ZTx3mE5nnZLuiQ--%7EA

Rivas, P., & Zhao, L. (2023). Marketing with ChatGPT: Navigating the Ethical Terrain of GPT-Based Chatbot Technology. AI, 4(2), 375–384. https://doi.org/10.3390/ai4020019

Robotic Marketer. (2023, August 29). Gemini's Unique Advantages in Marketing Over Other AI Tools: Why It Stands Out in the Marketing Realm. <u>https://www.roboticmarketer.com/the-benefits-of-gemini-over-other-ai-tools-why-it-stands-out-in-the-marketing-realm/</u>

Rodway, P., & Schepman, A. (2023). The impact of adopting AI educationaltechnologies on projected course satisfaction in university students. Computers andEducation.ArtificialIntelligence,5,https://doi.org/10.1016/j.caeai.2023.100150

Saeidnia, H. R. (2023). Welcome to the Gemini era: Google DeepMind and the information industry. Library Hi Tech News. <u>https://doi.org/10.1108/lhtn-12-2023-0214</u>

Satterfield, D., & Abel, T. D. (2020). AI Is the New UX: Emerging Research Innovations in AI, User Experience, and Design as They Apply to Industry, Business, and Education, and Ethics. In Advances in intelligent systems and computing (pp. 182– 188). https://doi.org/10.1007/978-3-030-51057-2_26

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2023).Saunders ResearchMethods.PearsonHigherEd.

http://books.google.ie/books?id=zoy1EAAAQBAJ&dq=Research+method+for+busi ness+students+Saunders+2023&hl=&cd=1&source=gbs_api

Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. International Journal of Educational Technology in Higher Education, 18(1). https://doi.org/10.1186/s41239-021-00292-9

 Shute, V. J., & Psotka, J. (1994). Intelligent Tutoring Systems: Past, Present,

 and
 Future.

 ResearchGate.

 https://www.researchgate.net/publication/235108246_Intelligent_Tutoring_Systems_

 Past_Present_and_Future

Singh, B. S. R. (2024, February 24). Google clarifies Gemini AI not reliable on political topics after AI's 'biased' reply on Modi. BusinessLine. <u>https://www.thehindubusinessline.com/info-tech/google-clarifies-gemini-ai-not-</u> <u>reliable-on-political-topics-after-ais-biased-reply-on-modi/article67881384.ece</u>

Smith, J. D. (2019). Analysing the Impact of Artificial Intelligence and Computational Sciences on Student Performance: Systematic Review and Metaanalysis. [EJ1375397]. Retrieved from <u>https://files.eric.ed.gov/fulltext/EJ1375397.pdf</u>

Su, J., & Yang, W. (2023). Unlocking the Power of ChatGPT: A Framework for Applying Generative AI in Education. ECNU Review of Education, 6(3), 355–366. <u>https://doi.org/10.1177/20965311231168423</u>

Suárez, A., Adanero, A., García, V. D. F., Freire, Y., & Algar, J. (2022). Using a Virtual Patient via an Artificial Intelligence Chatbot to Develop Dental Students' Diagnostic Skills. International Journal of Environmental Research and Public Health/International Journal of Environmental Research and Public Health, 19(14), 8735. <u>https://doi.org/10.3390/ijerph19148735</u>

Sylvestre, R. (2024, March 27). Google Gemini: Digital Marketing withMultimodalAI.NoGoodTM:GrowthMarketingAgency.https://nogood.io/2023/12/15/google-gemini/

Tahiru, F. (2021). AI in Education. Journal of Cases on Information Technology, 23(1), 1–20. <u>https://doi.org/10.4018/jcit.2021010101</u>

Tang, Z., Shao, K., Zhu, Y., Li, D., Zhao, D., & Huang, T. (2018). A Review ofComputationalIntelligenceforStarCrafthttps://doi.org/10.1109/ssci.2018.8628682

Team, G., Anil, R., Borgeaud, S., Alayrac, J. B., Yu, J., Soricut, R., Schalkwyk, J., Dai, A. M., Hauth, A., Millican, K., Silver, D., Johnson, M., Antonoglou, I., Schrittwieser, J., Glaese, A., Chen, J., Pitler, E., Lillicrap, T., Lazaridou, A., . . . Vinyals, O. (2023, December 19). Gemini: A Family of Highly Capable Multimodal Models. arXiv.org. https://arxiv.org/abs/2312.11805

Technology

&Society

file:///C:/Users/User/Downloads/JournalofEducationalTechnologySociety.pdf

Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., Robson, R., Thabane, M., Giangregorio, L., & Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. BMC Medical Research Methodology, 10(1). <u>https://doi.org/10.1186/1471-2288-10-1</u>

The White House. (2022). The Impact of Artificial Intelligence on the Future of Workforces in the European Union and the United States of America. https://www.whitehouse.gov/wp-content/uploads/2022/12/TTC-EC-CEA-AI-Report-12052022-1.pdf

Thoresen, B. (2022, June 3). Patient satisfaction at the Durban Institute of Technology chiropractic day clinic. <u>https://doi.org/10.51415/10321/181</u>

Tsantalis, J. (2023, December 13). Google Gemini: Advantages and Benefits You Need to Know. Medium. <u>https://johntsantalis.medium.com/google-gemini-advantages-and-benefits-you-need-to-know-26e98b7cc5af</u>

Tzeng, J. W., Lee, C. A., Huang, N. F., Huang, H. H., & Lai, C. F. (2022). MOOC Evaluation System Based on Deep Learning. International Review of Research in Open and Distance Learning, 23(1), 21–40. <u>https://doi.org/10.19173/irrod1.v22i4.5417</u>

U.S. Department of Education, Office of Educational Technology, Artificial Intelligence and Future of Teaching and Learning: Insights and Recommendations, Washington, DC, 2023. chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://www2.ed.gov/documents/aireport/ai-report.pdf

U.S. Department of Education, Office of Educational Technology. (2023). Artificial Intelligence and the Future of Teaching and Learning: Insights and Recommendations. Van Der Herten, K. (2022, March 23). AI proves effective at improving patent office efficiency and application timeliness. CAS. <u>https://www.cas.org/resources/cas-insights/intellectual-property/ai-proves-effective-improving-patent-office-efficiency</u>

Van Slyke, C., Johnson, R. D., & Sarabadani, J. (2023). Generative Artificial Intelligence in Information Systems Education: Challenges, Consequences, and Responses. Communications of the Association for Information Systems, 53, 1-21. https://doi.org/10.17705/1CAIS.05301

Venkatesh, N., Morris, N., Davis, N., & Davis, N. (2003). User Acceptance of Information Technology: Toward a Unified View. Management Information Systems Quarterly, 27(3), 425. <u>https://doi.org/10.2307/30036540</u>

Vpale, K. (2021, September 22). How to Measure and Improve Timeliness of Patient Care. LinkedIn. <u>https://www.linkedin.com/pulse/how-real-time-health-monitoring-data-transforming-patient</u>

Wang, W., Chen, L., Xiong, M., & Wang, Y. (2021). Accelerating AI Adoption with Responsible AI Signals and Employee Engagement Mechanisms in Health Care. Information Systems Frontiers, 25(6), 2239–2256. <u>https://doi.org/10.1007/s10796-021-10154-4</u>

Watkins, M. (2024, February 23). ChatGPT and Gemini Advanced Talk About the Future of AI. . . with Fascinating Results. <u>https://www.linkedin.com/pulse/chatgpt-gemini-converse-futureof-themselves-michael-watkins-gccce</u>

Willcox, G. (2020). Measuring Group Personality with Swarm AI. International Journal of Transdisciplinary Artificial Intelligence, 2(1), 49–68. <u>https://doi.org/10.35708/tai1869-126249</u>

Wixom, B. H., & Todd, P. A. (2005). A Theoretical Integration of User Satisfaction and Technology Acceptance. Information Systems Research, 16(1), 85–102. <u>https://doi.org/10.1287/isre.1050.0042</u>

Wogu, N. I. a. P., Misra, S., Assibong, P. A., Olu-Owolabi, E. F., Maskeliūnas, R., & Damasevicius, R. (2019). Artificial Intelligence, Smart Classrooms and Online Education in the 21st Century. Journal of Cases on Information Technology, 21(3), 66– 79. <u>https://doi.org/10.4018/jcit.2019070105</u>

Wu, D., Xiang, Y., Wu, X., Yu, T., Huang, X., Zou, Y., Liu, Z., & Lin, H. (2020). Artificial intelligence-tutoring problem-based learning in ophthalmology clerkship. AnnalsofTranslationalMedicine,8(11),700.https://doi.org/10.21037/atm.2019.12.15

Wu, L. (2023). Agile Design and AI Integration: Revolutionizing MVP Development for Superior Product Design. International Journal of Education and Humanities, 9(1), 226–230. <u>https://doi.org/10.54097/ijeh.v9i1.9417</u>

Xie, C., Wang, Y., & Cheng, Y. (2022). Does Artificial Intelligence Satisfy You? A Meta-Analysis of User Gratification and User Satisfaction with AI-Powered Chatbots. International Journal of Human-computer Interaction, 40(3), 613–623. <u>https://doi.org/10.1080/10447318.2022.2121458</u>

Xu, J., Zhang, X., Li, H., Yoo, C., & Pan, Y. (2023). Is Everyone an Artist? A Study on User Experience of AI-Based Painting System. Applied Sciences, 13(11), 6496. <u>https://doi.org/10.3390/app13116496</u>

Xu, L. (2020). The Dilemma and Countermeasures of AI in Educational Application. <u>https://doi.org/10.1145/3445815.3445863</u>

Xu, W. (2024). A "User Experience 3.0 (UX3.0)" Paradigm Framework: User Experience Design for Human-Centered AI Systems. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2403.01609

Xu, W., Meng, J., Raja, S. K. S., Priya, M. P., & Devi, M. K. (2021). Artificial intelligence in constructing personalized and accurate feedback systems for students. Advances in Complex Systems/International Journal of Modeling, Simulation and Scientific Computing, 14(01). <u>https://doi.org/10.1142/s1793962323410015</u>

Yamssi, M., & Forde, D. (2024, May 17). Mantle uses Gemini and Vertex AI in equity management platform. Google Cloud Blog. <u>https://cloud.google.com/blog/topics/partners/mantle-uses-gemini-and-vertex-ai-in-</u> equity-management-platform

Yang, L., Xu, S., Sellergren, A., Kohlberger, T., Zhou, Y., Ktena, I., Kiraly, A., Ahmed, F., Hormozdiari, F., Jaroensri, T., Wang, E., Wulczyn, E., Jamil, F., Guidroz, T., Lau, C., Qiao, S., Liu, Y., Goel, A., Park, K., . . . Golden, D. (2024). Advancing Multimodal Medical Capabilities of Gemini. arXiv (Cornell University). https://doi.org/10.48550/arxiv.2405.03162

Yang, Q. (2021b, April 14). Profiling Artificial Intelligence as a Material for User Experience Design. <u>https://doi.org/10.1184/r1/14376731.v1</u>

Yildirim, T. M., Khoramnia, R., Masyk, M., Son, H. S., Auffarth, G. U., & Mayer, C. S. (2020). Aesthetics of iris reconstruction with a custom-made artificial iris prosthesis. PloS One, 15(8), e0237616. <u>https://doi.org/10.1371/journal.pone.0237616</u>

Yu, H., Miao, C., Leung, C. et al., (2017). Towards AI-powered personalization in MOOC learning. npj Science Learn 2, 15. <u>https://doi.org/10.1038/s41539-017-</u> 0016-3

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? International Journal of Educational Technology in Higher Education, 16(1). <u>https://doi.org/10.1186/s41239-019-0171-0</u>

Zhai, X., Chu, X., Chai, C. S., Jong, M. S. Y., Istenic, A., Spector, M., Liu, J. B., Yuan, J., & Li, Y. (2021). A Review of Artificial Intelligence (AI) in Education from 2010 to 2020. Complexity, 2021, 1–18. <u>https://doi.org/10.1155/2021/8812542</u>

Zhao, H., & Wagner, C. (2022). How TikTok leads users to flow experience: investigating the effects of technology affordances with user experience level and video length as moderators. Internet Research, 33(2), 820–849. https://doi.org/10.1108/intr-08-2021-0595

Zulhusni, M. (2024, March 20). AI and elections: Google Gemini chatbot limits info; what's their strategy? Tech Wire Asia. <u>https://techwireasia.com/03/2024/googleis-putting-the-brakes-on-ai-chatbot-geminis-election-chats/</u>

Activities	Week														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
FYP talk															
Think about FYP Topic															
First meeting with supervisor															
Confirmation of the research topic									7						
Identify the IV and DV of the research				2			•								
Make a simple research framework on template		KI	••	м	Δ	· ·	v V	5	•	ЛF					
Completed for chapter 1															
Completed for chapter 2															
Completed for chapter 3															
Meeting with supervisor for correction for three chapter															
Presentation FYP 1															
Correction of FYP 1															
Submission of FYP 1															

APPENDIX 1: GANTT CHART FOR FINAL YEAR PROJECT 1

Activities	Week														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Meeting FYP supervisor															
Create questionnaire															
meeting with supervisor to make adjustment on questionnaire															
Distribution questionnaire			Ľ	2		R	, ,	: 6	2	ر د	-j-	9 د			
Data gathering			•												
Data Analysis	Ν	K	A L	Ν	Α		Y	SL		VIE	LA	KA			
Completed for chapter 4															
Completed for chapter 5															
Preparation of slide presentation															
Presentation															
FYP 2 submission															

APPENDIX 2: GANTT CHART FOR FINAL YEAR PROJECT 2

APPENDIX 3

QUESTIONNAIRE

AI TECHNOLOGY IN SHAPING STUDENT SATISFACTION ON EDUCATION

Dear Respondent,

I am Ling Ji Wei, an undergraduate student currently pursuing a Bachelor of Technology Management (High Technology Marketing) from the Faculty of Technology Management and Technopreneurship (FPTT) at University Teknikal Malaysia Melaka (UTeM). Currently, I am undertaking my Final Year Project (FYP). Thus, I would like to invite you to participate in my final year project on "AI TECHNOLOGY IN SHAPING STUDENT SATISFACTION ON EDUCATION".

This survey consists of three sections: Section A, Section B, and Section C. This survey will only take a few minutes to complete.

All data collected will be confidential and will be used only for academic purposes. Your response are highly appreciated. Thank you.

What is Gemini?

Gemini is a powerful artificial intelligence system capable of generating humanquality text, answering questions, and completing tasks in a comprehensive and informative manner.

Similar AI Tool such as ChatGPT.

Section A: Demographic



4. Faculty

1. Gender

 \square Male

- □ Faculty of Electronics and Computer Engineering (FTKEK)
- □ Faculty of Electrical Engineering Technology (FTKE)
- □ Faculty of Mechanical Engineering Technology (FTKM)
- □ Faculty of Industrial and Manufacturing Engineering Technology (FTKIP)
- □ Faculty of Information and Communications Technology (FTMK)
- □ Faculty of Technology Management and Technopreneurship (FPTT)
- □ Institute of Technology Management and Entrepreneurship (IPTK)

Section B: Factors that influence student satisfaction with Gemini as educational tools for learning

Strongly Disagre	ee		St	rongly Agree
1	2	3	4	5



2. Gemini produces comprehensive information

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

agree

3. Gemini provides me with all the information I need

1 2 3 4 5

Strongly O O O O O Strongly

disagree

4. Gemini provide sufficient information

 $1\ 2\ 3\ 4\ 5$

Strongly O O O O O Strongly

disagree agree

5. Gemini has an excellent interface to communicate my needs

1 2 3 4 5

Strongly O O O O O Strongly

disagree agree

Accuracy

- The quality or state of being correct or precise.

I prefer to use Gemini because;

1. Information from Gemini is correct

1 2 3 4 5

Strongly O O O O O Strongly

disagree agree

2. Information from Gemini is reliable

NIVERSITI TEKNIKAL ^{1,2}3⁴5'SIA MELAK

Strongly O O O O O Strongly

disagree

3. Information from Gemini is accurate

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

agree

agree

4. The information content is consistent with my previous filing experience

1 2 3 4 5

Strongly O O O O O Strongly

disagree

5. The information from the Gemini is clear

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

agree

Precision

- The quality, condition, or fact of being exact and accurate.

I prefer to use Gemini because;

1. The responses from Gemini are generally specific and directly address my questions

1 2 3 4 5

Strongly O O O O O Strongly

disagree

2. I rarely receive vague or ambiguous information from Gemini

1 2 3 4 5

Strongly O O O O O Strongly

disagree agree

3. I find Gemini's responses to be consistently to the point 1 2 3 4 5

Strongly O O O O O Strongly

disagree

4. The Gemin1 2 3 4 5

Strongly O O O O O Strongly

disagree

i provides the right solution to my request

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

agree

agree

5. Information provided in the Gemini is relevant

1 2 3 4 5

Strongly O O O O O Strongly

agree

disagree

Reliability

- The quality of being trustworthy or of performing consistently well.

I prefer to use Gemini because;

1. Gemini rarely fails to deliver information I can rely on

1 2 3 4 5 Strongly O O O O O Strongly disagree agree 2. I trust Gemini as a dependable source of information 1 2 3 4 5 Strongly O O O O O Strongly disagree agree 3. Gemini performs reliably 1 2 3 4 5 Strongly O O O O O Strongly disagree agree 4. Gemini information is trustworthy 1 2 3 4 5 Strongly O O O O O Strongly disagree agree 5. Gemini information is reliable in serving my needs

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

Timeliness

-The fact or quality of being done or occurring at a favourable or useful time.

I prefer to use Gemini because;

1. The information provided by Gemini is up-to-date

1 2 3 4 5

Strongly O O O O O Strongly

disagree

2. The information provided by Gemini is received in a timely manner

agree

agree

agree

agree

1 2 3 4 5 Strongly O O O O O Strongly

disagree

3. It does not takes too long for Gemini to respond to my requests

1 2 3 4 5

Strongly O O O O O Strongly

disagree

4. Using Gemini helps me to accomplish things more quickly

1 2 3 4 5

Strongly O O O O O Strongly

disagree

5. Using Gemini increases my productivity

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

Convenience

- The state of being able to proceed with something without difficulty.

I prefer to use Gemini because;

1. Accessing Gemini is convenient and user-friendly

1 2 3 4 5

Strongly O O O O O Strongly

disagree

2. I find it easy to access Gemini on my preferred devices

agree

agree

agree

agree

1 2 3 4 5

Strongly O O O O O Strongly

disagree

3. I experience no significant challenges in accessing Gemini

1 2 3 4 5

Strongly O O O O O Strongly

disagree

4. My interaction with Gemini is clear and understandable

1 2 3 4 5

Strongly O O O O Strongly

disagree

5. Interaction with the Gemini does not require a lot of my mental effort

1 2 3 4 5

Strongly O O O O O Strongly

disagree agree

Format

- The way in which something is arranged or set out

I prefer to use Gemini because;

1. The format in which Gemini presents information is clear and easy to understand

1 2 3 4 5

Strongly O O O O O Strongly

disagree agree

2. I find Gemini's information presentation format user-friendly

1 2 3 4 5

Strongly O O O O O Strongly

disagree

3. The information provided by Gemini is well formatted

agree

agree

agree

1 2 3 4 5

Strongly O O O O O Strongly

disagree

4. The information provided by Gemini is well laid out

1	2	3	4	5
1	-	5		2

Strongly O O O O O Strongly

disagree

5. The information provided by Gemini is clearly presented on the screen

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

Section C: Significant positive effects of Gemini on students' education

Strongly Disagre	ee		St	rongly Agree
1	2	3	4	5

Satisfaction

-Fulfilment of one's wishes, expectations, or needs, or the pleasure derived from this.

How do you feel about your overall experience of retrieving information from Gemini?

1. I enjoy using Gemini for my learning /assignment

1 2 3 4 5

Strongly O O O O O Strongly

disagree agree 2. Using Gemini makes it easier to do my assignment. 1 2 3 4 5 Strongly O O O O O Strongly disagree agree 3. I find Gemini easy to use 1 2 3 4 5 Strongly O O O O O Strongly disagree agree

4. I use Gemini frequently for my learning/assignment

 $1 \ 2 \ 3 \ 4 \ 5$

Strongly O O O O O Strongly

disagree

5. Using Gemini enhances my effectiveness at doing assignment

1 2 3 4 5

Strongly O O O O O Strongly

disagree

agree

agree

Thank you for your respond !!