INSIGHT INTO THE MULTI-PREDICTIVE FACTORS INFLUENCING ARTIFICIAL INTELLIGENCE (AI) ADOPTION IN UNIVERSITY ADMINISTRATION IN NORTH-CENTRAL NIGERIA

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Abstract
The use of artificial intelligence (AI) is fast taking over the academic terrain as well as other professions. It is also used in university system administration, though to a limited scope. This study sheds light on the various factors that influence the adoption of AI in university administrative systems in North-Central Nigeria. Using the Technology–Organization–Environment (TOE) framework and the Diffusion of Innovation (DOI) theory as a guide, the research explores key elements such as technological infrastructure, staff training and digital skills, perceived usefulness, organizational readiness, leadership support, and resistance to change. The paper examines the multi-dynamics of AI adoption in the university administrative system, specifically in North-central Nigeria. The categories of multi-predictive factors: technological and organizational readiness, influence of external environment and social attitudes towards adoption of AI are examined. The challenges of adopting AI in the university system, the panacea to the identified problems and the ethical implications are discussed. This study adds to the existing knowledge by emphasizing the complex interplay of technological, organizational, and human factors that shape AI adoption in higher education administration. The practical implications suggest that policymakers and university leaders should focus on enhancing digital infrastructure, building capacity, and implementing effective change management strategies to promote a sustainable AI-driven transformation.

Keywords: *Artificial Intelligence, University Administration, Adoption, Multi-predictive Factors, North-Central Nigeria, TOE framework, DOI theory*

Introduction

Artificial intelligence is regarded as a tool capable of easily composing, structuring, and disseminating expressions in the blink of an eye with minimal human intervention. Its application across various fields is becoming more widespread as the world recognises its multifaceted capabilities. Artificial intelligence has been used in recent settings especially in the education sector given its multi-dimensional abilities to simplify tasks, enhance learning (Mohammed et al., 2025a) and reduce stress. Beyond direct teaching uses, AI also plays a vital role in the administrative functions that support effective educational delivery. University administration handles academic and operational activities such as student enrolment, faculty coordination, financial management, and institutional planning. Good administration improves institutional efficiency, service delivery, and decision-making (Nwosu and Ekpe, 2022). Given the complexity of these tasks, incorporating advanced technologies like Artificial Intelligence offers significant potential for enhancing performance.

Artificial Intelligence (AI) adoption is increasingly seen as a vital element in promoting innovation and efficiency across various sectors, including education, healthcare, finance, and manufacturing. However, adopting AI technologies is complex and shaped by a wide range of factors rather than a single cause. This paper examines multiple predictive factors influencing AI adoption, highlighting the interaction between technological, organisational, environmental, individual, and

socio-cultural variables. Understanding these interconnected factors provides valuable insights for researchers, policymakers, and practitioners seeking to facilitate effective AI integration.

Conceptualizing Multi-Predictive Factors in AI Adoption

Multi-predictive factors refer to the diverse and interconnected elements that are likely to influence the adoption of AI technologies. Rather than viewing adoption through a unidimensional lens, contemporary research advocates a multi-faceted approach, recognising that technological readiness, organisational culture, regulatory environments, user attitudes, and societal norms converge to influence adoption decisions (Venkatesh et al., 2003; Maroufkhani et al., 2020). Mishra et al. (2022) assert that a holistic framework is necessary to capture the complex dynamics at play, proposing integrated models that encompass multiple predictive dimensions. Such frameworks enable more accurate predictive analytics and the formulation of targeted interventions to improve adoption rates.

Categories of Predictive Factors

Technological readiness, including the perceived usefulness, compatibility, complexity, and security of AI systems, significantly predicts organizational adoption (Alharthi *et al.,* 2023). Organizations are more inclined to adopt AI when the technologies promise substantial improvements over existing processes with manageable levels of complexity and risk.

Organizational readiness encompasses management support, financial and human resources, strategic alignment, and employee capabilities (Maroufkhani *et al.,* 2020). Effective leadership commitment and a skilled workforce are strong enablers for AI adoption. Organizational inertia or resistance, by contrast, can hinder technological integration even when external conditions are favourable (Dwivedi *et al.,* 2021).

The external environment, including regulatory pressures, competitive dynamics, and technological infrastructure, also plays a critical role (Borges *et al.,* 2021). Government regulations, in particular, can either serve as a catalyst or a hindrance to AI initiatives depending on the clarity, consistency, and forward-looking nature of the policies. At the micro-level, individual perceptions, trust in AI, perceived threat to employment, and personal innovativeness directly affect AI adoption (Jöhnk *et al.,* 2021). Employee scepticism or fear of job displacement can significantly slow down AI initiatives unless adequately addressed through training and change management strategies.

Broader cultural factors, including societal attitudes toward technology, national innovation indices, and ethical norms, influence organizational behaviour regarding AI adoption (Tarhini *et al.,* 2022). Cultures that value innovation and technological progress exhibit higher rates of AI adoption, while cultures with strong ethical concerns about AI may adopt a more cautious approach.

Interaction of Multi-Predictive Factors

In practice, predictive factors are not isolated but interact dynamically. For example, strong organizational leadership can counterbalance employee resistance, while an insufficiency of technological infrastructure may negate the benefits of favourable government policies. Therefore, AI adoption should be approached as a systemic transformation requiring harmonization across all

dimensions (Dwivedi *et al.*, 2021). In educational institutions, for instance, huge financial investments in AI technologies may fail if academic staff feel threatened or undervalued. This truly emphasizes the importance of addressing both structural and human elements concurrently (Jöhnk *et al.*, 2021).

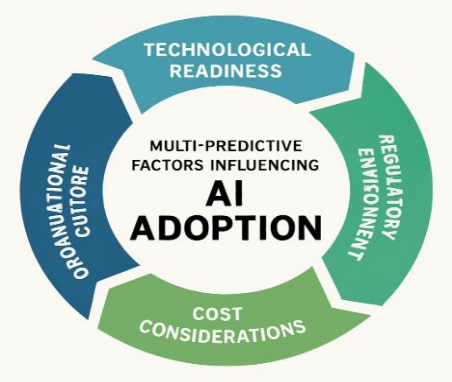

Figure 1: *Conceptual framework showing multiple predictive factors influencing AI adoption*.

The adoption of AI is a multi-factorial process influenced by a network of interacting technological, organizational, environmental, social-cultural factors and cost considerations. Understanding these multiple predictors is essential for crafting effective adoption strategies. Acknowledging and managing the interplay among these variables increases the likelihood of successful and sustainable AI integration. Future research must continue to explore integrated, context-sensitive models to accommodate the evolving complexities of AI technologies and organizational ecosystems.

AI integration in University Governance

The rapid evolution of societal, economic, and technological landscapes necessitates a transformative approach in aligning institutional goals in the university educational system. In North-Central Nigeria, this need is amplified by the region's socio-economic dynamics, demographic growth, and the advent of Artificial Intelligence (AI). Universities must innovate to remain relevant and impactful, leverage AI to meet the demands of a globalized economy, address local challenges, and enhance administrative, academic, and research outputs.

Integrating Artificial Intelligence (AI) into university governance can significantly enhance decision-making processes, operational efficiency, and policy implementation. The diagram below illustrates the flow of AI integration in university governance:

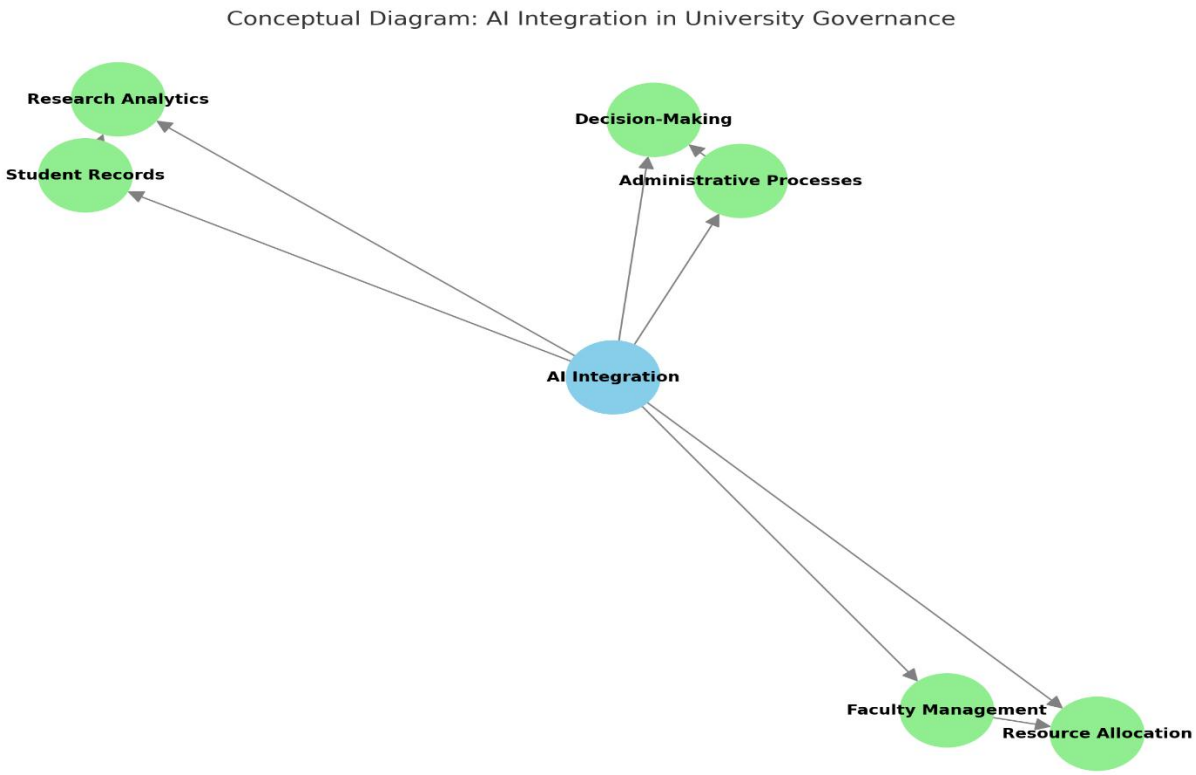

Figure 2: AI Integration in University Governance

Data Collection: Universities gather data from various sources, including student records, administrative processes, and academic performance metrics. A study on the readiness of higher education institutions in Northern Nigeria for AI integration highlights the potential of AI in enhancing data-driven decision-making processes. AI is revolutionizing data-driven decision-making in governance through a variety of powerful mechanisms. Predictive analytics, like modelling dropout risks and enrolment trends, allow for proactive interventions instead of just reacting to issues as they arise. Prescriptive analytics and optimization help with staff scheduling and budget planning by suggesting the best resource allocations based on simulated outcomes. Automated reporting and dashboards transform raw data from management information systems into actionable key performance indicators almost in real-time, giving leaders better visibility into operations. Natural language processing (NLP) tools dig into qualitative feedback from surveys, complaints, and accreditation reports to highlight systemic issues that need attention.

No doubt using these tools can lead to more efficient administrative decision-making and, in some cases, improved tracking of student outcomes. However, the effectiveness of these tools often depends on the data quality and how well users engage with them.

The existing literature highlights several important gaps that are particularly relevant to Northern Nigeria: There's a need for detailed, region-specific studies on institutional readiness, as most research tends to be either national or focused on single cases. Northern states would greatly benefit from targeted mixed-methods research. We need to conduct longitudinal evaluations of

pilot Artificial Intelligence (AI) projects to assess their long-term effects on administrative outcomes and student success. (The IAFOR Research Archive -). It is also crucial to explore the socio-cultural and governance factors—like leadership attitudes and policy levers—that influence adoption beyond just technical readiness.

AI Analytics and Strategic Decision-Making: While utilizing AI algorithms, the collected data is analyzed to identify patterns, trends, and insights that inform strategic decisions. The analysis yields actionable insights presented through dashboards and reports, highlighting areas for improvement and opportunities for growth. An assessment of AI's effectiveness in implementing public administration programs in Nigerian universities demonstrates its role in automating administrative tasks (Sanni K, *et al*, 2024).

University leadership uses these insights to make informed decisions on policy formulation, resource allocation, and academic planning. A review of AI readiness in higher education institutions in Northern Nigeria addresses the potential of AI in supporting quality assurance processes (Benson R. *et al*, 2024).

AI Automation: Routine administrative tasks are automated using AI, leading to increased operational efficiency and allowing staff to focus on more complex responsibilities. Automation streamlines processes such as admissions, course registrations, and examination grading, reducing errors and processing times. By this, operational efficiency is enhanced in the university system.

AI automation delivers notable efficiencies and analytical capabilities to university administration in North-Central Nigeria. Nevertheless, the journey faces familiar yet addressable challenges: inadequate infrastructure, scattered and low-quality data, evolving regulations (like the Nigeria Data Protection Commission - NDPC), limited human resources, ethical concerns, gaps in procurement and cybersecurity, and cultural resistance. By adopting a practical, step-by-step strategy—such as initiating small, human-in-the-loop pilot projects, emphasising data governance, building capacity, and ensuring vendor diligence—while adhering to NDPC guidelines, we can minimise risks and unlock scalable value.

AI systems continuously monitor policy implementation and compliance, ensuring that university operations align with established standards and regulations. Research on AI's role in educational administration and planning programs in Nigerian tertiary institutions emphasizes its impact on policy implementation and evaluation (Ogumode et al, 2024)

Societal Trends and Institutional Goals

North-Central Nigeria, characterized by its diverse population and socio-cultural nuances, faces challenges in meeting societal needs such as education access, skill acquisition, and employment. Universities in the region aim to produce graduates equipped with relevant skills to address these needs. AI can support this alignment by engaging in personalized learning through AI-driven systems, such as adaptive learning platforms, which cater for individual learning styles, ensuring students acquire the skills necessary for societal integration.

AI-powered online platforms can improve access to education by reducing geographical and infrastructural barriers, promoting inclusivity for underserved communities. They can also

enhance economic development and institutional coordination. The region's economy is shifting from being primarily agriculture-based to more diverse sectors, including technology and services. Universities must prepare graduates for this changing economic landscape.

Other areas of importance are curriculum development. AI analytics provide insights into labour market trends, enabling institutions to align curricula with industry demands. Labour market data from the International Labour Organization (ILO) indicates a 30% increase in technology-driven job opportunities in Nigeria between 2020 and 2023.

AI can enhance research and development capabilities, fostering innovation that can contribute to economic growth. As a result, unemployment can be reduced significantly. It also supports research and broadens the scope of knowledge.

Technological Trends and Institutional Goals

The rise of Artificial Intelligence (AI) and related technologies globally has created a pressing need for digital transformation in universities. Key areas include administrative efficiency, which resulted in AI-powered systems, streamlining administrative processes such as admissions, financial aid, and student management, reducing costs and improving accuracy. Likewise, it aids teaching and learning processes. Intelligent tutoring systems and virtual assistants support educators and students, making learning more interactive and effective. A typical example is Nasarawa State University's integration of AI chatbots to assist students with administrative and academic inquiries resulted in a 40% reduction in staff workload. The University of Ilorin adopted an e-learning platform augmented with AI features, enabling remote learning during the COVID-19 pandemic. This initiative enhanced access and demonstrated the potential for AI in overcoming infrastructural challenges.

AI tools also assist in research collaboration. Nasarawa State University's use of AI tools for research collaboration has improved the quality of academic publications and fostered partnerships with international institutions.

Proposed Framework for Integration

To effectively align institutional goals with changing trends using AI, the following framework is suggested:

1. **Strategic Planning**: Universities should integrate AI into their strategic plans, focusing on areas such as infrastructure, curriculum, and research.

2. **Capacity Building**: Faculty and staff training in AI technologies will ensure effective implementation.

3. **Public-Private Partnerships**: Collaboration with technology firms can provide resources and expertise for AI adoption.

4. **Policy Formulation**: The government and regulatory bodies must establish policies that promote AI adoption while addressing ethical and societal concerns.

This integrated approach enables universities to leverage AI for enhanced governance, ultimately improving educational outcomes and institutional effectiveness.

Challenges of Multi-Predictive Implementation in University Systems in North-Central Nigeria

The implementation of multi-predictive analytics (MPA) in university systems has the potential to enhance administrative processes significantly. However, universities in the North-Central region of Nigeria face several unique challenges that hinder the successful adoption and utilization of these technologies. Below is an in-depth discussion of these challenges with relevant references.

Limited Digital Infrastructure: The foundation of multi-predictive analytics lies in robust digital infrastructure, which includes high-speed internet, reliable power supply, and data storage facilities. However, many universities in North-Central Nigeria face deficits in these critical areas (**Mohammed *et al.*, 2024**). A report by Ajibade et al. (2022) highlights that less than 40% of tertiary institutions in the region have access to consistent internet and power, limiting their ability to deploy AI-based tools effectively. These problems affect various activities like teaching, practical activities which is vital (**Sobowale et al., 2024**), administrative efficiency to mention but a few.

Data Scarcity and Quality Issues: Predictive analytics relies on large volumes of accurate and reliable data. Many universities lack well-organized and digitized databases, while existing data are often incomplete, inconsistent, or outdated. Olayemi and Ibrahim (2023) observed that administrative departments in North-Central Nigerian universities often rely on paper-based records, which are prone to errors and loss, complicating data-driven decision-making.

Financial Constraints: The deployment of multi-predictive systems involves significant costs, including software acquisition, hardware upgrades, and staff training. Financial limitations in many universities hinder their ability to invest in these technologies. Universities in the region depend heavily on government funding, which is often insufficient to cover advanced technological initiatives (Eze & Okoro, 2021). Falode and Mohammed (2023) noted that due to challenges like finance and other factors, Nigerian institutions always find it difficult to incorporate modern technology for effectiveness in activities.

Resistance to Change: Many university staff members, particularly older administrators and faculty officers, are resistant to adopting new technologies due to a lack of familiarity or fear of obsolescence. The present-day computing system with AI is strange to many of the old administrators who see it as ethically mystical and unnatural. A study by Adekunle et al. (2022), 65% of administrative staff in North-Central Nigerian universities expressed reluctance to adopt AI tools, citing fears of job redundancy and increased workload.

Insufficient Technical Expertise: The implementation and management of multi-predictive systems require specialized skills in data science, machine learning, and AI. However, there is a scarcity of trained personnel in these fields within the region. Adigun and Uche (2020) found that less than 10% of IT staff in universities in North-Central Nigeria have adequate training in advanced data analytics and AI implementation.

Data Privacy and Security Concerns: The use of multi-predictive systems raises concerns about data privacy and security. Universities must ensure compliance with data protection regulations and safeguard sensitive information from breaches, which can be challenging in the Nigerian context. Eniola *et al.* (2021) reported multiple cases of data breaches in Nigerian universities, emphasizing the lack of robust cybersecurity measures.

Cultural and Institutional Barriers: Cultural attitudes and institutional policies can pose barriers to adopting innovative technologies. Universities may lack a culture of innovation or have rigid bureaucratic systems that slow down the adoption process. Onyekachi and Bala (2022) noted that hierarchical decision-making processes in Nigerian universities often delay the approval and implementation of technology projects.

Poor Collaboration among Stakeholders: Successful implementation of MPA requires collaboration between university management, government agencies, and technology providers. However, in North-Central Nigeria, there is often a lack of coordination and synergy among these stakeholders. An investigation by Okoye and Mohammed (2023) revealed that most universities in the region operate in isolation, with minimal engagement with private sector technology firms.

Lack of Policy and Regulatory Framework: There is a significant gap in policies and regulations that govern the use of AI and predictive analytics in the Nigerian educational system. This lack of guidance creates uncertainty and inhibits investment in these technologies. Eze (2021) argued that the absence of a national AI policy for education hampers universities' ability to standardize and optimize multi-predictive implementations.

Inequitable Access to Technology: Within the region, disparities in access to technology exist among urban and rural universities. Institutions in rural areas face greater challenges in adopting predictive analytics due to their location and fewer resources. Oyewole *et al.* (2022) found that rural-based universities in North-Central Nigeria were 50% less likely to adopt new technologies compared to their urban counterparts. Additionally, most institutions do not have access to technology that will bridge the gap between distance and time thus making education affordable and ubiquitous (Mohammed *et al.*, 2025b).

Short-Term Focus of Administrators: University leadership often prioritizes short-term goals over long-term investments in transformative technologies like multi-predictive systems. This shortsightedness can hinder sustained progress. Adebayo (2022) noted that many universities in the region allocate limited funds for technology adoption, focusing instead on immediate infrastructural needs.

The challenges discussed highlight the systemic and contextual factors that need to be addressed to harness the full potential of multi-predictive analytics in North-Central Nigeria's university systems. Overcoming these barriers will require a concerted effort from policymakers, educational institutions, and technology providers.

Ethical and Social Implications

The deployment of predictive analytics may lead to ethical issues such as bias in algorithms and unintended consequences. Universities may struggle to address these challenges due to limited

understanding and frameworks. Adamu and Salami (2023) highlighted cases where predictive algorithms used in admission processes inadvertently favoured certain groups, raising concerns about fairness and equity. The study on AI in public service and governance in Nigeria outlines challenges such as infrastructure deficiencies, funding constraints, skill gaps, and ethical concerns that may impede AI adoption in universities.

To address ethical concerns, Nigerian universities should develop a comprehensive policy framework to responsibly integrate Artificial Intelligence (AI) systems into their administrative functions. This approach aligns with the Nigeria Data Protection Regulation (NDPR, 2019) and the latest conversations around ethical AI governance (Jobin, Ienca, & Vayena, 2019; OECD, 2019). The aim is to ensure that all activities prioritise privacy, fairness, transparency, accountability, security, and inclusion—while adhering to both national and international best practices. The scope of application encompasses all AI-driven administrative systems utilised in universities, whether developed internally or sourced from external vendors. Key areas include admissions and enrolment management, human resources such as recruitment and promotion, financial administration, payroll processing, management of student records and learning analytics, as well as campus security and surveillance systems.

Ethical Principles Guiding AI Adoption

a) Privacy and Data Protection: Adoption of AI systems must comply with NDPR guidelines, ensuring that personal data is collected lawfully, only when necessary, and in a proportionate manner (NITDA, 2019). For all high-risk AI projects, Data Protection Impact Assessments (DPIAs) are mandatory, with findings documented and reviewed before implementation.

b) Fairness and Non-Discrimination: All AI systems should undergo testing for potential biases using disaggregated datasets (like gender, ethnicity, and socio-economic status) to prevent discriminatory outcomes (O'Neil, 2016; Jobin et al., 2019). Any biases identified must be corrected through model retraining or adjustments to the algorithms.

c) Transparency and Explainability: Decisions made by AI systems that impact the rights or opportunities of students or staff must be explained in straightforward, non-technical language. The processes and criteria behind these decisions should be documented and made accessible for review.

d) Accountability: It's crucial to clearly define who is responsible for the outcomes of AI systems. Even though external vendors might provide AI solutions, the university ultimately holds the responsibility as the data controller (NITDA, 2020).

e) Security and Robustness: AI systems must undergo regular security audits, including penetration testing, to protect against data breaches, adversarial attacks, and other potential vulnerabilities.

f) Equity and Digital Inclusion: When adopting AI, it is important to ensure that no stakeholders are left out due to a lack of digital resources. Accessibility measures, like device loan programs and offline access, should be part of the system design.

Governance Mechanisms: To put this framework into action, Nigerian universities should:

a) Set up an AI Ethics and Governance Committee to oversee the procurement, deployment, and monitoring of AI systems. This committee already exists in the Federal University of Technology, Minna.
b) Appoint a Data Protection Officer (DPO) who has the authority to ensure compliance with the NDPR.
c) Include ethical compliance clauses in all AI procurement contracts, addressing transparency, data ownership, and vendor accountability.

Implementation and Review Strategy: Every university needs to take the following actions:

a) Immediate Actions: The university needs to appoint or confirm the university Data Protection Officer (DPO), take stock of all AI systems currently in use and start conducting Data Protection Impact Assessments (DPIAs) for high-risk AI projects.
b) Periodic Review: Every University needs to carry out annual audits of AI ethics and publish a summary for the public that outlines the AI systems in use and their compliance status.
c) Incident Reporting: Institutions need to create secure channels for reporting errors, breaches, or any signs of bias in AI systems.

Conclusion

The integration of AI into the university educational system in North-Central Nigeria offers significant potential for aligning institutional goals with societal, economic, and technological trends. By addressing challenges and adopting strategic measures, universities can harness AI to drive innovation, inclusivity, and excellence in education and research. Artificial Intelligence (AI) comes with a lot of benefits for academics, administrators, managers, government and people in all walks of life.

However, there are challenges to the holistic adoption of AI. These challenges are surmountable if adherence to the standard rules of ethics is well guarded with sincerity. It is not an exaggeration to say that AI is highly disruptive and transformational, as observed by Joe (2023). To a large extent, heavy reliance on AI can disrupt the young generation of natural brainstorming. Consequently, instead of man remaining as the primary source of knowledge, reasoning, observation and innovation, these functions may shift to artificial intelligence. Nevertheless, its positive uses make it indispensable. To maintain balance, teachers, engineers, health workers and administrators should be able to draw lines between the use of intellect and artificial intelligence. Truly, Artificial Intelligence (AI) has come to stay, and we have to embrace it as a useful tool in university administration, but the naturalness in humans must not be lost.

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