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Artificial Intelligence in Higher Education in Libya: Opportunities and Challenges

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ABSTRACT

The educational system is one of the ancient systems characterized by conservatism, which requires protection from repeated and emergency changes, while at the same time the desire to prepare and equip students for the job market and the needs of society. For the application of artificial intelligence in the educational process, there have been arguments supporting and others rejecting it. There are concerns that if it is activated, education may deviate from its main goal, which is to provide students with reliable knowledge according to specific standards, and if it is not activated, the educational system will lag behind the rapid development and progress in artificial intelligence applications related to artificial intelligence. From this point of view, this research aims to study the possibility of using and employing artificial intelligence in higher education through a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis. The analysis showed that the opportunities outweigh the threats in applying artificial intelligence, and it highlighted the most prominent constraints imposed on it and the risks that may occur in the future and the potential problems if the threats are not overcome and the weaknesses are reduced. The study concluded that applications of artificial intelligence are good and very useful for both faculty and students, and they improve their efficiency and performance, but this is done with care in the presence of controls and laws, with an emphasis on originality in the educational process, credibility, and respect for the principle of equality.

الذكاء الاصطناعي في التعليم العالي في ليبيا فرص وتحديات

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الكلمات المفتاحية:
الذكاء الاصطناعى
التعليم العالى
تحليل سوات

الملخص

النظام التعليمي هو أحد الأنظمة العريقة التي تتميز بالمحافظة، مما يتطلب حمايته من التغيرات المتكررة والطارئة، مع السعي في الوقت نفسه لإعداد وتجهيز الطلاب لسوق العمل واحتياجات المجتمع. فيما يتعلق بتطبيق الذكاء الاصطناعي في العملية التعليمية، ظهرت حجج مؤيدة وأخرى معارضة لذلك. هناك مخاوف من أنه في حال تفعيله، قد ينحرف التعليم عن هدفه الأساسي، وهو تزويد الطلاب بمعرفة موثوقة وفق معايير محددة، وفي حال عدم تفعيله، سيتأخر النظام التعليمي عن التطور السريع والتقدم في تطبيقات الذكاء الاصطناعي. من هذا المنطلق، يهدف هذا البحث إلى دراسة إمكانية استخدام وتوظيف الذكاء الاصطناعي في التعليم العالي من خلال تحليل سوات (نقاط القوة، نقاط الضعف، الفرص، التهديدات). أظهر التحليل أن الفرص تفوق التهديدات في تطبيق الذكاء الاصطناعي، وسلط الضوء على أبرز القيود المفروضة عليه والمخاطر

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التي قد تحدث في المستقبل والمشكلات المحتملة في حال عدم التغلب على التهديدات وتقليل نقاط الضعف.
وخلصت الدراسة إلى أن تطبيقات الذكاء الاصطناعي جيدة ومفيدة للغاية لكل من أعضاء هيئة التدريس والطلاب، وتعمل على تحسين كفاءتهم وأدائهم، ولكن يتم ذلك بحذر في ظل وجود ضوابط وقوانين، مع التأكيد على الأصالة في العملية التعليمية، والمصداقية، واحترام مبدأ المساواة.

1. Introduction

SWOT analysis, also known as situational analysis, was developed by a management professor at the University of San Francisco in the early 1980s. It offers a structured method to objectively assess the reality of a business unit. SWOT stands for Strengths, Weaknesses, Opportunities, and Threats, which represent the internal and external factors impacting an entity. The SW portion addresses internal conditions by analyzing strengths and weaknesses, while the OT portion looks at external conditions, identifying opportunities and threats. Conducting a SWOT analysis helps organizations pinpoint areas for improvement, utilize their strengths, tackle weaknesses, seize opportunities, and counteract threats. This framework prioritizes issues, differentiating between urgent problems that need immediate resolution and those that can be postponed[1]. By sorting problems and aligning them with strategic goals, organizations can devise focused solutions and establish a clear direction for future growth. SWOT analysis facilitates systematic examination and correlation of factors, categorizing problems by priority, clarifying urgent issues, deferrable matters, strategic obstacles, and tactical challenges. These elements are organized in a matrix, then systematically analyzed to draw conclusions, aiding in informed decision-making and strategic planning for sustainable growth and success. The implementation of artificial intelligence in higher education in Libya in the absence of political stability and the absence of a law that controls the use of (artificial intelligence) carries several opportunities and challenges that need to be carefully managed to confirm the positive results of the higher education process. The limited language options available in AI tools is one of these challenges, which can harm students in the presence of poor English, AI can also facilitate academic dishonesty by providing easy access to solutions or creating sophisticated methods of cheating. In addition, the lack of accountability in using AI to make wrong decisions leads to problems where it may not be clear who is responsible for correcting these mistakes. which reduces the quality of engagement and critical thinking. Ethical concerns are of paramount importance for the integration of artificial intelligence into decision-making processes in education. Students and teachers need to understand how AI systems make decisions to trust these technologies and use them effectively. Furthermore, the principle of accountability for AI systems must be established to ensure that mechanisms are in place to address

Avoid these errors and correct them when they occur. The absence of clear evidence that AI enhances learning and teaching may lead to organizations being reluctant to invest in these technologies, This leads to a slower integration process. This problem is exacerbated by varying levels of readiness and preparedness at both the institutional and individual levels, further complicating the effective deployment of AI in education. Ethical and privacy challenges remain pressing issues. The need for robust data protection measures is paramount to ensure the security of faculty and student information and prevent its misuse. Ensuring fairness in AI systems is also crucial to promote equality and provide equitable learning opportunities for all students in higher education, in particular, face unique challenges with AI. While AI can enhance their learning and academic experience by providing personalized support and resources, it also carries risks related to language proficiency, privacy, and cultural differences. Addressing these challenges requires creating reliable AI systems that are culturally competent and sensitive to the diverse needs of students. Ensuring that AI is deployed responsibly and beneficially in higher education requires laws, controls, and a comprehensive approach that takes into account ethical implications, promotes transparency, and fosters collaboration among all stakeholders in the educational process.

2. Material and Methods

This study employs a SWOT analysis to evaluate the feasibility of integrating AI tools into Libyan higher education, specifically IT colleges of Tripoli University and colleges of Electronic Technology-Tripoli. Data was gathered via surveys via google form as attached in AppendixI targeting faculty and students, focusing on their perceptions of AI's opportunities and threats, along with the institutions' strengths and weaknesses. A questionnaire featuring ten external opportunities and threats, as well as ten potential internal strengths and weaknesses, was distributed, asking participants to select the top five in each category. The survey garnered 76 responses, comprising 24 teachers and 52 students, using a three scale from agree, neutral, and disagree. The collected data facilitated a SWOT analysis to pinpoint the primary external and internal factors influencing AI adoption in universities. This analysis was instrumental in formulating development strategies and forecasting potential limitations, risks, and challenges. Table I. presents the internal factors prioritized by the respondents, while Table II. details the evaluated opportunities and threats. A thorough examination of the strengths, weaknesses, opportunities, and threats associated with AI implementation in higher education enables the determination of a strategic approach to evolve the educational process through AI systems, while preserving the essence of higher education. This approach should leverage strengths, mitigate weaknesses, capitalize on opportunities, and minimize threats. By adopting a holistic systematic method, the environmental factors impacting the present state of higher education were categorized according to the SWOT framework, resulting in the development of four strategic paths.

TABLE I. HTHERE ARE VARIOUS METHODS FOR GRAPHICALLY DEPICTING A SWOT ANALYSIS IN A MATRIX, AND TABLE1 ILLUSTRATES ONE SUCH VERSION.

STRENGTHS	WEAKNESSES
1-Advanced Learning Tools: AI- tools offer innovative learning opportunities, as simulations, adaptive learning platforms, and virtual tutors, enriching the students	Lack of Standardization: No totally accepted standards for AI applications in Libyan in Higher education.
Predictive Analytics: AI can predict student outcomes based on data trends, helping educators intervene early when a student is at risk of falling behind or dropping out	2-Skill Gap in AI Literacy: Both educators and students often lack enough understanding of AI technologies, which can lead to misunderstanding of these tools.
3-Data-Driven Insights: AI helping them make informed decisions to enhance teaching methods and student outcomes. Via analyze vast amounts of data	3- Quality and Accuracy of AI Tools: there are Concerns about data accuracy and privacy, AI tools can sometimes produce inaccurate results, leading to misleading feedback, grading errors,
4- Lifelong Learning: AI can support lifelong learning by offering adaptive learning opportunities beyond formal education, allowing individuals to continually update their skills in an ever-changing job	4- Lack of funding for research and training centers has contributed to the delay in adopting artificial intelligence in the educational process.

Problem-Solving Assistance: AI can help students develop critical thinking and problem-solving skills by guiding them through complex problems step-by-step, offering hints and resources as needed.	5- Over-Reliance on Technology: There's a risk of becoming too dependent on AI, which could reduce the emphasis on human interaction, critical thinking, and other essential skills to higher education
6-Explainable AI: Use techniques like LIME, SHAP, or causal inference to explain AI model decisions.	6- Ethical issue data privacy and security these related to collection, storage, and use of sensitive student data.
7- The 24/7 availability of AI contributes to enhanced productivity, customer satisfaction, and overall performance in diverse industries.	7- Loss of trust in the credibility of intelligence systems due to the absence of a mechanism for the operation of these systems
8- Language Learning and Communication Skills: which can benefit from interacting with ChatGPT to practice and improve their language proficiency	8- Lack of Long-Term Planning: Insufficient planning for the long-term impact of AI on education.
9- Instant Solutions and: AI-powered tools can quickly analyze questions and provide instant solutions or clarifications, helping students overcome obstacles in real-time without waiting for assistance.	9- Limited Research and Development: Lack of investment in AI research and development.
10- Crisis Response and Management: In emergency situations, AI can help educational institutions respond quickly by offering solutions such as remote learning setups, communication strategies, and resource allocation.	10-Capacity Building and Training: the weakens training lead to lack to improve skills of AI for faculty members and students contribute to the slow pace of AI adoption.

TABLE II. BELOW SHOWS TEN POINTS OF OPPORTUNITY AND THREATS TO ADOPTING AI IN HIGHER EDUCATION.

OPPORTINTY	THREATS
1. Enhanced Student Satisfaction and they outcomes, that lead to be more engaged in their studies, and improved academic performance and achieve well results.	***1- Lack of Human Interaction: Overreliance on AI could lead to a decrease in personalized attention and support from human educators.***
2. Personalized learning experiences: that allows students to progress through material at their own pace, focusing on areas where they need more support and accelerating through concepts they have mastered.	2- Loss of Critical Thinking Skills: there's a risk that students may rely too heavily on AI technology that lead to a decline in critical thinking, problem-solving, and creativity.
3. Improved access to educational resources: Enhanced access to educational resources plays a vital role in expanding opportunities for learners and promoting academic success.	3- Cybersecurity Risks: The use of AI systems increases the attack surface for cyber threats, potentially compromising sensitive student data and institutional operations
4. Intelligent Systems AI-powered systems can optimize resource allocation, streamline processes, and improve decision-making, leading to greater efficiency and cost-effectiveness.	4- Lack of readiness: Infrastructure of institution not ready to implement AI, that referring to the hesitancy in adopting AI technology. This could be due to various factors such as lack of awareness, training, and concerns about data privacy, or loss job
5. AI-driven student support systems: These systems utilize artificial intelligence algorithms to provide personalized assistance, feedback, and guidance to individual learner	5- Ethical implications of AI decision-making, are a complex and multifaceted issue
6. Virtual classrooms for remote learning: These virtual classrooms use video conferencing, collaborative tools, and online resources to replicate the traditional classroom experience in a virtual setting	6- Financial constraints in adopting AI technologies and integrating AI with existing systems
7. Data analytics to support decision-making, educational institutions can make informed decisions to enhance teaching methods, curriculum design, and resource allocation.	7-Skill Gap: as AI technology advances, there may be a growing skill gap between those who can adapt to the new technological landscape and those who cannot.
8. AI can essay used to detect plagiarism: AI-powered plagiarism detection tools can compare written content against vast databases of academic papers, articles, and online sources to identify instances of copied or unoriginal material.	8- Limited availability of quality AI resources, many AI applications require large amounts of high-quality data to train effectively.
9. AI system can quickly and accurately grade assignments and testes	9-The use AI in education process lead to increase Ethical issues
10. AI Scientific Simulation can simulate complex scientific phenomena, accelerating research and innovation in fields like physics, chemistry, and biology	10- the impact of AI on originality and authenticity of the educational process

TABLE II. TTHE RESPONDENTS OF SURVEY HAVE IDENTIFIED THE TOP FIVE STRENGTHS AND OPPORTUNITIES, ALONG WITH THE TOP FIVE WEAKNESSES AND THREATS. THESE ARE ORGANIZED INTO A SWOT ANALYSIS TABLE AS DEPICTED BELOW IN TABL III

	Helpful	*Harmful*
Internal origin	**STRENGTHS(S)** -Advanced Learning Tools -Problem-Solving Assistance -The 24/7availability of AI -Instant Solutions -Predictive Analytics	**WEAKNESSES(W)** -Lack of Standardization - Capacity Building and Training -Quality and Accuracy of AI Tools -Lack of funding for research and training centers -Over-Reliance on Technology -Limited Research and Development misleading

	Helpful	*Harmful*
External origin	**OPPORTUNITIES (O)** -Intelligent Systems: -Virtual classrooms for remote learning -Enhanced Student Satisfaction -Data analytics -Scientific Simulation	**THREATS (T)** -Lack of Human Interaction: -Loss of Critical Thinking Skills: -Lack of readiness: -Financial constraints -Skill Gap: - Internet services interruption

The survey participants identified the top five strengths and five opportunities, along with the top five weaknesses and five threats. They are organized in a SWOT analysis tableIII as shown

TABLE III. SSTRATEGIES ADOPTED WITHIN SWOT ANALYSIS.

Through comprehensive analysis of the strengths, weaknesses, opportunities and threats facing the implementation of artificial intelligence in higher education, it thus becomes possible to determine the strategic approach to developing the higher education process through artificial intelligence systems with the current system while maintaining the originality of higher education that should build on its strengths and avoid its weaknesses, seize opportunities, benefit from its strengths and reduce threats. Using an integrated systematic approach, the internal and external environmental factors that touch the current and actual reality of higher education were classified and formulated according to the SWOT tool, which produced four strategies that can be employed to build thoughtful measures to develop higher education into a new model by integrating artificial intelligence into learning processes in higher education[6].[7].

3. Analyses and Discussion

S.O Strategy which called expand Strategy need to be investing in the advantage of instant solutions and problem solving to raise and develop the skills of teachers and students, thus improving their performance and increasing the quality of the outputs of the educational process

Employing virtual laboratories and scientific simulation systems in laboratories and laboratories to enhance laboratories and scientific experiments contributes to avoiding the risks resulting from some experiments and the possibility of repeating them around the clock 24/7 makes the educational environment more practical and fertile for experiments

Exploiting advanced educational tools in data analysis processes and working on harmonizing between tools to enhance problem solving and decision-making contributes to the development process

Investing in the multiple and visual diversity of the scientific material creates an attractive educational environment enhanced by viewing that contributes to benefiting from the effective use of advanced educational tools

The O.W Strategy underscores the significance of establishing standards and measures for integrating intelligent systems within educational institutions. These systems must adhere to institutional laws and policies and align with the integrity of the educational process, leveraging suitable opportunities within set parameters. Additionally, it advocates for the use of artificial intelligence systems to enhance the academic and technical abilities of educators and students, as well as to fortify research, training, and development centers with cutting-edge technology, ensuring alignment with the educational process's core values. The strategy also highlights the need for high-quality, accurate, and reliable services from artificial intelligence systems to counter misinformation and its effects, utilizing credible opportunities. Moreover, it focuses on the development and enhancement of personal skills and experiences, which helps prevent overreliance on technology and allows for the strategic use of available opportunities in addressing urgent or complex issues without compromising the authenticity and ethics of the educational process.

The S. T Strategy involves activating predictive analysis using artificial intelligence tools to forecast the future and assist in decision-making to mitigate risks. It also highlights the importance of leveraging the 24/7 availability of artificial intelligence tools for the development of scientific and technical skills across various domains, addressing gaps in critical thinking, and benefiting from the immediate solutions provided by AI systems as defensive measures against cyber threats and other dangers. Moreover, it focuses on the optimal use of advanced AI tools and their integration into current systems without constraints due to unpreparedness, while earnestly working to outfit higher education institutions with the necessary tools as dictated by AI system requirements.

The T.W Strategy, known as the withdrawal strategy, is considered one of the most perilous approaches due to the interplay between internal weaknesses and external threats. This situation arises from the lack of skilled scientific personnel, operational efficiency, and the swift advancements in artificial intelligence applications, coupled with competitive pressures, economic instability, and the absence of financial support. The proposed solution involves a retreat by re-evaluating the organization's engagement in artificial intelligence applications, potentially ceasing or limiting their scope.Withdrawal strategies necessitate investment in and activation of capacity-building centers, research, and training facilities, as well as the formation of local and international partnerships to tackle human interaction challenges. It is also crucial to emphasize the importance of establishing standards and criteria for integrating intelligent systems in accordance with educational policies, ensuring they align with the integrity of the educational process and mitigate external threats. Moreover, ensuring the precision and quality of artificial intelligence tools is essential to prevent data inaccuracies, which can be achieved by raising awareness and guiding students and users towards more dependable resources. Additionally, increasing funding for higher education institutions is vital due to their direct link to scientific research and development, as well as addressing the gaps in critical thinking abilities. Finally, resolving internet connectivity issues related to power outages and providing alternative energy sources are key to harnessing artificial intelligence applications effectively for sustainable development.

4. Conclusion

In conclusion, the integration of AI into Libyan higher education presents both opportunities and challenges. Through a comprehensive SWOT analysis, this research paper highlights the key factors that should be considered for the successful implementation of AI technologies. To benefit from strengths and opportunities, while mitigating weaknesses and threats, four strategies were extracted that can be relied upon in developing strategies for colleges and institutes of higher education so that artificial intelligence is employed according to specific standards and is successful. The study concluded that artificial intelligence applications are good and very useful for both faculty members and students, and improve their efficiency and performance, but this is done carefully in the presence of controls and laws, with a focus on originality in the educational process, credibility and respect for the principle of equality. Libyan universities must develop a strategic and comprehensive approach to adopting artificial intelligence, giving priority to technological infrastructure, ethical considerations, and developing the skills of students and scientific cadres. By adopting the transformative potential of artificial intelligence, Libyan higher education can enhance the quality of its academic programs and their accessibility and activation in general, which contributes to raising the quality of education and the outcomes of the learning process and contributing to keeping pace with the rapid development in the world of education and technology.

5. Recommendations and future works

Implementing these recommendations will strengthen Libya’s ability to adopt AI, improve the quality of education, and effectively manage the challenges that come with integrating AI into the higher education landscape.

Here are eight essential recommendations drawn from this study that aimed at effectively integrating AI into the Libyan higher education system:

1.Establish Clear Standards and Guidelines for AI Implementation.

2. Develop AI-Specific Research and Development Centers.

3. Establish clear Ethical AI Use in Education.

4. Address the Issue of Over-Reliance on AI.

5. Enhance Infrastructure for AI Readiness.

6. Influence AI for Personalized Learning.

7 Encourage the use of AI platforms that offer lifelong learning opportunities.

8 Develop Financial Support Mechanisms for AI Integration in Higher education.

6. Appendix

Survey on AI in Higher Education in Libya: Challenges and Opportunity

Note: After choosing one of the three levels of agreement, pleas choose the 5 most important in the four parts(Strength, Weakness, opportunity, and Threats)

Part 1: Academic Degree

What is your academic status?	**Select One**
Bachelor's Degree Student	☐
Master's	☐
PhD	☐

Part 2: Strengths of AI in Higher Education

Strengths	**Agree**	**Neutral**	**Disagree**	**Select the 5 most important strengths**
1. Advanced Learning Tools (e.g., simulations, virtual tutors)	○	○	○	☐
2. Predictive Analytics for student outcomes	○	○	○	☐
3. Data-driven decision-making for teaching improvements	○	○	○	☐
4. Lifelong Learning support through adaptive learning platforms	○	○	○	☐
5. Problem-Solving Assistance (e.g., guiding students through complex problems)	○	○	○	☐
6. 24/7 Availability of AI systems	○	○	○	☐
7. Explainable AI tools for decision transparency	○	○	○	☐
8. AI-powered Instant Solutions to academic queries	○	○	○	☐
9. AI for crisis response and remote learning management	○	○	○	☐
10. Language Learning Support through AI tools	○	○	○	☐

Part 3: Weaknesses of AI in Higher Education

Weaknesses	**Agree**	**Neutral**	**Disagree**	**Select the 5 most critical weaknesses**
1. Lack of Standardization for AI tools in education	○	○	○	☐
2. Skill Gap in AI Literacy among educators and students	○	○	○	☐
3. Concerns about the Quality and Accuracy of AI tools	○	○	○	☐
4. Over-Reliance on AI and reduced human interaction	○	○	○	☐
5. Lack of funding for AI research and training centers	○	○	○	☐
6. Ethical Issues related to data privacy and security	○	○	○	☐
7. Limited Research and Development in AI for education	○	○	○	☐
8. Insufficient Long-Term Planning for AI impact in education	○	○	○	☐
9. Loss of trust in AI systems due to unclear accountability	○	○	○	☐
10. Weak training and capacity-building initiatives for AI skills	○	○	○	☐

Part 4: Opportunities for AI in Higher Education

Opportunities	**Agree**	**Neutral**	**Disagree**	**Select the 5 most important opportunities**
1. Enhanced Student Satisfaction and academic performance	○	○	○	☐
2. Personalized Learning Experiences through AI	○	○	○	☐

Opportunities	Agree	Neutral	Disagree	Select the 5 most important opportunities
3. Improved Access to Educational Resources via AI	○	○	○	☐
4. Intelligent Systems for optimized resource allocation	○	○	○	☐
5. AI-driven Student Support Systems	○	○	○	☐
6. Virtual Classrooms for remote and flexible learning	○	○	○	☐
7. Data Analytics to improve curriculum and decision-making	○	○	○	☐
8. AI-powered tools for plagiarism detection	○	○	○	☐
9. AI for Scientific Simulations in various fields	○	○	○	☐
10. AI for automated grading and assessment	○	○	○	☐

Part 5: Threats to AI in Higher Education

Threats	Agree	Neutral	Disagree	Select the 5 most critical threats
1. Lack of Human Interaction and personalized support	○	○	○	☐
2. Loss of Critical Thinking Skills due to AI reliance	○	○	○	☐
3. Cybersecurity Risks associated with AI systems	○	○	○	☐
4. Lack of Readiness in institutional infrastructure for AI	○	○	○	☐
5. Ethical Implications of AI decision-making	○	○	○	☐
6. Financial Constraints for AI adoption and maintenance	○	○	○	☐
7. Skill Gaps caused by rapid AI advancement	○	○	○	☐
8. Limited Availability of Quality AI Resources	○	○	○	☐
9. Increasing Ethical Issues in AI's role in education	○	○	○	☐
10. Internet and Service Disruptions impacting AI use	○	○	○	☐

Thank you

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