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GENERATIVE AI IN ACADEMIC LIBRARIES: BEHAVIORAL REASONING THEORY PERSPECTIVE

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Abstract:

The objective of this paper is to understand the applications of GAI in academic libraries, analyze the 'reasons for' and 'reasons against' the use of GAI in academic libraries, understand its impact on user experience, and finally provide implications to researchers, practitioners, academicians concerning the topic. Technologies like generative artificial intelligence (GAI) can positively impact libraries by enhancing efficiency, user experience, and engagement. However, there is a dearth of studies concerning the transformative influence of GAI on libraries. This study aims to address this research gap by examining the role of GAI in academic libraries. The paper undertakes the exploratory review method and within that, adopts the secondary research method specifically online search and literature search. By using the Behavioral Reasoning Theory approach, we conceptualize the reasons for and the reasons against that influence the attitudes toward the use of Generative AI in academic libraries. The study contributes to the ongoing studies in this area: a) by proposing a conceptual model for the application of GAI in libraries b) by understanding the applications of GAI in libraries, c) by discussing the reasons for and against the use of GAI in academic libraries and d) providing future agenda for research.

Keywords:

Generative Artificial Intelligence, Generative AI (GAI), User experience, Academic libraries, University libraries, Librarians, Behavioral Reasoning Theory, Chat GPT

Introduction:

Generative AI is an emerging technology through which one can generate novel content, including text, audio, and video also. Traditional AI can find patterns to predict based on historical big data. Generative AI now utilizes big data to generate creative and original output. Generative AI based on deep learning and machine learning to train the algorithms to acquire knowledge and perform human-like tasks. Natural language processing (NLP) can be considered as a real-world application of generative AI. It can recognize and synthesize the voice content, spellchecking, and document summarization. One of the advanced Generative AI and NLP systems is ChatGPT has been proven to bring benefits and drawbacks also.

Generative AI can play a very crucial role within library settings to offer innovative solutions to enhance different aspects of information management. While using GAI for content generation it can create recommendations, summaries, and even the whole text document based on the existing materials, and library content can also be enriched. GAI can also contribute to data acquisition by collecting additional examples by applying diversity within the datasets. NLP models under the GAI can also help in the cataloging process and in extracting the relevant information from various resources which facilitates more effective categorization. Generative AI can also be utilized in enhancing the user experience through the recommendation engine and guiding patrons to knowledge resources such as books, research articles, and other resources. Educational experience can be enhanced through interactive learning materials such as quizzes and videos.

We are living in an era of rapidly intensifying technology in hardware, software, and online, and these advancements will continue to grow. This technological change has revolutionized academic libraries, opening novel prospects for delivering information services and managing resources. Academic libraries are constantly sprouting to keep pace with emerging trends and technologies (Gaikwad & Bilawar, 2023). They are positioned at the intersection of emerging technologies and scholarship in the era of digital transformation, navigating a changing terrain influenced by advances in artificial intelligence (AI). The use of AI in libraries was first introduced in 1990 (Asemi & Asemi, 2018) Since then, it has been widely used in academic libraries to improve the user experience, operational efficiency, and decision-making processes. Generative Artificial Intelligence (GAI), a subset of artificial intelligence, is one of the disruptive forces that can reshape academic library services completely. Generative AI is evolving at a rate rarely seen before (Hosseini & Holmes, 2023). Libraries should develop strategies to leverage generative AI technology while carefully and responsibly managing risks. By sharing different perspectives across distinct roles, geographies, and types of libraries, we can inspire new partnerships and opportunities for generative AI and other technologies to support and advance the work of our libraries (Hosseini & Holmes, 2023).

This research endeavours to shed light on the impact of generative artificial intelligence in academic libraries. The objective of this paper is to understand the applications of GAI in academic

libraries, analyze the 'reasons for' and 'reasons against' the use of GAI in academic libraries, understand its impact on user experience, and finally provide implications to researchers, practitioners, academicians concerning the topic.

We are seeking to address the following research questions in this study:

- What are the applications of GAI in academic libraries?
- What are the "Reasons for" using GAI in academic libraries?
- What are the Barriers or "Reasons Against" using GAI in academic libraries?
- Does the adoption of GAI in libraries enhance user experience?

The paper has been structured in the following manner: Section 1 starts with an introduction that provides the objectives and research questions for the study. Section 2 reviews the literature explaining the definitions of GAI, applications of GAI, and the current studies undertaken in the area of GAI and academic libraries. Section 3 encapsulates the theoretical framework based on which the proposed conceptual model is given. Section 4 elaborates on the research method. Section 5 discusses the "Reasons for" usage of GAI in academic libraries. Section 6 discusses the "barriers/reasons against" usage of GAI in academic libraries. Section 7 discusses how the adoption of GAI in academic libraries leads to user experience. Section 8 provides implications for librarians, academicians, researchers, and practitioners and showcases the proposed conceptual model. Section 9 provides the future agenda for research. Section 10 provides the conclusions and limitations of the study. Section 11 provides the references used for the paper.

2 Review of Literature:

The current section tries to elaborate on the current literature on this topic by understanding the definitions of GAI, the GAI tools that can be used in libraries, and the status of studies done in this area.

2.1 Definitions of GAI

Before delving into the nuanced impacts, it is imperative to articulate a clear understanding of Generative Artificial Intelligence. Table 1 below lists definitions of generative artificial intelligence that have been presented by various authors:

Table 1: Definitions of GAI

Author	Definitions of Gen AI
Feuerriegel et al., (2023)	"The term "generative AI" refers to computational techniques that are capable of generating new, meaningful content such as text, images, or audio from training data."
Zhihan (2023)	"Generative artificial intelligence (AI) is a form of AI that can autonomously generate new content, such as text, images, audio, and video."

Peres et al., (2023)	"The common element of GenAI tools is the generation of seemingly intelligent output in response to a human-provided prompt, including text, code, simulations, images, 3D objects, and videos."
(Hu, 2022)	"Generative modelling artificial intelligence (GAI) is an unsupervised or partially supervised machine learning framework, which generates manmade relics via the use of statistics, probabilities etc."
Sætra, (2023)	"Generative AI is here used as an umbrella term to describe machine learning solutions trained on massive amounts of data to produce output based on user prompts (input in the form of commands)."
Lim et al., (2023)	"Generative AI is a novel AI technology that can produce new content automatically by utilizing input data."
Castelli & Manzoni, (2022)	"Generative AI is a form of machine learning technology that can generate new output data automatically based on input data provided. This technology's application in constructing metaverse buildings can aid architects in the rapid creation of complex building structures, improving the efficiency of building design."

2.2 GAI Technologies/Tools

It is interesting to consider how libraries and their current procedures are changing in tandem with the emergence of generative AI, but it is also quite difficult given how quickly technology is developing (Hosseini & Holmes, 2023). The differences in the administration, usage, and organization of every library make this even more difficult (Hosseini & Holmes, 2023). When it comes to curation, user engagement, technology integration, and collection administration, two libraries within the same organization may take quite different approaches. (Hosseini & Holmes, 2023). Generative artificial intelligence has the potential to completely change the way academic libraries encourage students' love of reading and learning. (Viner, 2023). Using Generative artificial intelligence in libraries got a broader margin with the introduction of tools like ChatGPT (Oyelude, 2023), Bard, New Bing, and HuggingChat. ChatGPT is the most well-known of tools. This conversational bot reacts to user inputs by using artificial intelligence (Viner, 2023). It is capable of creating a vast array of content by scanning databases and material from all over the internet. Many educators and librarians are exploring and embracing its potential to alter learning, along with other AI technologies. In order to make it simpler for students in academic libraries to find pertinent and trustworthy material, AI methods can also be used to filter and organize digital content. (Viner, 2023). In addition, these systems can suggest books, articles, and internet resources to students depending on their academic requirements and areas of interest. (Viner, 2023). One can find a list of recommended reading by asking a straightforward question such, "I really enjoyed the Hunger Games series. What should I read next?"(Viner, 2023). Perplexity is another language model that can help with activities like content classification and cataloguing. A natural language processing (NLP) system called iAsk.Ai can help with reference and research queries. These tools and technologies aid academic libraries in being ready for and adjusting to the

rapidly evolving technology scene, guaranteeing that they can satisfy the needs of their users for years to come. These capabilities aid researchers save time and effort, allowing them to focus on their work's more creative and analytical aspects (Lund & Wang, 2023).

2.3 Studies undertaken in this area:

This section thoroughly reviews the present state of research on AI and GAI in academic libraries, synthesizing previous literature to clarify essential ideas, frameworks, approaches, and actual implementations.

The research (Yilmaz & Karaoglan, 2023) investigates the impact of integrating ChatGPT into programming education on the computational thinking skills, programming self-efficacy, and motivation of 45 undergraduate students. In an experimental setup, participants were randomly assigned to groups, one utilizing ChatGPT and the other as a control. Findings demonstrate a noteworthy improvement in computational thinking skills, programming self-efficacy, and motivation within the ChatGPT group. The benefits of integrating AI technologies like ChatGPT into library utilization is highlighted in the study. It is also discussed that how educators and researchers can utilize the optimized AI support for gaining valuable insights and to improve their learning outcomes.

Latest technologies such as generative AI tools (Viner, 2023) and specifically ChatGPT, bard etc. bringing revolution in education. However, some institutions prompted ban on these technologies and that may be concern for educators and librarians who recognize the potential benefits of generative AI. While it can help in fostering personalized interaction with the scholars and students by saving time for librarians and streamline the content creation process in the libraries. The technology facilitates information discovery, curating digital content as well as it is also suggesting the knowledge resources with aligning the interest of individual. Generative AI also motivates the creativity and collaboration by generating the quizzes and interactive story while it is required. Ultimately these tools enhance the opportunities for personalized learning experiences.

AI language models (Wang & Sun, 2023) excel in language processing, applied widely in speech recognition, translation, and diverse fields. Recently, they've extended to complex domains like protein analysis. This review highlights their potential in addressing challenges in antibody library development for therapeutic applications, emphasizing efficiency gains and overcoming chemical property issues.

The article (Lucchino et al., 2022) introduces a method for integrating Large Language Models with geometry and Multiphysics solvers in library applications. Users describe simulations in natural language, allowing non-experts to conduct advanced simulations effortlessly. The approach streamlines tasks like geometry building and meshing autonomously, indicating a future where libraries democratize access to advanced simulation capabilities.

The article published by (Lund & Wang, 2023) discussed about widely use of public tool and ChatGPT and their underlying technology. The content also throws light on potential effects of ChatGPT on academia and libraries. It focuses on benefits in searching content, reference service, cataloguing and content creation. Ethical concerns, such as privacy and bias, should also

acknowledged. The study also emphasizes on substantial potential for ChatGPT, and also highlights the importance of responsible and ethical utilization for collaborative interactions between the technology and professionals while creating advance scholarly knowledge without misuse.

Research study (Fernandez, 2023) has deep dived into AI-powered search, which depicts various impact of generative text AI. It also observes the unpredictability of future applications, the role of AI in intelligent text creation, acknowledging the biases and limitations aligning with the trade-offs for widespread adoption. The study considers and discusses both the aspect i.e. potential benefits and risks by emphasizing the importance of libraries which cultivates the positive vision for adopting evolving technology.

The rapid adoption of generative AI and ChatGPT which is depicted by (Hosseini & Holmes, 2023) has pushed the generative AI into the mainstream. But the various opinions and unwanted hype foster the challenges in predicting the impact of AI in libraries. While imaging the short medium- and long-term impact of operations, resources and various services is intricate due to swift technological development. The inequalities of libraries in different institutions and its management further multiplex this complexity. while integrating the generative AI, Librarians are encouraged to proficiently pilot their distinct circumstances and needs. It is possible when both opportunities and challenges are considered within their library's unique context.

In (Bandi et al., 2023), it is highlighted that Generative AI is useful for finding various applications for specific requirements and evaluation metrics. The study also mentioned the system requirements, exploration of model taxonomy and input-output classification. The paper also stressing the significance of understanding requirements for optimal performance and engaging standardized metrics to assess model quality, it offers insights for effective implementation and evaluation.

Brady (2023) and Lund &Wang (2023), describe the possible uses of ChatGPT in academia, such as literature help, text production, data analysis, translation, automated summarisation, and question answering. The integration of artificial intelligence has facilitated personalized library experiences, as seen in applications like chatbots and AI labs (Mamtora, 2020, pp. 22-25). Generative AI tool ChatGPT has numerous impacts on libraries like Data Analysis, Text generation, Automated summarisation, question answering, duplication detection, preservation, and support, etc. (Lund & Wang, 2023) (Inamdar, 2023).

Library-oriented artificial intelligence tools developed until today are elementary business aids of the runtime. Budding applications include systems that help perform the tasks for the library such as people, budget, collection development, scheduling, etc. These applications comprise systems for augmenting user services, such as ready references, information storage, and retrieval (Kumar &Sheshadri, 2019). Artificial intelligence technologies are now being used in academic libraries to achieve the integration of readers and libraries. Readers operate on one platform, tracking and acquiring users' personalized needs and information so that they can access information at a reduced cost to rationally use library resources. (Lateef et al., 2020).

Key ethical and privacy concerns about the use of ChatGPT in academic contexts have also been highlighted, underlining the importance of responsible and cautious use to mitigate hazards (Lund & Wang, 2023). Brady D. Lund and Ting Wang explored the ethical considerations that need to be considered because of the use of GAI tools such as privacy and bias. As their paper has shown, ChatGPT has considerable power to advance academia and librarianship in anxiety-provoking and exciting new ways. However, it is important to deliberate how to use this technology responsibly and uncover how professionals can collaborate with it to improve their work rather than abuse it or allow it to abuse us (Lund & Wang, 2023).

Wheatley & Hervieux, (2019) revealed that no university or university library mentions AI in their strategic plan, and very rarely proposes programming or initiatives on the topic. Wood and Evans, (2018), in their research, revealed that librarians are worried about the influence of AI on library services due to a series of reasons, such as job security, its uses, and technical difficulties; yet the majority of them are optimistic that it will present innovative opportunities and outlooks. Librarians must use technology responsibly as it develops while preserving the importance of people in the process. However, that should encourage librarians everywhere if they can stimulate fresh ideas for instruction and learning (Viner, 2023). Lenart (2023), in their Book review of The Rise of AI: Implications and Applications of Artificial Intelligence in Academic Libraries by Bartlomiej A. Lenart provides valuable insights and considerations for academic librarians shaping their professional practice to tackle current and future challenges and opportunities of AI and machine learning in libraries.

3. Theoretical background and conceptual model

The literature on consumer behavior has made frequent use of behavioral theories to comprehend the variables affecting user intentions and behavior. A relatively recent theory that establishes the connection between beliefs, reasons, motives, intents, and behavior is the behavioral reasoning theory (BRT).

This theory has been used in several studies to understand consumer attitudes, consumer intentions, and consumer motivations. Anayat et al., (2023) have used the BRT theory to ratify the motivations of adopting voice assistants which are based on artificial intelligence technology. The findings propagated that the “reasons for” and “reasons against” clarified the attitude of users towards adoption of voice-based assistants.

Similarly, the theory has been used to understand the adoption of 4.0 technology (Virmani et al., 2023) wherein the “reasons for’ showed positive relationship towards attitude and intention to used 4.0 technology whereas the “reasons against” did not show positive relationship with adoption intention. Gesk & Leyer, (2022) applied the BRT theory to understand the attitude towards adoption of AI based software’s in public service organizations wherein they substantiated that in public services, AI based software’s were more preferred over human based ones. Jan et al., (2023) have exercised this theory to understand the motivators and demotivators of adopting conversational agents powered by artificial intelligence technology in which they substantiated the hypotheses as propagated by BRT theory. Lee et al., (2023) have harnessed this theory for understanding the intentions of users to mobile health services and proposing a conceptual model

for the same. Hong & Park, (2024), have tested the technology readiness with respect to adopting autonomous vehicles using the BRT theory, in which they have substantiated that, “reasons for” and “reasons against” created an impact on the users’ intentions for adopting autonomous vehicles.

The concept of GAI in libraries is still relatively new, hence, for this study, we have used the BRT theory to understand the perspective of usage intention of GAI in academic libraries. Taking cues from the theory we have first tried to understand the motivators and barriers or as the theory says, “reasons for” and “reasons against” the intention to use GAI in academic libraries. We have further tried to establish if it leads to enhanced user experience. Based on the theory and the literature review of GAI studies, we have proposed a conceptual model (see fig 1).

4 Research method and research questions:

The exploratory review method has been used for this study since such a method is useful for studies when a certain concept or subject needs to be known in depth, especially so, in cases where many studies have not been done before. The purpose of such a method is to inspect the issues around the topic and not expect to arrive at any specific conclusions from it. Sice GAI in academic libraries context is new and rarely studies, we decided to adopt this method. Within the exploratory review method, we chose to adopt the secondary research method specifically online search and literature search. The literature search was done using popular search databases such as Scopus, Emerald, Springer, Web of Science, and Google Scholar. Although the number of papers on AI in academic libraries was more, the number of papers on Generative AI in academic libraries was relatively less. Hence, we resorted to online search methods and used internet mediums such as blogs, online articles, etc. for this study. The keywords used for the search were Generative AI, Artificial Intelligence, AI, Generative AI, Behavioral Reasoning Theory, Academic Libraries, Libraries, Benefits of Generative AI in academic libraries, and Applications of Generative AI in libraries. The relevant papers/articles etc were then studied and analysed to arrive at the conclusions and propositions as mentioned in the upcoming sections of the study.

5. **Reasons for using GAI in libraries.**

Libraries can employ generative AI in a variety of ways to improve user experience and operations. Among the important applications are:

5.1 For Better Content discovery and search:

ChatGPT presents a compelling substitute for search engines such as Google, which provides a list of links related to a topic in response to a query, enabling you to explore it further. The strength is its capacity to respond to targeted queries, offer knowledgeable explanations of subjects, or provide accurate replies without requiring the user to read several comments (Cox & Tzoc, 2023). ChatGPT's technology can be included into library discovery tools, offering collection items and replies to queries, owing to the recent release of an API. Think about the advantages of using ChatGPT to query massive text corpuses like HathiTrust. GAI tools could be used as research assistants in the future, doing virtual experiments, evaluating data, editing, and copying content, and producing citations (Cox & Tzoc, 2023). Using artificial intelligence in libraries got a wider margin with the introduction of ChatGPT (Oyelude, 2023). Expanded further, one finds that the tool could be used in research to produce ideas or streamline some aspects of the

process. Brainstorming, generating lists of keywords and providing summaries of works are few of the functions it can conduct (Oyelude, 2023). Generative AI tools can offer vital assistance to school librarians in content creation (Viner, 2023). ChatGPT can generate a rough draft of a paragraph that you can use as inspiration for your work, saving you the trouble of starting from nothing (Tanzi, 2023).

5.2 For Enhanced recommendation and Personalization:

With the capacity to ask questions and receive tailored recommendations in real-time, AI-based GPTs can provide users with a more engaged and interesting experience (Aithal & Aithal, 2023). Personalized reading recommendations can be given to customers using Chat GPT, considering their reading tastes and history. Chat GPT makes recommendations for books that customers might enjoy based on an analysis of the books they have previously checked out and their answers to surveys about their reading preferences (Brühl, 2023). Like any search engine, it can learn the information needs and preferences and offer personalized and relevant results (Cox & Tzoc, 2023). Recommendations can be given by ChatGPT based on a user's search history and interests. Users may find resources and information through this that they might not have found on their own. It is crucial to remember that ChatGPT is an additional tool that can improve researchers' and students' research experiences rather than a replacement for university libraries. Furthermore, librarians can customize ChatGPT to suit their requirements, making it a treasured addition to any library's repertoire (Lee, 2023).

5.3 For virtual libraries and exhibits:

The utilization of Digital Initiatives to improve library services is one of the core characteristics of Library 2.0. This includes accessing information and resources through digital resources. Libraries now include online databases, e-books, digital exhibitions, and collections that are accessible from any location (Hepler, 2023). Digital exhibitions are becoming more popular in libraries because they give an immersive and interactive approach for visitors to connect with resources. Creating these exhibitions is time-consuming and resource intensive. ChatGPT, fortunately, can be trained to produce exhibit material, giving librarians a beginning points for their exhibitions (Lee, 2023). Librarians may then update and enhance the produced information as required, bringing their knowledge and insights to bear in order to create a genuinely unique and interesting presentation. Libraries may use ChatGPT to create dynamic and informative digital exhibitions that engage their visitors' attention and interest (Lee, 2023).

5.4 For language translation and transcription:

Generative AI can help in language translation and transcription services, enabling libraries to make content accessible to a broader audience (Sultan, 2023). ChatGPT can be used for machine translation, permitting researchers to access and comprehend research data in multiple languages (Lund & Wang, 2023). ChatGPT provides linguistic support and feedback to professionals who require assistance authoring, revising, or translating papers or materials (Kirtania, 2023). Natural-language understanding (NLU) models paired with generative AI are becoming increasingly

popular for providing on-the-fly language translations (Brady, 2023). These solutions assist libraries in breaking down language barriers and increasing their scope of accessibility for consumer bases by allowing them to deliver service or material in their native language.

5.5 Content Indexing, Cataloguing and metadata generation:

One arena in which artificial intelligence can be deployed in academic libraries is content indexing (Banks, 2023). Traditional indexing techniques have several downsides. It can be a laborious manual process. Indexing can give a general idea of the context in which a book, journal, or paper was originally thought up. ChatGPT can be used to automatically yield cataloguing and metadata for library resources, like book titles and descriptions (Lund & Wang, 2023). Tools like DALL-E, Midjourney, DeepAI, etc. can be used to create art and then add it to web catalogues (Cox & Tzoc, 2023). Apart from this, ChatGPT can be used for Generating draft metadata to describe material (IFLA, 2023).

5.6 Referencing:

One of the most laborious responsibilities for librarians is answering reference inquiries. With generative AI, librarians can delegate repetitive reference questions to the AI bot, releasing their time to manage questions that require human touch (Lee, 2023). This improves the efficiency of the library and also improves the user experience (Lee, 2023). Librarians can assist scholars by providing tips for asking accurate questions to get the best results (Cox & Tzoc, 2023). ChatGPT can help library users quickly find answers to specific questions they may have, such as how to locate a particular book, how to use library resources, or how to conduct research on a particular topic (Kirtania, 2023).

Proposition 1. Reasons such as Content discovery and Search, Enhanced Recommendation and Personalization, Virtual libraries and Exhibits, Language Translation and Transcription, Content Indexing, Cataloguing and Metadata Generation, and Referencing have a positive influence on attitudes toward the use of GAI in academic libraries.

6. Reasons against using GAI in libraries/Barriers

Although the use of GAI in libraries is widely seen as inevitable, there are still challenges in putting AI into practice (Y. Li et al., 2022). In the current scenario, artificial intelligence in academic libraries is almost non-existent (Wheatly & Sandy, 2019). The effective integration and adoption of GAI technologies in libraries can be hampered by several factors, such as a lack of awareness, the limitations of a nation's technological infrastructure, the availability and quality of data, financial and resource constraints, ethical and cultural considerations, a shortage of skilled labour, and the need for capacity building (Kumar & Sheshadri, 2019). The following are some of the “reasons against” or barriers that can limit the adoption of GAI in academic libraries.

6.1 Technology Barrier

The increasing need for information access has recently aided in the growth of societies, and libraries are the best place to acquire information (Omame & Alex, 2020). Libraries need to keep abreast of the latest technologies like generative artificial intelligence due to the paradigm shifts in the format and dynamics of information and knowledge brought about by the quick development

of such technologies. Libraries risk becoming obsolete today if they don't start to use the new technologies and innovate how they provide information and services. Technology barriers are the biggest obstacles to implementing Generative artificial intelligent systems. Modern technology devices such as computers and other electronic systems, must be present in the library (Wheatly & Sandy, 2019). Libraries need help pursuing technological implementations such as Generative AI, due to its resource-intensive and technically challenging nature. It necessitates intensive technological support, which most libraries lack and seek support (Cox & Majumdar, 2022). Also, there are chances of potential worsening of the digital divide due to dependency on digital technology and the chances of excluding users who do not have access to reliable internet or advanced devices.

6.2 Infrastructure barrier:

IT infrastructure management is critical to prevent system failure (Borgohain et al., 2022). In the case of implementing Generative AI tools or technologies in academic libraries, more financial resources will be required to set up the requisite infrastructure. Libraries must reevaluate their methods and innovate their offerings to prosper in the new information economy. A practical way to accomplish this goal is by implementing artificial intelligence within libraries (Omame & Alex, 2020). Developing generative artificial systems will be very beneficial to libraries for technical query handling, referencing, circulation, better resource management, faster information retrieval etc.

6.3 Lack of knowledge/training

Although some librarians see the significance of generative artificial intelligence (GAI), many professionals in the area still need to become familiar with and cannot make the most use of this technology. To enable anyone to commission or manage GAI utilities, it is essential to possess the requisite skills for managing the new technology, know what parameters to monitor, and what pitfalls to avoid when introducing a new utility. Technical skills can be gained but essentially problems arise as a result of a poor training set, biased corpus, and inefficient metric evaluation (Upshall, 2022). Making GAI valuable is the aim, not demonizing it. According to some studies, libraries should address AI from the standpoint of their employees and patrons through continual education (Wheatly & Sandy, 2019).

6.4 Lack of innovation:

A poll conducted in 2017 for Horizon revealed that 68% of college students begin their research on Google and Wikipedia. To remain a crucial presence in the evolving information landscape, libraries must reconsider how they distribute high-quality content in light of these free information providers and the growing open-access trend in scholarly publication methods (Lateef et al.,2020). Libraries need to provide services that live up to the expectations of the new generation of hyperconnected customers to attract new users and keep their current ones interested (Lateef et al.,2020). This entails reconsidering the library's conventional physical layout, which will be quite different from a calm area with bookshelves for reflective reading and writing. The library must evolve from a quiet place for introspective study to a lively hub for creative cooperation. Only then can it be relevant. Libraries and other public institutions can use cutting-edge technology to stay

ahead of disruption (Okunlaya R. &., 2022). For example, AI can support the university library as an enabling technology to provide transformative services that complement quality education, learning and research. Still, there is a clear indication that library service providers must learn how technology like GAI can contribute as an alternative innovative service delivery means in the face of disruption. Technology adoption is a topical research area in the information systems (IS) domain (Salahshour et al., 2018). (Wheatly & Sandy, 2019) conducted research on AI engagement in 25 university libraries. They concluded that libraries still need AI in their strategic plans to provide services ready for the future. Their research reveals a crucial void in the library's understanding of the importance of the current AI movement that can encourage librarians to think about AI as a technology that can foster an alternative innovative service delivery.

6.5 Fund Limitations

The adaptation of technologies like generative AI in libraries will take time. One of the major hurdles in this adoption is the high financial expenditures required to purchase innovative systems and gadgets which are the primary reasons for delaying the use of the AI technology (Hussain,2023). These challenges primarily stem from constrained budgets, limiting the allocation of funds for expensive technology solutions. Decision-makers may need more awareness of Gen AI's crucial role in enhancing library services and user experiences. Additionally, the fast-paced evolution of AI technologies presents difficulties in keeping up to date with the latest advancements. Libraries may face vendor lock-in issues and need help to align software purchases with overarching academic goals. These hurdles pose obstacles to adopting cutting-edge technologies, necessitating strategic solutions to secure adequate funding for Gen AI software in academic library settings. Educational institutions are frequently the first to feel the effects of budget cuts when government funding declines and political or economic developments occur (Lateef et al.,2020). The battle for institutional or governmental financing resembles the egg and chicken dilemma. Libraries are expected to exhibit cost-effective procedures and value for money. But businesses can't achieve it without incorporating new technologies to modernize their physical locations, provide fresh services, and enhance the customer experience for today's customers—all of which call for more money (Tella, 2020). Because of this, modern-day libraries frequently find themselves in a financial bind and need further money to demonstrate value.

6.6 Ethical concerns

In addition to the above challenges, there are substantial ethical concerns about AI, especially in library environments, such as privacy, bias, and intelligibility. Privacy and security concerns emerge when collecting and analysing user data required for personalized AI-driven experiences (Amzat & Adewojo, 2023). The increased use of technologies such as Generative artificial intelligence, may result in some security holes and device penetration to access data, resulting in privacy and confidentiality issues, making beneficiaries concerned about their privacy and the confidentiality of their data. Breach of sensitive user data could hurt the library and its patrons. They might collect and analyse data about library users, which could lead to privacy concerns. It takes specialized training to ease worries about privacy and security. Libraries must take the

required security measures to protect user data and guarantee that AI-generated content respects users' privacy. (Inamdar, 2023).

6.7 Executive Stagnancy

Information digitalization has affected library systems and operations. Today, the digital and physical worlds are equally vital, and libraries must learn new skills to remain competitive and provide better services to their users in the digital age (Lateef et al.,2020). In order to optimize a patron's learning experience, these services call for new competencies, including increased levels of digital fluency, the capacity to deliver the most appropriate resources much faster, and assistance for hands-on, creative activities. The integration of Gen AI in academic libraries faces a significant impediment in the form of a lack of decisive commitment from decision-makers. A supreme will among those responsible for making critical choices is necessary to seamlessly adopt Gen AI technologies within the academic library landscape (Peters, 2023). Decision-makers, including library administrators, university officials, or budgetary authorities, might need to fully grasp the transformative potential of Gen AI in enhancing library services, optimizing resource allocation, and improving user experiences. This lack of awareness or commitment can lead to delayed or inadequate funding for the procurement of Gen AI software and applications and a hesitancy to embrace technological advancements that could greatly benefit the academic community (Peters, 2023). Addressing this challenge requires targeted efforts to raise awareness, foster understanding, and garner support from decision-makers who hold the power to shape the technological trajectory of academic libraries. The need for more skilled workers is an issue for libraries that use artificial intelligence approaches (Okunlaya et al., 2022). The librarians are concerned about being replaced by robots and intelligent technologies because of their efficiency and capacity to finish jobs quickly. This calls for legislation that will help library personnel secure jobs. Artificial intelligence techniques may result in a digital divide for library workers, as some are drawn to using technologies. In contrast, others fear using them and reject the change and development policy, particularly in modern technologies. As a result, libraries require training programs to improve their capabilities and productivity over time. Among the subjects' librarians need to be trained in include data analysis, machine learning, and natural language processing. Due to the considerable time and resource commitment, this program could be challenging for smaller libraries or those operating on a lower budget.

Proposition 2: Reasons such as Technology Barriers, Infrastructure Barrier, Lack of knowledge/Training, Lack of Iinnovation, Fund Limitations, Ethical concerns, and Executive Stagnancy have a negative influence on attitudes toward the use of GAI in academic libraries.

7. Discussion: How adoption of GAI in libraries leads to User experience

It is a striking fact that artificial intelligence, which is used in almost every aspect of life from transportation to industry, from law to health, from painting to mathematics, and which adds a new dimension to the process of mass technologization, has abruptly entered into educational methods for problem-solving and symbol recognition. GAI is dependent on the ability to map symbols. New applications, such as multimedia systems, digital libraries, GISs, and e-commerce, have offered tremendous potential for information researchers.

As the application gets more powerful, diverse, and pressing, some well-known challenges with obtaining information n became much more significant in modern technology era (Kumar & Sheshadri, 2019). Dewa et al., (2015) identified some of AI's advantages in library operations especially the ability to perform library duties efficiently. With AI operation, libraries can carry out tasks speedily, compared to the tasks being done by human beings which will lead to enhanced customer experience. AI is handy in reducing human errors in library operations.

As per (Liu, 2011) use of artificial intelligence in libraries will help give personalized recommendations and speed up the query handling process. Jha (2023) demonstrates how AI technologies save costs and time for library services in all areas. By deploying AI, the library will be better equipped to help current and former patrons in their hour of need leading to enhanced experiences. João et al., (2021), argued that artificial intelligence could help library users find and retrieve new media more effectively and efficiently while introducing them to latest content they might not have otherwise discovered. Using artificial intelligence to recommend related works could benefit library patrons conducting research by quickly searching the library's database, providing convenience and entertainment value.

Generative AI systems can generally read to you, inform you, counsel you, teach you, fix your errors, and patiently attend to all of your requests. Thus, there are a lot of opportunities for libraries and information services with generative artificial intelligence. According to João et al., (2021), artificial intelligence could help library users find and retrieve new media more effectively and efficiently and expose them to fresh content they might not have otherwise discovered. Using generative artificial intelligence to recommend related works could benefit library patrons conducting research by quickly searching the library's database, providing convenience and entertainment value.

Generative AI systems can generally read to you, inform you, counsel you, teach you, fix your errors, and patiently attend to all of your requests. Thus, there are a lot of opportunities for libraries and information services with Generative AI. A study by (Hauptmann et al., 1997), investigated the application of AI methods in a digital video collection. In order to enhance the library's interface and make it more user-friendly, the authors wanted to automate the development of metadata. The research uses image analysis, audio recognition, and natural language processing to provide particular AI-based interface elements, like word location tagging, representative frames, and video skims. These AI methods offer a digital video library user interface that makes it simple for users to find and access pertinent content. A, Subaveerapandiyan (2023), points out that even if each AI technique has flaws, they are nonetheless successful in producing reliable navigation tools for the digital video library.

GAI can personalize user interactions, automate repetitive chores, enhance information retrieval, and offer cutting-edge services. Artificial intelligence (AI)--enabled chatbots can efficiently respond to user queries and offer prompt support, increasing user happiness in the process (A. Subaveerapandiyan, 2023). AI-enabled intelligent libraries can expedite the classification, cataloguing, and recommendation processes, giving users effective access to information.

8. Implications

Our study has different connotations for different stakeholders. In this section, we propose the various connotations of our study to the librarians, GAI practitioners, researchers, and academicians which will help them further their understanding and implementation around GAI in academic libraries.

8.1 Implications for librarians:

Librarians can use GAI to make their library search systems more effective and accurate since it will help them comprehend customer queries more effectively, automate their referencing and information-seeking services, catalog the metadata of the library resources to provide better accession services by effective content generation (Lund & Wang, 2023; Brzustowicz, 2023) and content curation (Xiao et al., 2023). Using GAI, they can do automation, avoid duplication of copies (Inamdar, 2023), and preserve fragile and rare documents (Iyishu et al., 2013) thus making the library collection more effective. Librarians can assume newer and more savvy roles such as the role of a data provider, providing superior recommendations to the users (George & George, 2023) by using tools such as Amazon recommender, IBM Watson, etc. librarians will also be perceived as managers providing personalized information based on the unique needs of the users (Bharadiya, 2023), and also assume the role of content providers who can assist the AI tool generators by providing library functional requirements since they understand the information or data requirements (Cox et al., 2019).

GAI can be used in libraries to create metaverse 3D type of content wherein brick-and-mortar libraries can be replicated by virtual ones (Dreamson & Park, 2023) making learning experiences truly immersive. Librarians can be aided by virtual assistants who can offer customized assistance to the users thus enhancing user experience (George & Wooden,2023; Kamruzzaman et al.,2023). Librarians can make use of GAI tools like ChatGPT or ChatPDF to enhance referrals, use chatbots for providing recommendations, query solving, and update upcoming library-related events (Inamdar, 2023). GAI tools can be used by librarians to provide faster retrieval information systems leading to customer satisfaction and enhanced user experience (Hussain, 2023; Yu et al., 2019). Thus, we can say that libraries of the future may be recognized as, “Intelligent Libraries” as termed by James Clay (2018).

8.2 Implications for researchers and academicians:

Researchers will immensely benefit from using GAI as it will help them find relevant articles thus easing their search for relevant literature on their topic, aid them in drafting proposals, and aid in analyzing and getting insightful data (Lund & Wang, 2023). GAI will help researchers complete their work faster and more accurately as it will speed up the search process, assist in analyzing huge data, and help access better content through recommendation tools (Cox et al., 2019; Sathianathan and Ray, 2023). They can also access the articles in the language of their choice (Inamdar, 2023) providing ease and better understanding. Another major implication for researchers is the ease of accessibility and that too from remote places thus breaking down geographical barricades, helping access and create virtual researcher groups, sharing the same interests, and broadening research collaborations and horizons (Wider et al.,2023; Amzat &

Adewojo, 2023). Researchers can use Artificial Intelligence Text Generators (AITG) as research assistants to help them proofread articles, for data analysis, experiment building, or even for creating bibliographies (Cox and Tzoc, 2023).

Academicians will be impacted by using the GAI technology and tools as it will profoundly impact the teaching-learning process (Cox et al., 2019) as the GAI tools could be used to generate personalized content for students, develop novel curriculum, understand what content is being accessed by the students, what do they lack, and create an environment of connected learning as proposed by (Pinfield et al., 2017). Academicians can create virtual student groups in virtual libraries which will aid in group studies enhancing the teaching-learning environment (George & Wooden,2023; Kamruzzaman et al.,2023).

8.3 Theoretical implications

This study tries to apply the foundations of the Behavioral Reasoning Theory (BRT) to this topic. Since we were trying to analyze the 'reasons for' and the 'reasons inhibiting' the adoption of GAI in academic libraries, this theory seemed relevant which would give us a better perspective on the adoption of this technology in academic libraries.

In our opinion, this theory has not been applied in prior studies for this subject area hence it provides theoretical implications to the academicians or researchers as to how this theory can be applied to the area of Generative AI for academic libraries. The study provides 'reasons for' and 'reasons inhibiting' usage of GAI in academic libraries. These reasons will help them identify the intention to use GAI and further how it can impact user experience.

This theory can be further studied to understand the mediators or moderators that can affect the intention to use GAI in academic libraries apart from the reasons for and against as already mentioned in this study. Application of the BRT theory to this subject area will give a different perspective to the academicians or researchers in this area to delve further into the topic and investigate it in a more detailed manner.

8.4 Practical implications:

The study provides practical implications to GAI tool developers in the sense that they can now look at libraries as potential sources where the GAI applications will be required in the future. They can focus on applications that will help library employees in content creation, content personalization, automation, ease of search and query handling, virtual assistants to help with library tasks, and so on. They can also develop applications that will help researchers in article searches, creating bibliographies, collaborating with other researchers, information retrieval, summarization of content, and so on.

9. Future Research Agenda:

ChatGPT had emerged as a boon as well as a bane for academia and the librarianship community. It will be interesting for researchers to investigate how this technology can be used fruitfully for availing its benefits and mitigating ethical issues such as bias, privacy, consent, transparency, etc. (Lund & Wang, 2023). The paradigm of 'intelligent libraries' is seeking to bring about a disruptive change in the way academic libraries will function in the future (Cox, 2018). Most of the librarians are still unsure about the concept of GAI and how it may impact their area of functioning. Hence,

they need to understand the expectations of the new-age library users and the usage of the new-age GAI tools for enhancing enhanced user experience and engagement. It is equally important to address the issues faced by librarians in terms of technology literacy, job security, continued existence of traditional libraries (Pinfield et al., 2017) concerning this emerging transformation. Metaverse-integrated GAI technology is another phenomenon gaining momentum and envisaged application for libraries since it can help deliver immersive and personalized experiences to users (Amzat & Adewojo, 2023). This phenomenon needs further investigation in terms of its application, its challenges, and its benefits to the users.

Artificial intelligence text generators are the next futuristic application for content generation which can find several applications in the field of academic libraries such as cataloging, curating, audio transcription, or braille books for the visually challenged or hearing impaired, and so on (Inamdar, 2023). The application of artificial intelligence in libraries (AAIL) is also gaining momentum (Borgohain et al., 2022) with more emphasis on research areas such as profiling and personalization, automating library management, use of robots in libraries, and so on. New frameworks need to be developed in the context of using GAI in libraries such as the "Artificial Intelligence Library Services Innovative Conceptual Framework" (AI-LSICF), proposed by (Okunlaya et al., 2021) in the context of using AI for libraries.

The research agenda for the use of GAI in academic libraries is summed up in table 2 below.

Table 2: Research agenda for the use of GAI in academic libraries

Future research areas	**Future research questions**
ChatGPT in academic libraries	What are the risks associated with using ChatGPT in academic libraries? What methods should be availed to mitigate the risks associated with the adoption of Chat GPT in academic libraries?
Intelligent libraries	What are the expectations of the new age user regarding the new age 'Intelligent libraries? How will the use of GAI tools and technologies disrupt the functioning of the academic library systems? How will the GAI tools impact user experience and user engagement in academic libraries? How will the usage of GAI tools impact the function of the librarians as well as the libraries?
Metaverse integrated GAI technologies	How can Metaverse be used in academic libraries to transform user experience?

	How can Metaverse be used in academic libraries to transform user engagement? How can Metaverse be used in academic libraries to enhance research and learning? What are the benefits and challenges associated with the use of metaverse-integrated technology in libraries?
ATG (Artificial Intelligence text generator)	Role of ATG in academic libraries? What GAI tools will help academic libraries in text generation? How can ATG be used in academic libraries to enhance user experience and make learning more immersive? What are the ethical concerns regarding the use of ATG in academic library systems and how can these risks be mitigated?
AAIL (Application of artificial intelligence in libraries)	Role of AAIL in profiling and personalization of user content in academic libraries? Role of AAIL in the automation of the library management system? Role of robots in libraries: benefits and risks?
Artificial Intelligence Frameworks for Academic Libraries	Role of GAI for digital transformation in libraries? Role of GAI in the innovation of library services? What policy initiatives need to be considered by the academic library community for inclusion of GAI in academic library systems?

10. Conclusion and limitations of the study

Generative AI is an upcoming technology that is increasingly being adopted in all sectors. The educational sector has been seeing the adoption of GAI tools such as ChatGPT, ChatPDF, by students on a large scale. Since libraries are an integral part of the educational system, they must embrace emerging technologies for their functioning. Libraries can benefit from the implementation of technologies such as generative artificial intelligence (GAI), which can improve user experience, efficiency, and engagement. Nevertheless, there is a paucity of research on the

revolutionary impact of GAI on libraries. The purpose of this study was to fill in this research gap by investigating GAI's function in academic libraries. The study, which targets views with a strategic rather than a technical interest in GAI, is conceptual in character and employs an exploratory literature review.

The Behavioral reasoning theory perspective was used to understand the attitude towards the usage intention of GAI in academic libraries. Taking help from the available literature, we tried to underline the "reasons for" (basically the motivators) and the "reasons against" (basically the inhibitors) for the attitude towards usage intention. We also further tried to understand the implication of the usage intention of GAI in academic libraries, on the user experience. Based on the BRT model, we studied the "reasons for" and "reasons against" intention to use GAI in academic libraries. The following conceptual model in figure 1 is proposed based on the findings of the study:

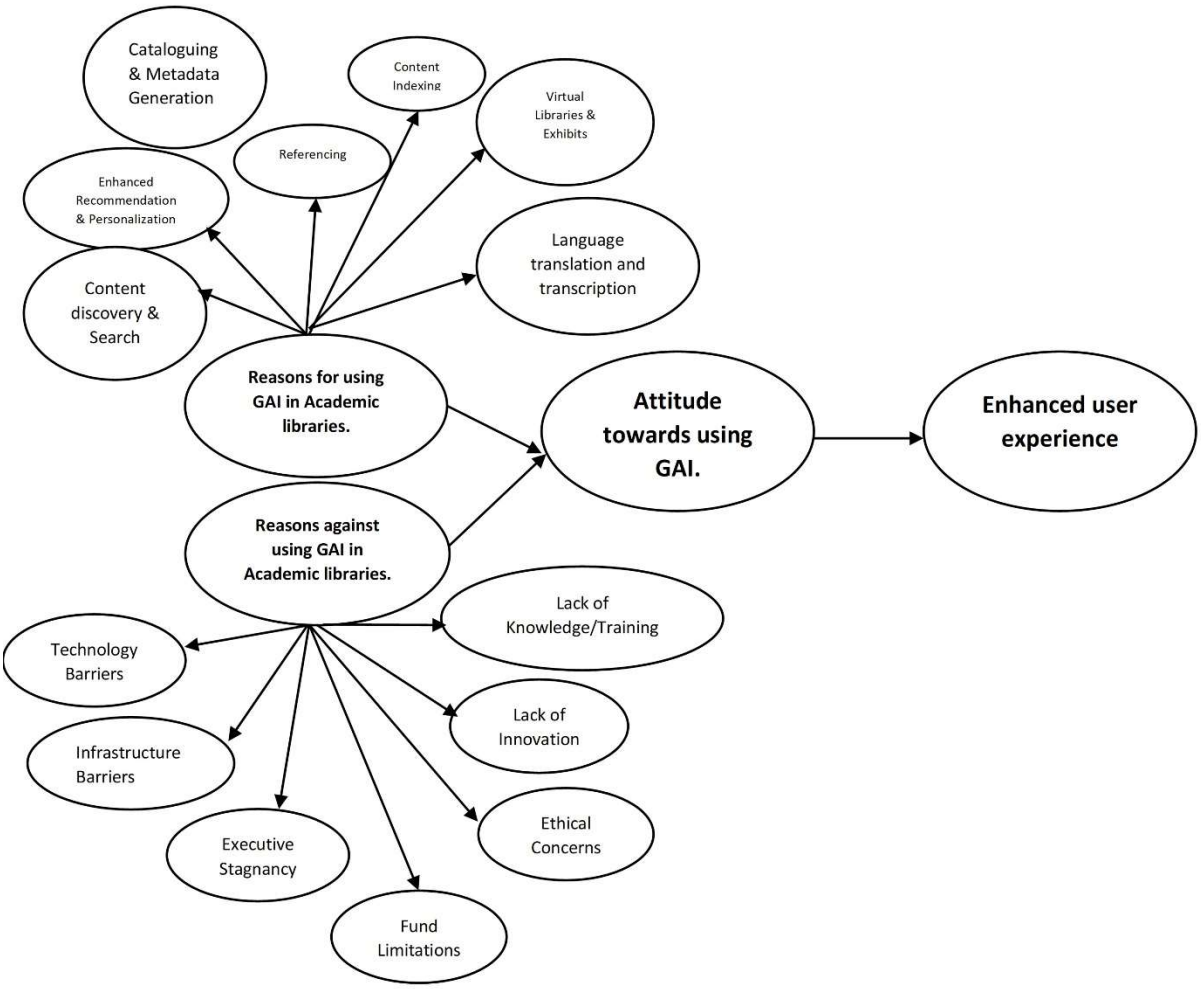

Figure 1: Proposed conceptual model.

As per our findings, the reasons why GAI could be used in academic libraries were, for Content discovery and Search, Enhanced Recommendation and Personalization, Virtual libraries and Exhibits, Language Translation and Transcription, Content Indexing, Cataloguing and Metadata Generation, and Referencing. The inhibitors of using the technology based on our findings were related to issues such as Technology Barriers, Infrastructure Barriers, Lack of Knowledge/Training, Lack of Innovation, Fund Limitations, Ethical concerns, and Executive Stagnancy. Our study also hypothesizes that GAI implementation will lead to enhanced customer experience.

In section 8, we have discussed the implications of our study for librarians, researcher's academicians, and practitioners. We have also proposed the future agenda of research with future research questions which will help researchers, librarians, and academicians for further investigation in GAI for libraries.

The limitation of the study, in our opinion, stems from the fact that we derived the findings based on a literature review and it was not substantiated by a quantitative study on the same. We feel further investigations can be taken to validate the propositions mentioned in our study. Qualitative studies could also be undertaken by interviewing experts to validate the findings of our study.

Finally, we would like to conclude that Generative AI is here to stay. The academic libraries which form an integral part of the education sector cannot shy away from adopting this technology. As mentioned in our findings there are several benefits of this technology but at the same time libraries need to consider the inhibitors while implementing this technology in academic library systems.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used [ChatGPT / Quill bot] in order to [find out relevant papers and content]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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