

AI and Library Assessment: A world of learning and opportunities

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AI in Library Assessment: Opportunities, Challenges, and Evolving Practices

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Abstract

The integration of artificial intelligence (AI) in library assessment offers transformative opportunities to enhance services, improve operational efficiency, and better meet user needs. This paper explores the intersection of AI with traditional library assessment practices, focusing on AI-assisted and AI-driven approaches. While AI-assisted methods augment human efforts through tools like predictive analytics and natural language processing, AI-driven models operate with greater autonomy, making real-time decisions and providing personalized insights. These innovations promise significant benefits but also introduce complex challenges, including issues of transparency, algorithmic bias, data privacy, and accountability. By critically analyzing the potential and limitations of both AI-assisted and AI-driven approaches, this paper provides practical examples, ethical considerations, and a roadmap for gradual adoption. The discussion underscores the importance of balancing the efficiency and scalability of AI with ethical oversight and human expertise to ensure equitable and responsible implementation. Ultimately, this paper aims to guide librarians in thoughtfully integrating AI technologies to amplify their impact while preserving the core values of trust, equity, and community engagement. By addressing both the opportunities and risks of AI, it contributes to a forward-looking dialogue on how libraries can responsibly harness these tools to shape the future of assessment practices.

Introduction

The AI Revolution in Libraries

Artificial Intelligence (AI) is rapidly transforming industries across the globe, reshaping how sectors like healthcare, finance, education, and entertainment operate. Libraries, traditionally viewed as centers of knowledge and learning, are beginning to explore AI's potential to redefine their role in the 21st century. As AI technologies become more accessible, libraries are

increasingly adopting them to enhance operations, improve user engagement, and streamline services. From automating repetitive tasks to generating new insights from complex data, AI offers transformative opportunities that can help libraries respond more dynamically to the evolving needs of their users.

However, the integration of AI in libraries is still at an experimental stage, requiring thoughtful exploration and adaptation. Library leaders and researchers are actively investigating how AI can improve everything from resource management to user services, often starting with AI-assisted tools that augment human capabilities. As these technologies continue to evolve, more autonomous, AI-driven systems are also emerging, capable of conducting complex assessments with minimal human input and oversight. These innovations hold the promise of dramatically improving efficiency and decision-making in libraries, but they also bring significant ethical challenges and the need for careful and thorough oversight.

Reassessing Library Assessment in the AI Era

The introduction of AI into library workflows presents a unique opportunity—and a necessity—to reevaluate traditional methods of library assessment. Conventional assessment practices, often grounded in qualitative and quantitative approaches, have served libraries well for decades, helping them understand user behavior, measure the impact of services, and allocate resources efficiently. However, these methods may not fully capture the complexity of today's digital library environment, where vast amounts of data are generated from diverse user interactions through both physical and digital resources.

AI offers new tools that can significantly enhance assessment capabilities by analyzing massive datasets, identifying hidden patterns, and providing real-time, predictive insights. However, the use of AI in assessment also raises important questions: How do we ensure that AI systems operate ethically, transparently, and without bias? What role should human librarians play in overseeing these increasingly autonomous systems? And how can we balance the benefits of AI with the need to maintain privacy, accountability, and trust in library operations?

These questions demand a rethinking of assessment practices in libraries. One important difference we must understand is between AI-assisted tools and AI-driven systems. While AI-assisted tools augment human decision-making by providing enhanced data processing capabilities, AI-driven systems go a step further, pushing the boundaries of what is possible, offering fully autonomous assessment models that force us to ask ourselves how much human input and oversight is truly needed. Both approaches challenge traditional paradigms of library impact evaluation, emphasizing the need for a framework that harmonizes AI's strengths with the core values and objectives of libraries. AI-assisted approaches enhance human decision-making by providing tools to analyze data and generate insights, while AI-driven methods take a step further, operating autonomously to make decisions and perform tasks with minimal human intervention.

Purpose

This paper aims to provoke a deeper discussion about the role of AI in library assessment, challenging existing paradigms and advocating for a more forward-thinking approach to evaluating library services in an era increasingly defined by artificial intelligence. By examining and comparing traditional assessment with AI-assisted and AI-driven approaches, the paper explores how these technologies can redefine assessment methods, metrics, and outcomes.

This paper aims to contribute to a future-focused dialogue, guiding librarians as they navigate the complexities and possibilities of integrating AI into their assessment practices. Ultimately, it seeks to empower libraries to embrace AI technologies while maintaining the core values of fairness, transparency, and community engagement that have long been central to their mission. *This paper explores the intersection of AI and library assessment through **traditional, assisted, and autonomous AI models**, addressing challenges and ethical considerations.*

Traditional Assessment Methods and AI

Traditional assessment methods are based on foundational research methods, and distinctions between qualitative and quantitative approaches, or mixed method approaches. Philosophical perspectives are informing choices around these methods, such as assumptions around the nature of reality and truth (objective vs emerging), the ability to generalize (to large groups of people vs individualized and specific contexts), and they types of outcomes that are important to measure (trends of quantitative indicators vs contextual impact and changes achieved). Most of the 20th century library assessment work has been quantitative in nature in the form of library statistics; the centrality of library statistics is replaced by more qualitative and User Experience/ UX-methods in the 21st century. Both qualitative and quantitative methods can benefit from AI tools.

On a practical level, AI-Driven approaches are driven based on the development of AI-tools. They can inform the practice of implementing assessment through querying, editing findings, and summarizing and communicating findings. In this mode AI-driven methods are to be used by researchers to help them augment and deliver improved research output. Research tools use algorithms embedded in them that allow predictive analytics, more efficient text and data mining, and natural language processing, which are already AI-driven approaches.

| AI & Assessment | | Benefits | | |
|--|---|---|---|---|
| The nature of knowing | Roles | Generalize | Contextualize | Both |
| Traditional assessment | Human researcher agency expertise | Quantitative: <ul style="list-style-type: none"> • Surveys • Statistical Analysis • Usage Data | Qualitative: <ul style="list-style-type: none"> • Interviews • Focus Groups • Case Studies | Mixed Methods: Combination of Quantitative and Qualitative approaches |
| AI-Assisted approaches (traditional) | Machine assisted perspective Accessible to non-experts | Predictive Analytics: <ul style="list-style-type: none"> • Regression Analysis • Time Series Forecasting • Machine Learning Models | Text and Data Mining: <ul style="list-style-type: none"> • Natural Language Processing (NLP) • Sentiment Analysis • Topic Modeling | Predictive Analytics & Text and Data Mining: Integrated approaches for comprehensive insights |
| AI-Driven approaches (futuristic/experimental) | AI-agents Machine driven perspective | AI Agents choose: <ul style="list-style-type: none"> • Autonomous Systems • Adaptive Algorithms | AI Agents choose: <ul style="list-style-type: none"> • Automated Qualitative Analysis • AI-Generated Reports | AI Agents choose: <ul style="list-style-type: none"> • AI-Driven Integrated Mixed Methods • Dynamic Data Processing |

| Method | When is the method | | |
|-----------------------------------|---|---|---|
| | Quantitative | Qualitative | Mixed |
| Experiments | Comparing outcomes using numbers | Context around the experiment useful to describe | Depends on the balance between comparison and context description |
| Survey | Asking for numeric data or number coded data | Open ended survey questions | Both |
| Focus Group and Interviews | Not applicable with the exception of occasional follow up with numeric or coded data. | Asking opinions, feelings, impressions while taking into account group dynamics | Not applicable with the exception of occasional follow up with numeric or coded data. Both qualitative and quantitative approaches can be used in an interview protocol. |

| AI & Assessment | Methods | Ethical Considerations |
|--|--|---|
| Traditional assessment | Quantitative: Surveys, Statistical Analysis, Usage Data (e.g., SPSS, Excel) | Privacy: Ensure confidentiality of user data. |
| | Qualitative: Interviews, Focus Groups, Case Studies (e.g., NVivo) | Bias: Mitigate interviewer bias in qualitative data collection. |
| | Mixed Methods: Combination of Quantitative and Qualitative approaches (e.g., Survey + Case Study) | Transparency: Clear methodology and reporting. |
| AI-Assisted approaches (traditional) | Predictive Analytics: Regression Analysis, Time Series Forecasting (e.g., Python - SciKit-Learn) | Data Privacy: Secure handling of large datasets. |
| | Text and Data Mining: NLP, Sentiment Analysis, Topic Modeling (e.g., NLTK, TensorFlow) | Bias: Ensure algorithms are fair and non-discriminatory. |
| | Predictive Analytics & Text and Data Mining: Integrated approaches for comprehensive insights | Accountability: Human oversight of AI outputs. |
| AI-Driven approaches (futuristic/experimental) | Autonomous Selection by AI Agents: Dynamic Method Selection (e.g., Reinforcement Learning) | Transparency: Ensure AI decision-making processes are understandable and explainable. |
| | Automated Qualitative Analysis: AI-Generated Thematic Analysis (e.g., GPT-based systems) | Bias: Continuous monitoring to prevent AI-induced biases. |
| | AI-Driven Integrated Mixed Methods: Adaptive Data Processing (e.g., End-to-End Machine Learning Systems) | Accountability: Clear delineation of human vs. AI responsibilities. |

Of course, there are benefits and limitations of each method, whether AI is enabled or not. Comparing AI-derived with human derived research analysis is beneficial as it allows us to enrich our perspectives and helps us define ways in which AI adds value to research. Ultimately, we are facing a key question as to whether our future is technology enabled or technology driven, and this question centers around whether we give more agency to the technology or those wielding the technology. In other words, does the researcher as a person have and feel that they have the agency needed to guide the work, or is the researcher more of an observer who creates the conditions (i.e. sets up the technology) for the research to be carried out?

As we are reflecting on traditional and AI enabled methods, we are posing a series of reflective questions for researchers and librarians to grapple with.

How is agency by the researcher manifested?

Data

Researchers spend a lot of time thinking through the evidence they need to collect, the arguments they need to make and how to substantiate them, and the ways they can communicate their work effectively. Traditional methods of data handling rely on manual data collection and analysis, whereas AI approaches can handle much larger datasets efficiently and derive insights more quickly. **Can the researcher feel confident that the AI tools are indeed at their command and do not threaten their agency over the direction of the research?**

Purpose of inquiry

Researchers are often grouped into quantitative and qualitative schools of thoughts depending on their willingness to generalize or explore the surrounding context of a topic. AI allows for more personalized approaches in both quantitative and qualitative analysis and can rely more on individual user behavior and nuances. **Can the researcher feel they are achieving the right balance or intended balance towards generalization or context building with AI tools at their disposal?**

Automation

Research approaches have automated many processes over the years and AI accelerates this automation exponentially. **Do researchers feel they have control over the thinking process as they are automating processes even more rapidly? Are assessment librarians utilizing AI tools to reduce the manual workload?**

Insights

AI can provide deeper insights through advanced analytics and machine learning techniques, uncovering patterns and correlations that may not be apparent with traditional methods. **Are assessment librarians and researchers confident that the emphasis placed by AI tools is an outcome that we can work with in a beneficial manner?**

Scale

AI-driven approaches are often more scalable and adaptable to changing library environments and user needs compared to traditional methods. An example, when Martha Kyrillidou started doing data analysis in the late 1980's, it was quite labor intensive to collect print survey data, code them, and analyze them on a mainframe (a survey of 500 people was considered a large project in the late 1980s). In the 1990s, a dataset of 10,000 cases could be analyzed longitudinally on a personal computer (as a researcher, for example, Martha Kyrillidou did a series of longitudinal trend analysis on the ARL Annual Salary Survey). In the 2000-2010, we could analyze a few hundred thousand cases using computing power and we were able to

launch projects like LibQUAL+ collecting more than 300,000 cases of user survey data across multiple libraries. As our scale became larger, researchers were questioning more and more the purpose of standardization and generalizability and emphasized more the need for context. Qualitative methods became increasingly mainstream and have grown to dominate our practices. ***Are we comfortable towards scaling qualitative analysis in the same ways we have done with quantitative analysis? What does that mean for how we understand reality and truth? How does the context around the method affect the results and conclusions we come to?***

In summary, while traditional library assessment methods provide valuable insights through direct user interaction and analysis, AI-driven approaches leverage advanced technologies to automate processes, enhance personalization, and uncover deeper insights from data, thereby complementing and expanding the capabilities of traditional methods in modern library management. ***But the key question is: do researchers and assessment librarians feel comfortable with the leap in scale, automation, personalization, and information abundance that AI methods can generate? Are we ready to harness these new tools and what does that mean for...?***

AI-Assisted and AI-Driven Assessment: A Spectrum of Capabilities

The integration of artificial intelligence into library assessment spans a continuum, from AI-assisted systems that enhance human efforts to AI-driven systems that operate with significant autonomy. While both approaches leverage AI to improve efficiency and generate insights, they differ in their reliance on human oversight and decision-making authority. Understanding this spectrum is critical as libraries navigate the evolving landscape of AI adoption.

Defining AI-Assisted and AI-Driven Assessment

AI-Assisted Assessment involves tools that enhance librarians' decision-making by automating repetitive tasks, processing large datasets, and offering actionable insights. These systems require human interpretation and oversight to implement changes effectively. For example:

- Predictive analytics helps librarians allocate budgets by forecasting resource demand based on historical trends.
- Natural language processing (NLP) identifies patterns in user feedback, aiding in service improvements.
- Automated classification systems organize materials, streamlining cataloging tasks while keeping librarians in control.

In contrast, **AI-Driven Assessment** represents a more autonomous use of AI, where systems independently analyze data, make decisions, and adapt to new information with minimal human involvement. For instance:

- AI-driven tools can dynamically reallocate resources, such as shifting budgets to high-demand digital collections during peak usage periods.
- Advanced systems refine their methods over time, improving efficiency and responsiveness based on real-time data.

While both approaches aim to optimize library operations, AI-driven systems push the boundaries of automation and scalability, offering potential benefits alongside unique challenges.

Advancing AI-Driven Assessment with AI Agents

A significant development in AI-driven systems is the rise of **AI agents**—autonomous systems that interact with their environment, make decisions, and perform tasks to achieve specific goals. These agents differ from traditional AI models by combining data analysis with decision-making and action capabilities, creating systems that are both adaptive and proactive.

For example, an AI agent in a library might monitor real-time user behavior, such as digital resource usage or study room reservations. Based on this data, the agent could:

- Adjust library hours during peak times to maximize accessibility.
- Recommend personalized resources to users based on their preferences and usage history.
- Reallocate staffing or funding to address emerging demands, such as increased requests for digital archives.

The collaboration between multiple AI agents presents even greater possibilities. One agent might focus on resource allocation, while another manages user engagement, creating a dynamic ecosystem where systems communicate and adapt seamlessly. For instance, an agent managing study room bookings could work with another agent optimizing staffing schedules to ensure sufficient coverage during busy periods.

While these advancements promise significant benefits, implementing AI agents requires careful consideration of feasibility. High-quality data, robust infrastructure, and staff training are essential to ensure these systems function effectively. Furthermore, libraries must balance the efficiency of AI agents with ethical considerations to maintain user trust.

Transitioning from Assistance to Autonomy

Libraries may not immediately leap from AI-assisted to AI-driven systems. Instead, many will adopt a phased approach, integrating AI gradually as they build familiarity and confidence. For example:

- A library might begin by using NLP to analyze user feedback, empowering librarians to identify trends. Over time, this could evolve into an AI-driven agent that autonomously implements service changes based on feedback patterns.
- Predictive analytics tools used for budget planning could lead to autonomous systems reallocating funds in real-time based on changing user demands.

This incremental adoption allows libraries to test AI capabilities in low-stakes environments while addressing any challenges that arise, such as bias or data inaccuracies.

Shared Ethical and Practical Considerations

Whether AI-assisted or AI-driven, all systems share common ethical and operational challenges that must be addressed for successful implementation:

1. **Transparency and Explainability**

The "black box" nature of many AI systems, particularly AI agents, complicates transparency. Libraries must prioritize tools that offer interpretable outputs and actively communicate how AI-derived decisions are made, fostering trust and accountability among users and staff.

2. **Bias Awareness**

Both approaches risk perpetuating biases embedded in their training data or algorithms. While bias cannot be eliminated, libraries must focus on identifying and mitigating its effects. Regular audits and adjustments, alongside diverse training datasets, are critical to promoting fairness in outcomes.

3. **Data Privacy and Security**

AI systems require access to large datasets, often including sensitive user information. Libraries must implement robust data protection protocols, comply with privacy regulations, and clearly communicate data usage policies to users to maintain trust.

4. **Accountability and Oversight**

In AI-assisted systems, librarians directly interpret and guide decisions, ensuring accountability. For AI-driven systems, governance frameworks must define responsibility for autonomous actions, ensuring that AI outputs align with institutional values and user expectations.

5. **Organizational Readiness**

Libraries must invest in staff training, infrastructure, and policy development to prepare for the adoption of AI-driven systems. Without these foundational elements, transitioning to more autonomous systems may be ineffective or even counterproductive.

The Future of AI-Driven Assessment

The advancements in AI agents and other autonomous technologies are pushing libraries toward a new era of highly adaptive and scalable assessment practices. As these systems evolve, the line between AI-assisted and AI-driven approaches will blur, creating a continuum of capabilities that blend human expertise with AI's transformative potential.

Libraries that embrace this balance will be able to navigate the challenges of AI adoption while unlocking its full potential. By starting with AI-assisted systems and gradually transitioning to more autonomous tools, libraries can ensure that their assessment practices remain innovative, ethical, and aligned with their core mission of equitable service to all users.

Conclusion

The integration of artificial intelligence into library assessment practices marks a pivotal moment in the evolution of library services. AI technologies—spanning the spectrum from AI-assisted tools that enhance human decision-making to AI-driven systems that operate autonomously—offer transformative opportunities to redefine how libraries evaluate their impact, allocate resources, and engage with users. By automating labor-intensive tasks, uncovering nuanced patterns in data, and enabling dynamic adjustments, these tools empower libraries to achieve greater efficiency, scalability, and precision while remaining adaptable to the needs of their communities.

AI-assisted assessment provides immediate benefits by augmenting human expertise. These systems enhance librarians' ability to analyze complex datasets, streamline workflows, and generate actionable insights, all while ensuring that critical decisions remain rooted in human oversight. As libraries adopt these tools, they can focus on delivering more nuanced, user-centered services, provided they remain vigilant about addressing issues like bias, transparency, and data privacy. Human judgment and contextual understanding will always be essential to interpret AI-generated results and ensure they align with institutional values and goals.

AI-driven assessment, powered by advancements in autonomous AI agents, represents a more ambitious vision of library operations. These systems can dynamically allocate resources, optimize services in real time, and even anticipate user needs through adaptive learning. However, their increasing autonomy introduces challenges around accountability, governance, and trust. Libraries must establish robust frameworks for monitoring these systems, ensuring their actions are explainable, equitable, and aligned with the library's mission. The rise of AI agents highlights both the promise and complexity of a future where decision-making becomes more automated.

The distinction between AI-assisted and AI-driven systems may blur over time as technologies evolve, but the shared ethical and practical considerations remain constant. Libraries must address concerns about algorithmic and human bias, safeguard user privacy, and maintain transparency to preserve public trust. These challenges demand not only technological competence but also a renewed commitment to the core values that have long defined library services: equity, accessibility, and community engagement.

In conclusion, the future of library assessment lies in thoughtfully integrating AI technologies to amplify human capabilities rather than replace them. By fostering a culture of ethical innovation, libraries can lead the way in responsibly adopting AI, ensuring these tools enhance their ability

to serve diverse communities while preserving the trust and transparency that form the foundation of their mission. As libraries embrace AI, they must remain vigilant, adaptable, and user-focused, ensuring that technology is harnessed to uphold their enduring commitment to knowledge, education, and equity in a rapidly changing world.

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