2024

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Original Publication Citation

Jiang, T., Liu, E., Baig, T., & Li, Q. (2024). Enhancing decision-making in higher education: Exploring the integration of ChatGPT and data visualization tools in data analysis. *New Directions for Higher Education.2024*(207), 15-29 . https://doi.org/10.1002/he.20510

DOI: 10.1002/he.20510

PRACTICE AND POLICY

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Enhancing decision-making in higher education: Exploring the integration of ChatGPT and data visualization tools in data analysis

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Abstract

This chapter explores the potential of integrating conversational AI tools such as ChatGPT with data visualization (DV) tools such as Power BI in higher education settings. A brief history of chatbots is summarized and challenges and opportunities in higher education are outlined. The highlights include AI's prospects for enhancing data-informed decision-making while needing safeguards to mitigate risks. Through a pioneering exercise, we integrated ChatGPT's conversational capabilities with Power BI's interface via API and tested functionality. Suggestions for good practice and implications for higher education are discussed.

Practical Takeaways

- The importance of data security, recognizing current limitations in accuracy, and good practices for integrating DV tools with ChatGPT. The exercise shows that AI tools have the potential to aid higher education leaders, but still face many challenges, and human judgment remains essential.
- Integration of ChatGPT with Power BI in higher education aims to enable natural language interaction with data visualizations, facilitating dynamic discussions and insights for leaders.

- Considerations include data security protocols, technical challenges, financial constraints, and the potential and limitations of AI. Technical challenges include limitations in ChatGPT's interpretation of complex queries, API performance issues, and data processing inefficiencies.
- Affordability of enterprise AI versions poses a barrier to adoption for institutions with budget constraints despite recognizing potential benefits.
- ChatGPT represents a significant advancement in AI capabilities but has limitations, including generating inaccurate information and lacking awareness of its limitations. Human oversight and critical evaluation are crucial in navigating the evolving AI landscape and leveraging its benefits effectively while mitigating risks.

INTRODUCTION

Recent advances of disruptive technologies, including Artificial Intelligence (AI), Machine Learning (ML), and the rise of digital platforms, have transformed the landscape of higher education systems across the globe. Throughout history, humans have been symbolized as a signifier of intelligence, contributing to modernization processes over the centuries. Significantly, the current shift toward AI-driven digital platforms and applications may signal a monumental shift that combines human intellect and machine-generated intelligence in a contemporary transitional paradigm (Baker et al., 2023). The integration of these artificially-intelligent agents into academia profoundly influences how academic leaders make decisions and contribute to the advancement of modern knowledge orientations. Simultaneously, these tech-oriented transformations present a double-edged sword, offering exciting new opportunities while raising inevitable concerns and apprehensions (Dai et al., 2023).

Overall, the higher education community is becoming keenly aware of a paradigm shift and profound impact of disruptive technologies and AI on teaching, learning, and decision-making processes (Schon et al., 2023). What was once a fictional fantasy of technologically-advanced knowledge has now become a reality not only in the business and industry sectors but also in the educational realm. Data-informed decision-making is empowered by AI-based agent modeling, data analytics, and predictive intelligence tools. These AI-powered tools influence numerous institutional practices, including student enrollment, curriculum development, resource allocation, strategic planning, academia-industry collaboration, employing new knowledge for civic benefits, and beyond. Using machine learning algorithms, the university develops predictive models that forecast future enrollment trends based on historical data and external factors such as economic conditions, demographic shifts, and changes in educational policies. Consequently, these technologies create an enabling environment for competitiveness and an adaptive approach toward sustaining quality standards in higher education.

With rapid advancements in AI technologies, it is anticipated that teaching, learning, and research methodologies will also progress, expanding the possibilities for accessing high-quality education at anytime and anywhere. For instance, virtual laboratories, real-time

networks and collaboration, mobile learning, and design simulation projects connected to the real world practically and reflectively aid students in exploring the social and physical dynamics of our world (Aithal, 2023). AI-powered tools are becoming ubiquitous, ingrained into every aspect of life. Therefore, academia needs to take the lead, fostering collaboration between AI-driven chatbots like ChatGPT and Data Visualization (DV) tools such as Power BI, integrating them into data dashboards to expedite data analytical discoveries. This chapter focuses on integrating ChatGPT, an advanced conversational AI model, with Power BI, a popular DV tool, with the aim to explore integration possibilities, assess effectiveness, and propose best practices for utilizing AI tools in data analysis.

A BRIEF HISTORY OF CHATBOTS AND GENERATIVE AI

AI is becoming ubiquitous in every industry. While many once perceived AI as a distant, futuristic concept, it has been integrated into our daily lives and work. Devices such as Amazon's Echo & Alexa have found their way into countless households, revolutionizing how we interact with new technologies. Such advancements are not just tools for adults; they entertain our kids, who, with wide-eyed wonder, command these devices with ease and fascination. With the emergence of AI and ML-powered technologies such as Tesla Autopilot, ChatGPT, Amazon Alexa, Netflix AI features, ElevenLabs, and alike, the once-imagined future of AI is undeniably present, deeply woven into the fabric of our everyday routines.

Many AI-powered applications take the form of a Chatbot. The term "chatbot" comes from "chatterbot", coined in 1994 by Michael Mauldin. The concept of bots originates from the word "robot," introduced in 1920 by Karel Čapek. The journey of chatbots began in 1966 with Eliza, developed by Joseph Weizenbaum, mimicking a psychotherapist. Weizenbaum expressed concerns about the anthropomorphization of computers, a phenomenon later dubbed the "Eliza effect" (in Kim et al., 2019). Over the years, various chatbots like Parry and Racter merged, highlighting the development in the field (Rudolph & Tan, 2023). Alan Turing, in 1950, proposed the Turing Test to measure machine intelligence. The test involves a human evaluator who interacts with both a computer and another human through a text interface, without knowing which is which. If the evaluator cannot reliably distinguish the responses of the computer from those of the human, then the computer is said to have passed the Turing Test and demonstrated artificial intelligence. By 2014, a chatbot named Eugene Goostman could fool one-third of the judges, challenging the predictive accuracy of the Turing test (Rudolph & Tan, 2023). The 2010s saw the rise of voice assistants like Siri, which paved the way for advanced chatbots. While chatbots like ChatGPT represent a significant leap in AI, concerns about deception persist. In the modern age, chatbots, built upon generative pre-trained transformers (GPT), find use in various sectors, from customer service to education (Rudolph & Tan, 2023). Despite their advancements, concerns about deception persist, underscoring the ongoing dialogue surrounding AI ethics and responsibility.

TECHNOLOGICAL CHALLENGES AND OPPORTUNITIES IN HIGHER EDUCATION

In an era of technological advancement, higher education systems and their affiliated academic leaders, educators, management staff, and students confront a broad spectrum of opportunities and challenges. Some are universal, while others are unique due to contextual and geographical significance. The positive prospects of AI-driven tools

in academia are regarded as "enablers for enhancing education quality and transforming higher education" (Dai et al., 2023, p. 85). Dai's work suggests that AI generative and data-powered tools enable students to plan, organize, and personalize the learning process, fostering student-centered learning. Additionally, Aithal (2023) outlines important features of information-based learning, including personalized learning, collaborative learning, mobile learning, interactive learning, access to a wide range of resources, real-time feedback, and blended learning. Alongside these teaching-learning opportunities, AI generative tools and chatbots offer global accessibility 24/7/365, providing data insights that aid educational institutions in decision-making, improving class management, decision-making, and administrative efficacy (LIaha et al., 2023). Technology serves as a powerful accountability structure, potentially offering more inclusive opportunities for decision-making and efficient service delivery in educational systems.

While AI technology offers promising potential benefits, there are also valid concerns about the security, trustworthiness, and ethical implementation of AI applications. According to Slimi and Carballido (2023), a great fear lies in how we measure AI or disruptive technologies and their ability to benefit humanity and society at large. In this fluid digital and AI-powered transformative epoch, an assessment of the sensitivity and vulnerability of integration of technologies is highly crucial for academic institutions for better preparedness and adaptive strategy. For instance, it is critical to understand how sensitive academic leaders are to ethical issues of new technologies, particularly, when it comes to the deployment or integration of AI generative tools and modern technology in administrative and managerial procedures. According to Kaspi and Venkatraman (2023), there are serious ethical issues pertinent to ChatGPT. The large language models (LLMs) that are used in ChatGPT may discriminate based on unfair or discriminatory responses derived from prestored human biases, and they ignore or infringe on text ownership, copyrights, intellectual property rights, and the privacy of data (Kaspi & Venkatraman, 2023). As a result, authenticity and unbiased data generation is a major issue for academic programs. To address such issues and assure quality standards, some mechanisms are being adopted. These include utilizing AI-powered tools for automated proctoring of exams, filtering out unfair algorithmic decision-making processes, detecting and mitigating biased information, and preventing academic dishonesty (Slimi & Carballido, 2023).

There is a growing body of research on AI applications in higher education. Scholars such as Zawacki-Richter, 2019 and Zheng & Webber in this volume, describe excellent examples such as profiling and prediction (admissions decisions and course scheduling; drop-out and retention; student models and academic achievement), intelligent tutoring systems (teaching course content; diagnosing strengths and automated feedback; curating learning materials; facilitating collaboration; the teacher's perspective), assessment and evaluation (automated grading; feedback; evaluation of student understanding, engagement, and academic integrity; evaluation of teaching), and adaptive systems and personalization (teaching course content; recommending personalized content; supporting teachers and learning design; using academic data to monitor and guide students; representation of knowledge in concept maps).

Helping senior higher education institution (HEI) leaders navigate and understand technical terms, apps, and data in the context of a competitive higher education market is crucial for effective decision-making in alignment with the overarching goals and mission of the institution. Terenzini's (1993, 2013) three tiers of organizational intelligence is a frequently cited framework to help institutional research (IR) and institutional effectiveness (IE) practitioners cope with higher education challenges. Tier 1 is referred to as analytic/technical intelligence, Tier 2 is called issues intelligence, and Tier 3 is contextual intelligence. Utilizing Terenzini's framework, Webber and Zheng (2020) developed in-depth analyses to guide higher education administrators in working effectively with the

rise of big data and new technologies on campus. This approach not only emphasizes the importance of foundational intelligence, which includes technical skills, and data literacy, but also highlights the need for the highly sought Tier 3, contextual intelligence, to apply deeper personal skills and knowledge in real-world situations (Dawson et al., 2015; Webber & Zheng, 2020).

Zheng and Webber (2023) discuss the technological advances in higher education and their associated implications and opportunities for higher education professionals. Chatbots, like ChatGPT, have generated warnings about potential disruptions, but also showcase the rapid development of AI. These tools rely on massive datasets and can support student success if used properly, but risks around bias and plagiarism need addressing. In this age of the Internet of Things (IoT), IR and IE professionals should understand AI definitions, applications in higher education, and implications for their work. They should also update skills like data science and visualization to leverage AI tools. AI can help with tasks like documentation, analysis, and summarization. However, human judgment is still essential for responsible data-informed decision-making.

The need to translate complex data stories and technical information into data intelligence has made data visualization tools indispensable in higher education. Through visually appealing graphs, charts, and dashboards, these tools allow educators to convey information effectively, enabling students to grasp concepts and trends more easily. Moreover, these tools empower researchers to analyze data efficiently, identify patterns, and compellingly communicate findings, contributing to academic advancements. There are several popular DV tools available that cater to a wide range of needs and preferences. Some of the most widely used DV tools include Tableau, Microsoft Power BI, Qlik, IBM Cognos, Google Charts, and SAS Visual Analytics. Each has its pros and cons. For example, Power BI pros include ease of use and Microsoft integration while cons are less customization. Tableau pros are advanced analytics and visuals but have a steep learning curve and higher cost. When selecting a data visualization solution, it is important to consider the specific analytical and reporting requirements, data infrastructure, user skill level, and budget to match the strengths of the tool to the organization's needs. Higher education professionals also need to stay ahead in data analytics. For example, it is essential to stay updated with the latest software features, such as the 2023.1 Tableau version's Accelerator Data Mapping and Copilot in Power BI. These updates ensure that users' data analytics remain at the cutting edge and continue to deliver valuable insights to their institution leaders.

INTEGRATING POWER BI DATA DASHBOARDS WITH CHATGPT THROUGH APPS

In recent years, there has been a proactive trend among vendors in the education sector to incorporate AI capabilities into DV tools. This integration involves leveraging AI-driven functionalities like machine learning algorithms, predictive analytics, and natural language processing (NLP). The primary objective is to automate tasks, unveil concealed patterns within datasets, and construct predictive models. By incorporating such AI-driven features, these tools significantly bolster their analytical capabilities, empowering users to extract profound insights and facilitate more efficient data-informed decision-making processes.

To gauge the potential of integrating AI-empowered functionalities in data visualization (DV) tools, we undertook a pioneering exercise that involves the integration of Power BI with ChatGPT functionalities using OpenAI's Application Programming Interface (API). The purpose, structure, and findings from our exercise are described below.

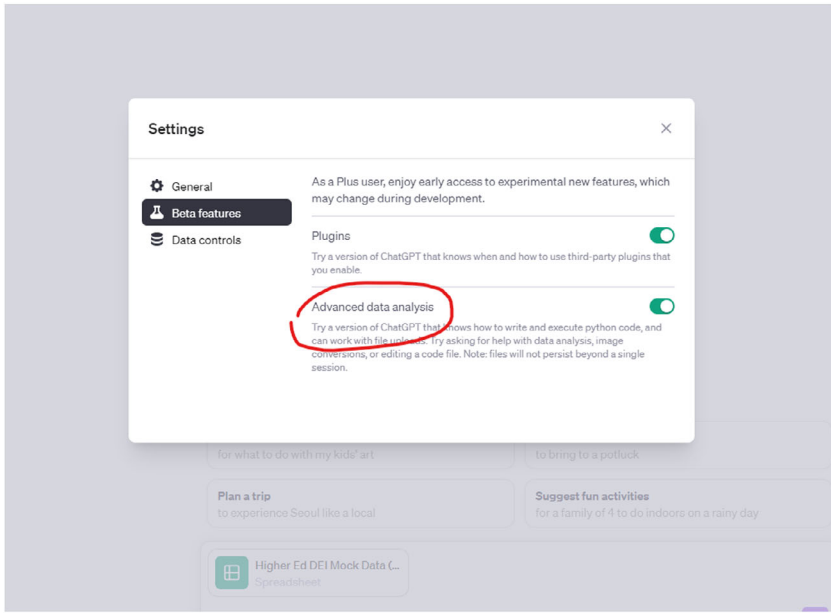

FIGURE 1 Enable advanced data analysis plugin in ChatGPT 4.0.

PURPOSE OF THE EXERCISE

Imagine a higher education leader dynamically discussing data visualizations, asking natural language questions, and receiving comprehensive explanations. This could become a reality through the integration of ChatGPT and Power BI via an API. API stands for Application Programming Interface. APIs define how different components of software should interact, specifying the methods and data formats applications can use to request and exchange information. In simpler terms, think of it as a messenger that enables two different systems to talk to each other. It allows developers to access certain features or data from an application without needing to understand its internal workings, essentially providing a way for different software to work together. ChatGPT can leverage Power BI's interactive features to provide real-time insights and recommendations. In return, Power BI's intuitive interface offers a platform for leaders to delve into data. When combined, AI-driven analysis, natural language processing, and interactive visualizations promise enhanced decision-making. By coupling PowerBI with Generative AI tools, our exercise aims to explore innovative ways of data analysis and storytelling within higher education. The fusion of these tools could potentially revolutionize data interpretation, allowing for more comprehensive insights and effective communication of complex information to students, educators, and researchers alike.

In our exercise, we employed the "Higher Education Diversity, Equity, and Inclusion (DEI) Mock Data," an Excel file with various tabs like race and ethnicity, majors list, person data, postal codes, and enrollment information. It is crucial to note that the data used in our exercise is simulated data, downloaded from the Data World website (https://data.world/datasets/higher-education), a data catalog platform whose cloud-native SaaS (software-as-a-service) platform combines a consumer-grade user experience with a powerful knowledge graph to deliver enhanced data discovery, agile data governance, and actionable insights. After enabling the Advanced Data Analysis plugin in the paid version of ChatGPT 4.0 (see Figure 1), we uploaded the mock data file. ChatGPT was then instructed

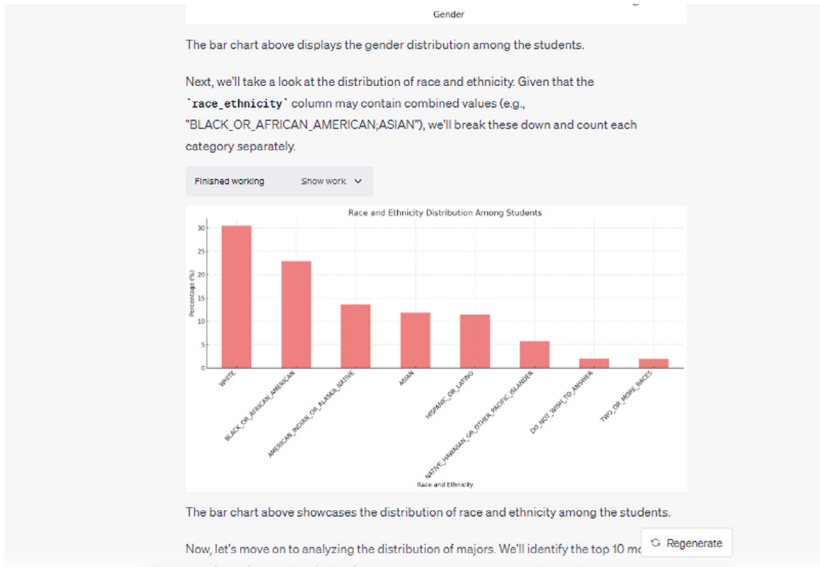

FIGURE 2 Higher education DEI mock data analyzed by advanced data analysis plugin.

to merge different Excel tabs using common student IDs, analyze the merged data, create visualizations, and finally generate a PowerPoint presentation reminiscent of an IR professional's work. Impressively, ChatGPT completed these tasks within five minutes, producing DEI visualizations broken out by annual enrollment, major, gender, ethnicity, and race (see Figure 2). Furthermore, a summarized PowerPoint report was readily available for download.

The bar chart above showcases the distribution of race and ethnicity among the mocked student enrollment data. It lists percentages of race and ethnicity; for example, white is the largest student group, followed by black or African Americans, Asians, Hispanics, and other groups. This chart is an example of an automatically-generated chart based on imported data using the ChatGPT advanced data analysis plugin. Similarly, AI can also identify historical trends and popular programs, such as the top ten majors in your enrollment data. Higher education leaders are often responsible for making data-informed decisions regarding student enrollment, program offerings, resource allocation, and strategic planning. By leveraging AI technologies, they can gain insights into enrollment trends, student demographics, program popularity, and other key metrics to inform their decision-making processes and enhance the overall effectiveness of their institutions.

DATA SECURITY PROTOCOLS

This exercise used mock data to illustrate the potential of using ChatGPT for advanced data analysis tasks. However, when considering using real student-level data with ChatGPT, several practical considerations arise. Uploading such personally identifiable information (PII) data might violate institutional or federal regulations, such as the Family Educational Rights and Privacy Act (FERPA) and Health Insurance Portability and Accountability Act (HIPAA) making it currently difficult for higher education professionals to use Advanced Data Analysis for their actual work. OpenAI's policies strictly prohibited the uploading of confidential information to ChatGPT, as outlined in its Terms of Service and FAQ page.

However, on March 1, 2023, there was an update in their policies; OpenAI now specifies that specific user-submitted data will not contribute to training or improving its models unless users explicitly opt-in to share that data. Furthermore, OpenAI has made strides to accommodate HIPAA compliance requests. OpenAI and users now can sign Business Associate Agreements (BAAs) upon request, supporting the compliance needs of relevant customers under HIPAA regulations (Wells, 2023). Users must be aware that if there is not a signed BAA between OpenAI and a Covered Entity, uploading Protected Health Information (PHI) to ChatGPT could breach HIPAA regulations. Even with a BAA in place, individual employees of a Covered Entity must exercise caution. HIPAA mandates that any disclosure of PHI to a Business Associate must serve a legitimate healthcare operations, treatment, or payment purpose. Moreover, such disclosures should involve the minimum necessary amount of PHI required to accomplish the specified task.

Some institution officials might consider third-party vendors that bridge their BI data dashboards with ChatGPT. For instance, some third-party visual tools such as AI Lens (https://www.lensvisual.io/) and Alteryx GPT connectors (https://community.alteryx.com/t5/Data-Science/Alteryx-and-Generative-AI-How-To-Use-the-Alteryx-OpenAI/ba-p/1164000), leverage AI to facilitate data analysis, offering insights, reports, and dashboards. While they tout a secure and private platform, guaranteeing users complete data control, it is essential to remain cautious. Products from third-party vendors that integrate data dashboards with ChatGPT are still in their developmental stages, which could result in inconsistencies and disruptive services. Engaging with third parties may also introduce data-sharing risks and potential data breaches. A third option is for an institution to sign an enterprise license with some of the GenAI developers such as OpenAI enterprise and Microsoft Copilot Studio. In an enterprise-implementation environment, data will be secured within the enterprise while users are still able to leverage what the platforms can offer (https://openai.com/blog/introducing-chatgpt-enterprise).

EXERCISE STRUCTURE

Since 2023, there has been a surge in technical guidance on integrating ChatGPT with Power BI, as evidenced by the works of Mahmood (2023), Araujo (2023), and Halkjaer (2023). Many US higher education officials have created custom dashboards using Microsoft Office 365 Power BI, enabling campus leaders to view real-time key data points. Raw data from the institution's student information system (SIS) can be converted into intuitive visuals, offering leaders a clearer perspective on the institution's performance. They can use this information on their own (filter and drag-and-drop way) or in collaboration with the IR and IT teams. With the advance of AI and ML technologies, higher education leaders might wonder, "Can we interact with BI dashboards through conversations? Can Power BI automatically generate visuals tailored to my command?" Because these are valid questions, we sought to explore these possibilities.

Our exercise encompassed three key steps: data preparation; setup of Power BI and ChatGPT integration; and testing the integration. Initially, we curated the necessary datasets for our exercise. This involved assembling and organizing the "Higher Education Diversity, Equity, and Inclusion (DEI) Mock Data," comprising various Excel tabs encompassing demographic details, majors, enrollment information, and other relevant data points. This synthetic dataset, downloaded from the Data World website, was used to simulate real-world educational data without compromising sensitive information. Second, we set up the integration between Power BI and ChatGPT, allowing us to query the data visualizations using natural language. Following data curation, we proceeded to integrate Power BI with ChatGPT. This involved accessing the latest version of ChatGPT, specifically ChatGPT

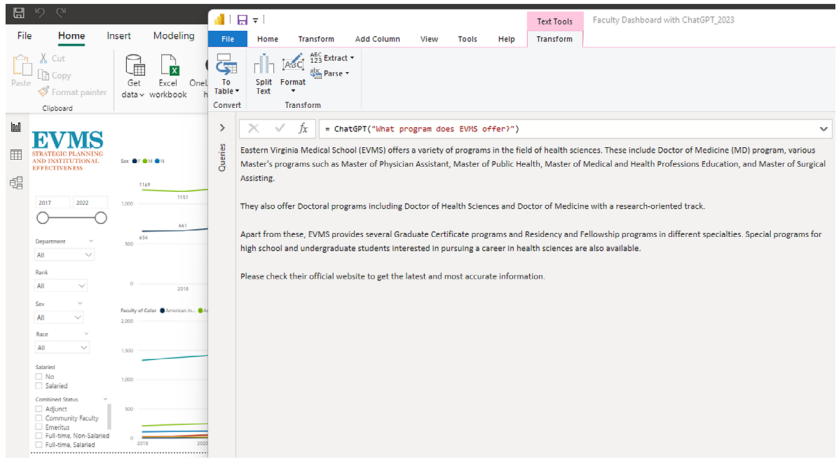

FIGURE 3 Interacting with ChatGPT in power BI.

4.0, through OpenAI's API. Once Power BI reports and ChatGPT are integrated, users can pose basic questions to ChatGPT, such as inquiring about the programs our school offers, the current enrollment figures based on the actual data, our standing in the U.S. News rankings, and which institutions are our peers. ChatGPT will then generate a response shown in Figure 3.

Third, we activated the Advanced Data Analysis plugin within ChatGPT 4.0, enabling enhanced data processing capabilities. The integration process included linking the generated DEI Mock Data within Power BI and establishing communication between the two platforms. Lastly, to validate the integration's functionality and assess its efficacy, we conducted comprehensive testing procedures. This involved executing various commands and instructions within ChatGPT to interact with Power BI, such as directing ChatGPT to merge and analyze different datasets, create visual representations, and generate simulated reports akin to those generated by institutional research professionals. Additionally, we scrutinized the compatibility and efficiency of the integration by examining the speed, accuracy, and quality of the outputs produced by ChatGPT through Power BI (see Figure 4).

FINDINGS

Our exercise of integrating a DV tool with ChatGPT reveals that its natural language capabilities are not yet as mature as we had envisioned. First, users can pose questions to ChatGPT through Power BI reports and convert the responses into data visualizations. However, users might not get current data and meaningful insights through ChatGPT. For instance, since ChatGPT's training data was last updated in September 2021, queries about more recent information could yield invalid responses. In practice, pursuing reliable and secure integration surfaces numerous challenges. In the Power BI advanced query editor, we tested a question asking it to compare Eastern Virginia Medical School with other Virginia medical schools in applications and enrollments and to create tables. The integrated platform answered our command and automatically created two tables. However, the data from other Virginia medical schools was not updated through the most current year. This limitation in ChatGPT's ability to interpret our request and locate the most current data available made our testing process more challenging. Second, we also observed that invoking the API repeatedly becomes inefficient for even a few hundred rows, attributed to its

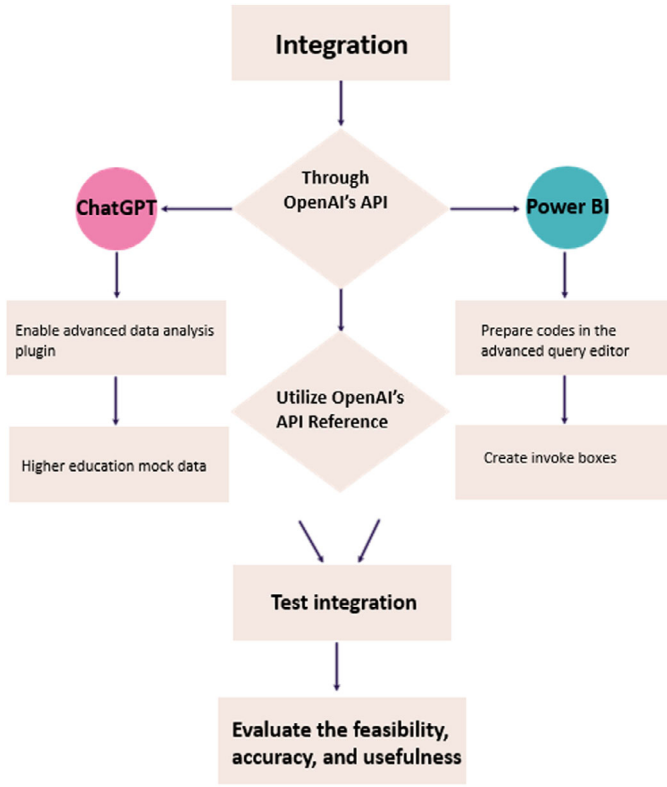

FIGURE 4 Flow diagram of the ChatGPT and power BI integration.

data generation task and Power Query's absence of parallel processing. Third, ChatGPT outputs exhibit variability with every model refresh, leading to inconsistencies. This issue may be fixed as OpenAI continues to evolve its models in the future.

Thirdly, higher education leaders may express concerns about data security or data privacy. In our demonstration, we used either mock data or aggregated public data with sensitive information removed. However, in real daily work, sensitive data such as student and faculty IDs or even SSNs might be used to merge multiple tables. Consequently, AI platforms such as ChatGPT, still face challenges in ensuring robust data security because they are not yet mature solutions capable of assuring users that their API connections are impervious to data breaches. While private versions of AI tools may provide better security features and are more suitable for handling sensitive institutional data, their high costs create a hurdle for many higher education institutions. Limited budgets might make it challenging for these institutions to afford the licenses or subscriptions required for these private versions. This financial barrier could restrict their ability to adopt these tools despite recognizing the advantages they offer in terms of data security. The integration of ChatGPT with Power BI through API may open up new possibilities, connecting users' data visualizations with advanced AI capabilities. However, it is essential to recognize that such integrations may require significant effort and colleagues' buy-in.

Admittedly, ChatGPT is a highly capable chatbot powered by an advanced AI system. While previous iterations of AI had limitations in quality, ChatGPT marks a significant advancement, proving genuinely useful for a wide range of tasks, from software development to generating business concepts and crafting speeches. Its enhanced capabilities hold immense potential for businesses that recognize its significance early. Our

investigation into the field leads us to the conclusion that ChatGPT is just the beginning, as similar chatbots with increasing capacities are on the horizon. What sets ChatGPT apart is its potential to handle creative and expressive tasks, revolutionizing industries by rapidly generating written content. It can even produce computer code efficiently, drastically speeding up software development. Additionally, it introduces the concept of human-machine collaboration, where experts can guide and improve AI outputs. However, AI still has limitations and can generate convincing but inaccurate information. "You can ask it to describe how we know dinosaurs had a civilization, and it will happily make up a whole set of facts explaining, quite convincingly, exactly that. It is no replacement for Google. It does not know what it doesn't know, because it is, in fact, not an entity at all, but rather a complex algorithm generating meaningful sentences." (Mollick, 2022, p. 173) While ChatGPT represents a significant leap forward, it is crucial to approach this technology with a critical eye and recognize both its potential and limitations as we navigate the rapidly evolving AI landscape.

GOOD PRACTICES FOR INTEGRATING DV TOOLS WITH CHATGPT

Higher education leaders and researchers should first and foremost remain aware of the responsible and ethical uses of data. On October 30, 2023, the White House issued an Executive Order concerning the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. After the Executive Order, federal agencies such as NSF and NIH released their statements and guidelines on the ethical use of data and AI. In addition, education professional associations such as Educause and the Association for Institutional Research (AIR) place great importance on ethical standards, especially when handling and processing data in an institutional context. Educause provides guidance on ethics, big data, and analytics in their publication "Ethics, Big Data, and Analytics: A Model for Application" (Educause, 2013). Similarly, the AIR "Statement of Ethical Principles" outlines principles for ethical practices in institutional research (Association for Institutional Research, 2019). The commitment to these standards is essential to maintain public trust and uphold the integrity of educational research. FERPA is a pivotal piece of legislation that protects the privacy of student education records. Schools and educational institutions that receive funding from the U.S. Department of Education are bound by FERPA regulations, ensuring that they maintain confidentiality and give parents and eligible students the right to access and amend their education records. For higher education professionals working in medical schools or related fields, an additional layer of data security is essential, as HIPAA offers further protection for the privacy and security of medical information beyond what FERPA requires.

On the institutional level, some colleges and universities are modifying their HR, IT, and data governance policies regarding the use of generative AI tools. For example, Harvard University posted on its official website the "Guidelines for Using ChatGPT and other Generative AI tools." The statement clearly says that all members of the Harvard community first must protect confidential data, meaning that members should not enter data classified as confidential (Level 2 and above), including non-public research data, into publicly-available generative AI tools, following the University's Information Security Policy. Harvard classifies data into five levels (L1 - Information intended and released for public use. L2 - Low-Risk Confidential Information that may be shared only within the Harvard community. L3 - Medium Risk Confidential Information intended only for those with a "business need to know." L4 - High-Risk Confidential Information that requires strict controls. And L5 - Reserved for Research Data only, as determined by IRB or Data Use Agreement). Information shared with generative AI tools using default settings is not

private and could expose proprietary or sensitive information to unauthorized parties. Second, Harvard members are responsible for any content that they produce or publish that includes AI-generated material: AI-generated content can be inaccurate, misleading, or entirely fabricated (sometimes called "hallucinations") or may contain copyrighted material. Harvard members are required to review their AI-generated content before publication (Garber et al., 2023). As institutions like Harvard recognize both the potential and risks of generative AI, developing clear policies and guidelines will be crucial for responsibly integrating these powerful tools into academic and professional settings.

AI AS A CATALYST FOR HIGHER EDUCATION LEADERS

Some international and national education authorities have expressed caution regarding the use of generative AI tools. For instance, the United Nations Educational, Scientific and Cultural Organization (UNESCO) recently published a document titled "ChatGPT and Artificial Intelligence in Higher Education: Quick Start Guide" (https://www.iesalc.unesco.org/wp-content/uploads/2023/04/ChatGPT-and-Artificial-Intelligence-in-higher-education-Quick-Start-guide_EN_FINAL.pdf). This Quick Start Guide is a concise, jargon-free downloadable resource that offers an overview of how ChatGPT operates and outlines its potential applications in higher education. IE and IR practitioners in American higher education institutions are familiar with the accrediting agencies. There are seven such agencies in the country, each with its own comprehensive compliance forms and accreditation standards that its members must adhere to. As AI technology advances, we anticipate that guidelines related to academic integrity, data integrity, student learning outcomes (SLOs), and quality enhancement plans (QEPs) may be further scrutinized in the coming years. Some mainstream higher education accreditation and assessment software like WEAVE may also embed new AI-powered features into the current cloud-based platform to meet new higher education needs.

Both healthcare and higher education are often perceived as slower to adapt to technological changes compared to certain sectors of private industry. There are several reasons for this, some institutions may have budget constraints and staffing shortages. Leaders in small institutions may prefer to wait and see how new technologies have an impact on larger institutions before adopting them. When those flagship institutions integrate innovative AI tools, they not only enhance their own educational and research capabilities but also set a benchmark for the wider academic community. Their actions can have a cascading effect: other institutions, seeking to remain competitive and relevant, are prompted to adopt similar technologies or to innovate further. This ripple effect, initiated by top-tier and flagship institutions, often accelerates the overall pace of technological integration across the academic landscape, elevating standards and practices in sectors and advanced data analytics nationally.

Furthermore, universities and colleges serve a broad range of stakeholders including boards of trustees, executive leaders, administrative faculty, teaching faculty, classified staff, students, alumni, and the local community. Meeting the needs and preferences of such a varied group can be challenging and can slow down decision-making processes. For instance, professors in higher education often have autonomy in how they teach their courses. This can be a double-edged sword. On one hand, it allows for diverse teaching methods and innovation. On the other, it can mean that there is no unified approach to adopting new technologies. Additional time and training will help faculty and staff members become more comfortable or familiar with the latest technologies. A few years back, using pivot tables might have been intimidating to some Excel users. Training and upskilling can be a significant undertaking, requiring both time and resources. Apart from

these internal challenges, there may be pressure from various external bodies such as accreditation agencies to maintain certain standards and practices, which can sometimes slow innovation.

ABUNDANT TRAINING OPPORTUNITIES EMPOWER EDUCATORS TO CHAMPION AI LITERACY

Numerous training sessions are easily available today across modalities, from online modules to in-person workshops, to help educators strengthen relevant skills. For example, MIT Professional Education offers a professional certificate program in machine learning and artificial intelligence for HEI leaders looking to further develop expertise in this critical domain. Immersive data literacy boot camps offered by IBM can also upgrade faculties' abilities to leverage analytics and metrics for informing instruction. Certification programs focused on data visualization tools like Tableau help instructors translate complex informational sets into engaging, comprehensible graphical formats for students. In addition, webinars offered by the Association of American Colleges & Universities (AAC&U) on AI offer glimpses into AI's future implications across campus services and learning environments. By tapping into these readily accessible development opportunities around AI, ML, and data literacy, HEI leaders can feel empowered to provide industry-aligned support regardless of their prior technical exposure. With multifaceted training resources at their fingertips, faculty are primed to prepare students for both utilizing and critically evaluating automation and intelligent systems in the workforce.

Lastly, HEI leaders must envision an aspirational future enabled by artificial intelligence and data visualization innovations. They must consider how generative AI and data analytics platforms can evolve to adapt to changing student and workforce development needs. This forward-thinking approach ensures that AI and data tools remain valuable assets supporting institutional goals in the long term. For instance, by combining AI conversational interfaces with interactive data visualizations, colleges can achieve tremendous efficiency gains in surfacing insights from institutional data to inform decision-making. As automation handles routine analytical tasks, human actors are freed to focus on higher-order critical thinking, design, and strategy.

CONCLUSION

Integrating new technologies into an organization's infrastructure requires thoughtful consideration of various interrelated components. As Webber and Zheng (2019) propose, four key aspects—people, process, technology, and culture—must align to ensure proper and beneficial adoption of data analytics platforms. Similarly, Chen and Popovich (2003) put forth three core pillars of platform, process, and people as critical to customer relationship management system success. Guided by these established frameworks, our exercise of artificial intelligence and data visualization integration involved preliminary data preparation, technical setup of the Power BI and ChatGPT tools, and live testing.

The integration of advanced AI chatbots like ChatGPT with data visualization tools such as Power BI offers promising new capabilities for data-informed decision-making in higher education. On the flip side, achieving this integration requires thoughtful planning and careful execution to ensure both security and effectiveness. Key considerations include selecting the right tools, managing APIs, addressing potential biases in AI outputs, establishing data privacy safeguards, and training users. Though challenges remain, the conversational and customizable insights enabled by combining natural language AI

with interactive data visualizations can enhance institutional research and planning. As AI and data analytics continue advancing rapidly, higher education leaders have significant opportunities to leverage these innovations. But they must do so judiciously, with an eye toward ethics, quality, and enriching human judgment. By collaborating across campus units and updating technical skills, higher education professionals can help guide appropriate AI adoption while remaining essential partners. With care and strategic vision, AI-powered analytics tools hold the potential to positively transform data-informed decision-making in higher education.

ACKNOWLEDGMENTS

We would like to extend our gratitude to all contributors who collaborated on this work. Tristan's expertise in designing the exercise using Power BI and ChatGPT 4.0 was invaluable to the project. Elina's technical proficiency in higher education data analysis greatly enhanced our research efforts. Special thanks to Tasawar and Qingrong for their diligent literature review and data collection. Each individual's contribution played a vital role in the completion of this project.

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How to cite this article: Jiang, T., Liu, E., Baig, T., & Li, Q. (2024). Enhancing decision-making in higher education: Exploring the integration of ChatGPT and data visualization tools in data analysis. *New Directions for Higher Education*, *2024*, 15–29. https://doi.org/10.1002/he.20510

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