

Exploring the Impact of Generative Artificial Intelligence on Higher Education Students' Utilization of Library Resources

A Critical Examination

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ABSTRACT

In the field of higher education, generative artificial intelligence (GenAI) has become a revolutionary influence, shaping how students access and use library resources. This study explores the intricate balance of both positive and negative effects that GenAI might have on the academic library experience for higher education (HE) students. The key aspects of enhanced discovery and retrieval, personalization and engagement, streamlined research processes, and digital literacy and information evaluation potentially offered through using generative AI will be considered. These prospective advantages to HE students offered by using GenAI will be examined through will be examined through the theoretical framework of the Technological Acceptance Model (TAM) introduced by Davis et al. in 1986, which suggests that perceived usefulness and perceived ease of use are key factors in determining user acceptance and utilization of technology. The adoption of GenAI by higher education students will be analyzed from this viewpoint before assessing its impact on their use of library resources.

INTRODUCTION

In the realm of higher education, generative artificial intelligence (GenAI) has emerged as a transformative force, influencing the way students access and utilize library resources. This study delves into the complex interplay of positive and negative impacts that GenAI may have on the academic library experience of higher education students.

As higher education institutions (HEIs) contend with the changing landscape of information access and processing, GenAI technologies have emerged as promising tools for addressing, and even driving, these challenges. They offer personalized recommendations, automate research processes, and even generate content, potentially streamlining and enhancing students' engagement with library resources.

The advent of GenAI and its use by higher education (HE) students will be considered through the theoretical lens of the Technological Acceptance Model (TAM), which posits that perceived usefulness and perceived ease of use are fundamental determinants of user acceptance and usage of technology.¹ The adoption of GenAI by HE students will be considered from this perspective before consideration of its impact on students' utilization of library resources.

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Submitted: 31 October 2023. Accepted for Publication: 19 August 2024. Published: 23 September 2024.

This research review will specifically detail the following key aspects, considering the advantages, disadvantages and impact of each on HE students' utilization of library services: enhanced discovery and retrieval; personalization and engagement; streamlined research processes; and digital literacy and information evaluation.

TECHNOLOGY ACCEPTANCE MODEL

The actual use of GenAI and AI-based systems, as well as acceptance of and behavioral intention towards these, must be considered when exploring the impact of GenAI on HE students' utilization of library services, certainly those that are online. The Technology Acceptance Model (TAM) was first introduced by Davis et al. in 1986.² The model provides a traditional viewpoint about technology acceptance from users' aspects. TAM is a theory for explaining, predicting, and improving user acceptance of information technology (IT). The TAM framework consisted of four key variables, including perceived ease of use, perceived usefulness, attitude toward using, and intention to use technology. Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort."³ Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance."⁴ Attitude toward using refers to "an individual's positive or negative feelings about performing the target behavior."⁵ Intention to use is defined as "a measure of the strength of one's intention to perform a specified behavior."⁶

Research indicates that 'perceived usefulness' and 'perceived ease of use' have a direct impact on students' intention to use online education platforms.⁷ In turn, students' cognitive engagement relates to their continuous usage intention, which means that student interest and engagement should be maintained. It could be argued that the way GenAI applications respond directly to user input results in ongoing "dialogue", potentially meeting the of maintaining student interest and engagement.⁸

TAM has been empirically proven through research to be a robust model for understanding end-user adoption of technology and for examining the acceptance of new and developing technology by users with different characteristics in different organizations.⁹ As such, this theory will be applied to the intention of HE students to use GenAI and the impact this is likely to have on their utilization of library services.

GenAI is becoming ubiquitous, transforming various sectors by enhancing efficiency, creativity, and personalized experiences. Search engines have been using AI to provide more accurate and relevant results and users actively use AI in everyday life, asking Siri, Alexa, and Cortana for local traffic updates, current weather conditions, and even meal suggestions. This prolific use of GenAI has been recognized and embraced by Microsoft, whose Microsoft 365 suite (including Word, Excel, PowerPoint, and Teams) has integrated AI-powered "copilots" (AI assistants) across its platform of solutions, and Google's AI chatbot—Bard—that uses natural language processing to assist users with various tasks, from answering questions to providing recommendations. Higher education students often need to conduct extensive research for their assignments, theses, or dissertations. GenAI can be used to create personalized research assistants that help students navigate library resources more efficiently.

For instance, a student working on a paper about climate change can use a GenAI-powered assistant to answer specific questions about their topic, drawing from a vast database of academic resources, and to summarize lengthy academic articles, making it easier for the student to grasp key points quickly. The AI can also recommend relevant books, articles, and journals available in

the library based on the student's research topic and can help the student organize their references and citations in the required format, saving time and ensuring accuracy. Enhanced ease of use of technical tools improves students' perception of usefulness in new online learning systems, and the fact that GenAI has been embedded in tools, services, and apps such as those from Microsoft meets this increased ease of use. Furthermore, perceived ease of use and perceived usefulness are directly related to cognitive engagement, and cognitive engagement is directly correlated with continuous usage intention.¹⁰ Lu, Pang, and Shadiev found that enhancing the ease of use and usefulness of the technologies in online learning courses improves students' cognitive engagement and increases their continuous usage intention.¹¹ The increased ease of use and usefulness of GenAI to HE students offers a potential explanation for their general acceptance and adoption of GenAI and utilization of online library resources.

ENHANCED DISCOVERY AND RETRIEVAL

The GenAI-driven recommendation systems may improve students' ability to find relevant library materials, but they also raise concerns regarding filter bubbles and overreliance on algorithmic recommendations.

Advantages

GenAI can offer enhanced information discovery and retrieval to HE students. GenAI has the ability to help students find relevant and reliable information from various sources through data aggregation, pulling large amounts of data from multiple sources, such as databases, journals, websites, and social media, and processing this information quickly and efficiently, saving students time and effort. GenAI can use natural language processing (NLP) and machine learning (ML) techniques to understand the user's query, context, and intent, and provide personalized and contextualized search results that match the user's needs. For example, GenAI can use semantic search to rank results based on their meaning rather than their keywords or use recommendation systems to suggest related or complementary resources based on the user's preferences or behavior.¹²

GenAI can summarize long articles, research papers, or social media posts into concise points, helping students understand the main ideas without having to read through large amounts of text.¹³ This enhanced discovery and retrieval applicability of GenAI is further enriched by the fact that GenAI can be available around the clock at a time to suit students, providing students with instant access to information whenever they need it.

Disadvantages

Filter bubbles are situations where users see or hear only information that confirms their existing beliefs or opinions and miss out on diverse or opposing perspectives. GenAI uses algorithms based on the user's profile, browsing and search history, feedback, and past behaviors to personalize or customize information to the specific user.¹⁴ GenAI will consequently present only information that will abide by the user's past activity, providing limited returns and less contact with contradicting opinions, which can cause the user to become "intellectually isolated."¹⁵ Despite these concerns, however, there seems to be little or no empirical evidence that preselected personalization for users by algorithms takes place without any deliberate individual user choice because the user (or student) will enter the prompts and provide the detail and information required to get the desired response; the evidence suggests that users typically have some level of control or choice in the personalization process.¹⁶ There is also no support for the filter-bubble hypothesis that intellectual or ideological isolation can occur when search results use algorithms to selectively present information that users agree with based on their past behavior and search

history.¹⁷ It is worth noting that these studies were carried out prior to the advent of GenAI and the potential boon in personalized content, but it can be argued that we need to filter or select content in order to get relevant, reliable, useful information and this is what GenAI offers.

Despite the numerous advantages of GenAI and other forms of technology, there is an inherent risk of overreliance on technology.¹⁸ Overreliance on algorithmic recommendations results when users rely too much on the recommendations generated by GenAI-driven systems and do not critically evaluate the quality, accuracy, or reliability of the information. Overreliance can lead to errors in decision-making, reduced creativity, and loss of autonomy, with humans being shown to be unable to ignore incorrect AI advice.¹⁹ Research has shown that humans are susceptible to a variety of misjudgments and biases when seeking advice from machines and that recommendation-dependent preferences can create inefficiencies when the decision-maker is too responsive to the recommendation.²⁰

Impact

The enhanced discovery and retrieval ability offered by GenAI directly impacts on HE students' use of library resources as students are unlikely to be accessing the journal articles and other data returned by GenAI in their own HEI. Many library services and resources at most HEIs are available online and around the clock and so can be accessed from anywhere at a time to suit the student. HEIs also subscribe to many databases and other resources, so if HE students regard GenAI as a valuable tool to list relevant and reliable information, they can source or retrieve that information from their own HEI and effectively utilize their library resources. It is also important for students to learn to evaluate sources on their own and they can be empowered to do this if they retrieve the information from their library. Furthermore, AI-supported searches and information retrieval do not remove the need for information literacy, a skill library staff help develop in students. The use of conversational agents or chatbots and voice assistants could be useful applications in library work that can serve to save library staff time as well as offer a 24/7 wraparound service to HE students, thereby encouraging them to utilize their library resources.²¹

PERSONALIZATION AND ENGAGEMENT

While personalization through AI has the potential to increase student engagement, it may also contribute to information silos and limit students' exposure to diverse perspectives.

Advantages

Generative AI can tailor the information presentation and delivery to suit the individual needs, interests, and preferences of each student, analyzing the student's profile, feedback, performance, learning goals, and preferences, and providing customized content that is relevant, meaningful, and engaging for each student.²² HE instructors and librarians can design and deliver personalized and enriching educational experiences by utilizing GenAI tools in conjunction with an instructional design matrix.²³ GenAI can also offer self-directed learning, simulation scenarios, and writing assistance and, according to Hess et al., students can develop adaptive practice when GenAI applications are incorporated to help build self-regulated learning and metacognitive skills.²⁴ GenAI can generate personalized adaptive learning materials for individual learners to adjust the difficulty level, pace, style, or format of the content according to the student's progress or feedback.²⁵ The ultimate goal, arguably, is to create a personalized course that is student-centered to the extent that the gathering of activities and their sequencing is tailored to each student's specific needs, objectives, and background.²⁶

Disadvantages

Personalization algorithms often show users content that aligns with their existing views or preferences and create “echo chambers” or “filter bubbles,” where users are isolated in their own informational environment and their exposure to alternative viewpoints may be limited. AI algorithms used for personalization can have inherent biases based on the data they were trained on.²⁷ These biases could influence the content recommended to students, skewing their learning experiences and limiting the diversity of the content they are exposed to. There needs to be a balance and diversity in personalized content recommendations, or indeed in students’ use of GenAI for this purpose.

Impact

AI personalization can increase awareness by informing students about available library resources and services and motivating students to use them. For example, a marketing campaign can use AI algorithms to analyze students’ behavior and preferences and recommend relevant and engaging content or activities from the library.²⁸ GenAI personalization can also expand access to knowledge by helping students access more diverse and relevant sources of information, using web search results to generate informative and comprehensive answers to any question. It might also be used as an assistant to discuss problems presented in assignments or to speed up the learning process, which library staff can provide assistance with.²⁹ Anuyahong et al. found that as well as providing personalized learning experiences, AI-based systems had a positive impact on student engagement and motivation, although analysis also revealed some limitations and potential concerns, such as technical issues and the potential for bias in the AI algorithms used in these systems.³⁰ Atuase and Maluleka concluded that marketing of library resources increased awareness and motivated students to use them but found no relationship between competencies in information literacy and the use of library resources beyond developing students’ capacity to use library resources.³¹

STREAMLINED RESEARCH PROCESSES

AI-driven content summarization and citation generation can expedite research tasks. However, it carries with it the risks of oversimplification and intellectual laziness that may result from overreliance on automated processes.

Advantages

GenAI can help students conduct research more efficiently and effectively by automating some of the tasks involved in research processes, such as literature review, data collection, analysis, synthesis, citation management, and plagiarism detection.³² GenAI can help students to write essays, reports, summaries, or other academic papers by generating suggestions, outlines, introductions, conclusions, or even entire paragraphs based on the topic and keywords provided by the student. Students recognize the potential of GenAI for personalized learning support, writing and brainstorming assistance, and research and analysis capabilities.³³ Students can use ChatGPT to get ideas for their research papers or to improve their writing skills.

Disadvantages

GenAI also poses some challenges and limitations for student research efficiency and effectiveness, including accuracy, privacy, and ethical issues. GenAI may not always produce accurate or reliable results due to errors in the data sources, algorithms used in the generation process, or the quality of the input provided by the user. Therefore, students need to verify and evaluate the results produced by generative AI before using them for their research purposes.

AI-driven content summarization is the process of using artificial intelligence (AI) algorithms to condense lengthy text into brief summaries. The AI algorithms identify key sentences, understand the context, and generate helpful summaries in their own words. These summaries can be useful for researchers who need to quickly grasp the main points of a large amount of information, such as articles, books, or reports. However, this process may also oversimplify the complexity and nuance of the original text, leading to distorted or inaccurate impressions. For example, an AI summary may omit important details, introduce errors or biases, or lose the subtlety or tone of the author's message.³⁴ Therefore, researchers should always verify the quality and reliability of the generated summaries before using them for their own purposes.

AI-driven citation generation is the process of using AI algorithms to create citations for various source types, such as videos, webpages, books, and journals. The AI algorithms extract relevant information from the source, such as the author, title, publication date, and URL, and format them according to the chosen citation style. These citations can be useful for researchers who need to properly attribute their sources and avoid plagiarism, but this process reduces human effort and generic or repetitive citations might be generated that do not reflect the originality or significance of the research, so students must always review and edit the generated citations before submitting them for publication.³⁵ Another challenge is the risk that HE students may become too reliant on GenAI, because the model simplifies the acquisition of answers or information, which could magnify laziness and counteract the learners' interest to carry out their own research and reach their own conclusions; this in turn could hinder their critical thinking and problem-solving skills.³⁶

Impact

This streamlined research process that simplifies, standardizes, and optimizes the steps involved in conducting research can have various benefits for HE students and their utilization of library resources. For example, Kot and Jones found that HE students are helped to achieve better grades and outcomes in their research projects because they are provided with clear guidance, feedback, and support throughout the research process.³⁷ Using electronic resources and books and GenAI-streamlined research processes can develop the interest and enthusiasm of HE students for their research topics by involving them in meaningful and relevant activities, such as brainstorming, problem-solving, collaboration, and reflection.³⁸

Subaveerapandiyan conducted an extensive literature review and concluded that AI application in libraries "holds immense potential for revolutionizing library operations and enhancing user experiences."³⁹ GenAI in library services improves information retrieval, automates routine tasks, personalizes user interactions, and provides innovative services, so HE students should utilize library resources, embracing these opportunities.

A streamlined research process also poses some challenges and limitations for HE student utilization of library resources, including reducing students' autonomy and creativity by limiting their ability to exercise their own judgment and initiative in choosing their research topics, methods, or approaches by imposing rigid rules or standards on them, which in turn could reduce their sense of ownership or responsibility for their research outcomes. Importantly, librarians are still a vital resource to aid students in the use of citation management systems as research tools to help students organize their work and save time.⁴⁰

DIGITAL LITERACY AND INFORMATION EVALUATION

GenAI's impact on digital literacy and critical information evaluation is a topic of concern; it is necessary to equip students with the skills to critically assess AI-generated content and discern its credibility.

Advantages

Digital literacy is the ability to use digital technologies effectively and responsibly for communication, collaboration, creativity, and problem-solving; and critical information evaluation is the ability to assess the quality, credibility, relevance, and bias of information sources and products. Both skills are essential for students to succeed in the twenty-first century. GenAI can help HE students develop their digital literacy skills, including skills for finding, evaluating, using, and creating digital content in meaningful and responsible ways. GenAI can also provide personalized recommendations for academic resources, helping students find relevant information more efficiently and enhancing their ability to use digital libraries and databases. Library staff can be key in teaching HE students to maintain transparency by declaring generative AI tool usage.⁴¹

With regard to information evaluation, GenAI can assist students in identifying biases in information sources. When analyzing large datasets, AI can highlight potential biases and encourage students to critically evaluate the information they encounter as well as help students verify the accuracy of information by cross-referencing multiple sources, promoting a more rigorous approach to information validation.⁴² GenAI can also analyze the tone, style, and structure of texts, helping students understand the nuances of different types of content. This aids in developing a deeper understanding of the material and improves critical thinking skills.⁴³

Disadvantages

GenAI may influence students' thinking processes by providing them with ready-made answers or solutions rather than challenging them to think critically about the problems they are trying to solve. There is a risk that students may become overly reliant on AI tools, potentially undermining their ability to evaluate information independently. This risk can be mitigated by library staff emphasizing the importance of critical thinking alongside AI use.⁴⁴ Students need to be able to evaluate the quality and validity of the content generated by generative AI as well as their own assumptions and opinions. They also need to be able to generate original and innovative content that reflects their own voice and perspective.

Impact

GenAI may produce inaccurate, inappropriate, biased, or misleading content, and HE students need to be able to recognize when generative AI is used as a tool rather than a source of knowledge or authority. Students also need to be able to verify the accuracy and reliability of the content produced by generative AI before using it for their own purposes; library staff can be invaluable in this process. The range of barriers to utilization of library services include the perceived absence of a need for library services and lack of awareness of library services and resources, psychological factors such as lack of approachability, and time constraints, but these barriers can be overcome by libraries using GenAI applications.⁴⁵ In a systematic review, Crompton and Burke found that GenAI was used by library services for assessment or evaluation; for predictions; as an assistant; as an Intelligent Tutoring System; and for managing student learning; as such, HE students will benefit from utilizing the library services available.⁴⁶

CONCLUSION

Li found that perceived usefulness and perceived ease of use of AI-based systems positively impacted students' attitude, behavioral intentions, and their final, actual use of AI-based systems.⁴⁷ Should HE students recognize the usefulness and ease of use of GenAI and its application to library services and research, they should readily adopt it and fully utilize library services. This meets the TAM framework key variables of perceived ease of use, perceived usefulness, attitude toward using, and intention to use technology, so that the advantages and impact considered in this article provide evidence that HE students should accept the possibilities available through GenAI and fully utilize their library resources.

In order for academic libraries to remain relevant to the students they support, they must provide a service that meets the needs of the students—and also perhaps exceed their expectations. Advances in technology require librarians to seek new and innovative ways to maintain the user experiences of their libraries and GenAI has become one of the modern technologies for library operations.⁴⁸ AI has a great deal of potential to enhance student information discovery and retrieval; offer personalization which can increase engagement; streamline research processes; and serve to improve digital literacy and the information evaluation research capabilities of students. HE academic libraries endorsing the use of GenAI and facilitating student engagement therewith means that the TAM variables of perceived ease of use and perceived usefulness are met. This will in turn influence student attitude towards using GenAI for these purposes the purposes of discovering and retrieving information and assisting in the processes of research and improving their digital literacy, so that their intention to use it and continue to use it increases, especially with library services support.

AI will also have implications for the information skills training that libraries currently provide their students and which form an important part of the library services offered. Indeed, academic libraries have already begun to explore the implications of AI in associated training material and are developing library guides to support student use of AI. Libraries could use “virtual assistants” in the form of AI Chatbots to improve service quality, which will overcome the time and geographical divide in marketing and promotion of library resources to HE students.⁴⁹ The online 24/7 availability of these virtual assistants means that HE students will likely believe that using them will be free of effort and will enhance their academic ability and performance. The fact that these “assistants” will provide information readily and supply verifiable academic support and references will impact HE students' attitude towards the virtual assistants so that students will have positive feelings about using a virtual assistant. The TAM model suggests that perceived usefulness and perceived ease of use are essential determinants of user acceptance and usage of technology, and this article has considered that HE students will accept and adopt the GenAI technology.

Libraries face several challenges to effective implementation of GenAI in library operations, including the high cost of technological tools and other financial challenges, poor networking, erratic power supply, lack of trained personnel, and outdated technologies and economic factors. There may also be resistance to change by library staff. Implementing AI in the ways suggested, such as having a virtual assistant, is likely to make library services and resources more accessible and more useful to both current and prospective students, especially as students may only use a library service if they can see the value that it provides them. If these challenges can be met and overcome, libraries will be able to offer relevant services to HE students that will meet their needs

as well as enhance student digital literacy skills and awareness of the need to remain critical in their research and academic endeavors.

This critical examination acknowledges that while generative AI holds great potential to enhance students' access to and interaction with library resources, it also poses challenges that should not be underestimated. Libraries play a central role on HEI campuses and should remain pivotal to universities' research and educational endeavors, guiding the consideration and use of GenAI and actively developing strategies to leverage AI technology responsibly whilst mitigating any associated risks.⁵⁰

Libraries interested in exploring implementation of the application are invited to install and/or modify the software. The authors are interested in how the software works for another institution and are happy to collaborate on installation, implementation, and expansion projects.

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