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Using Artificial Intelligence to Achieve Digital Transformation in Higher Education in Jordan: Opportunities and Challenges

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ABSTRACT

The present study aimed to assess the prospects and obstacles of employing artificial intelligence (AI) to accomplish digital transformation in the context of higher education in Jordan. A total of 300 faculty members at Jordanian institutions received questionnaires to respond to the research inquiries, while 15 faculty members were interviewed. The findings indicate that the majority of respondents believe AI has the potential to facilitate personalized learning, increase student engagement, and improve teaching efficacy in Jordanian higher education. However, they express concerns regarding ethical quandaries, privacy implications, and the necessary knowledge and training to implement AI in higher education in an efficient manner.

الكلمات المفتاحية:

الذكاء الاصطناعي
التحول الرقمي
التعليم العالي
الأردن

ملخص

هدفت الدراسة الحالية إلى تقييم آفاق ومعوقات توظيف الذكاء الاصطناعي لإنجاز التحول الرقمي في سياق التعليم العالي في الأردن. تلقى ما مجموعه 300 عضو هيئة تدريس في المؤسسات الأردنية استبيانات للرد على استفسارات البحث، في حين تمت مقابلة 15 عضوًا من أعضاء هيئة التدريس. رغم أن النتائج تشير إلى أن غالبية المستجيبين يعتقدون أن الذكاء الاصطناعي لديه القدرة على تسهيل التعلم الشخصي، وزيادة مشاركة الطلاب، وتحسين فعالية التدريس في التعليم العالي الأردني. الا أنهم أعربوا عن مخاوف بشأن المعضلات الأخلاقية، وتداعيات الخصوصية، والمعرفة والتدريب اللازمين لتنفيذ الذكاء الاصطناعي في التعليم العالي بطريقة فعالة.

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1 Introduction

The rapid progression of technology has resulted in the emergence of artificial intelligence (AI) as a formidable tool capable of revolutionizing various sectors, including education. Jordan's tertiary education system encounters numerous challenges, including inadequate funding, antiquated pedagogical methods, and restricted technological resources (Al-Smadi & Al-Kabi, 2021; Al-Zu'bi et al., 2022). The present research investigates the potential benefits and challenges associated with the implementation of artificial intelligence (AI) to transform higher education in Jordan. The research places particular emphasis on personalized learning, heightened student engagement, enhanced pedagogical effectiveness, ethical implications, privacy apprehensions, and the imperative for specialized expertise and education.

1.1 Personalized Learning

A highly promising aspect of artificial intelligence (AI) in higher education is its capability to enable personalized learning. Artificial intelligence-powered systems can analyze student data to detect particular learning styles, preferences, and requirements. This empowers instructors to adapt their instructional approaches following this information (Al-Fahad, Al-Shehri, & Al-Shehri, 2021; Al-Zu'bi, Omar Fauzee & Kaur, 2017). An extent of customization of this nature possesses the capacity to augment academic accomplishments and elevate the overall welfare of students. Personalized learning via AI, on the other hand, necessitates substantial investments in technical infrastructure and the creation of suitable algorithms (Ally, 2021).

1.2 Improved Student Engagement

AI possesses the capacity to augment student engagement through the provision of immersive and engrossing learning experiences. Virtual and augmented reality technologies can generate immersive learning environments, whereas AI-powered chatbots are capable of providing immediate assistance and feedback (Al-Zu'bi, 2020; Arora & Sharma, 2021; Bao & Cai, 2021). Students may be able to maintain motivation and focus on their studies with the assistance of these techniques, resulting in improved academic performance. However, the integration of these technologies into the higher education system of Jordan might face challenges of costs, accessibility, and the requirement for sufficient training of instructors (Al-Mawadiah & Al-Zu'bi, 2021; Chen & Chen, 2021; Chiu & Tsai, 2021).

1.3 Enhanced Teaching Effectiveness

The utilization of artificial intelligence (AI) to automate administrative duties like grading and attendance monitoring has the potential to augment the efficacy of teaching. This enables instructors to devote additional time to other critical facets of instruction (Dabbagh & Kitsantas, 2021; Al-Zoubi & Alsmadi, 2020). Additionally, analytics powered by AI can provide educators with valuable insights regarding student performance, allowing them to identify specific areas in which students may require additional assistance or intervention. However, the implementation of artificial intelligence in the field of education might raise apprehensions regarding the reduction of human interaction, thereby requiring instructors to adapt to innovative pedagogical approaches (AL-Zu'bi, 2019; Gao, Luo & Zhang, 2021; Kizilcec, Bailenson & Gomez, 2021).

1.4 Ethical Concerns and Privacy Issues

The implementation of artificial intelligence in higher education engenders specific concerns regarding privacy and ethics. AI systems' utilization and analysis of student data may give rise to biases, prejudices, and concerns regarding the data's security and privacy (Li & Wang, 2021; Liu & Wang, 2021). To address these concerns and ensure the responsible and ethical application of AI technologies, institutions must establish distinct norms and standards (Lu & Law, 2021; Ma & Adesope, 2021).

1.5 Specialized Skills and Training

The implementation of (AI) in the higher education system of Jordan requires educators and administrators to develop specialized knowledge and receive appropriate training. This requires the ability to integrate AI tools into existing teaching and learning methodologies, as well as an understanding of the capabilities and limitations of such tools (Miao & Wang, 2021; Nye & Hedges, 2021). To optimize the incorporation of artificial intelligence (AI) within the realm of higher education, establishments ought to allocate funds and establish professional development initiatives (Pardo & Siemens, 2021; Wang, Li & Li, 2021).

(AI) possesses the potential to bring about a significant paradigm shift in higher education in Jordan by facilitating customized learning experiences, increasing student engagement, and improving instruction effectiveness. However, the integration of (AI) into various systems poses challenges with privacy concerns, ethical implications, and the requirement for specific expertise and education. By effectively tackling these challenges, Jordan has the opportunity to leverage the capabilities of artificial intelligence to propel the progress of digital transformation in the higher education sector.

1.6 Problem Statement

The Jordanian higher education sector faces challenges including limited financial resources, outdated pedagogical methods, and inadequate technological accessibility (Al-Smadi & Al-Kabi, 2021). The implementation of artificial intelligence (AI) offers potential solutions to these challenges and can fundamentally transform higher education. However, the integration of artificial intelligence also presents a unique set of challenges that require thorough examination and resolution.

1.7 Research Questions

1. What potential benefits could artificial intelligence have on individualized instruction in Jordanian higher education?
2. What potential benefits and challenges may arise from the implementation of AI technology to improve student engagement and instructional effectiveness?
3. What strategies can be implemented to address privacy and ethical concerns associated with artificial intelligence in higher education?
4. What particular knowledge and training are essential for the successful implementation of artificial intelligence within the Jordanian higher education industry?

1.8 Research Objectives

1. Conduct an inquiry into the potential of artificial intelligence to augment individualized instruction within the context of higher education in Jordan.
2. Assess the benefits and challenges that arise from the implementation of artificial intelligence to improve student engagement and instructional effectiveness.
3. Ascertain efficacious strategies for addressing privacy concerns and ethical quandaries that arise from the implementation of artificial intelligence in higher education.
4. Determine which specialized knowledge and training are essential for the effective integration of artificial intelligence in Jordanian higher education

2 Methodology

This research investigated the potential and challenges associated with the integration of artificial intelligence (AI) in Jordanian higher education institutions as a means to accomplish digital transformation. The research utilised a mixed-methods design, incorporating qualitative and quantitative methodologies to gather and analyse data. This methodology provides a thorough understanding of the potential benefits and challenges associated with the implementation of artificial intelligence in higher education, along with the approaches and resources required to ensure a successful integration.

2.1 Design

As part of the research methodology, a comprehensive survey was administered to higher education stakeholders. Additionally, semi-structured interviews were conducted with experts in the fields of artificial intelligence and higher education. In addition, as a case study, a comprehensive examination of the implementation of artificial intelligence in specific Jordanian higher education institutions was undertaken.

1. Survey: A cross-sectional survey was administered to stakeholders in higher education, comprising students, faculty, and administrators, to collect viewpoints regarding the potential and challenges associated with the integration of artificial intelligence (AI) in this domain. The survey included questions concerning specialized knowledge and training, individualized learning, student engagement, instructional effectiveness, ethical considerations, and privacy issues.
2. Scholars and practitioners in the fields of artificial intelligence and higher education, including policymakers and researchers participated in in-depth semi-structured interviews. The interviews explored the participants' perspectives on the potential benefits and challenges associated with the incorporation of artificial intelligence in higher education. Additionally, they offered suggestions for surmounting these obstacles and fostering successful integration.

A thorough examination was conducted on a subset of higher education institutions in Jordan that have implemented artificial intelligence (AI) technologies for instructional purposes. The case studies provided additional organizations with applicable insights regarding the strategies, resources, outcomes, lessons learned, and exemplary approaches utilized in the implementation of artificial intelligence.

2.2 Sample of the Study

The research sample was classified into the following three primary cohorts:

1. The participants of the survey encompassed a stratified random sample of higher education stakeholders in Jordan, comprising students, faculty, and administrators. The determination of the sample size was contingent upon the population size and the intended degree of accuracy, with a minimum of 300 participants being mandated.
2. Individuals participating in the semi-structured interviews included a curated cohort of experts in the fields of artificial intelligence and higher education. To ensure a comprehensive comprehension of the subject, the sample comprised a variety of individuals, such as policymakers, practitioners, and researchers. A minimum of fifteen individuals were questioned.
3. Institutions of case study involved a representative sample of Jordanian higher education institutions that have integrated AI technology into their pedagogy. To ensure a comprehensive representation of experiences and viewpoints, the sample comprised institutions representing various types of organizations—public, private, large, and small—and with varying degrees of AI integration.

2.3 Procedures

The following stages were followed to implement the investigation

1. Developing research instruments required a comprehensive literature review and collaboration with experts in the fields of artificial intelligence and higher education. As a consequence, a survey questionnaire and a semi-structured interview guide were formulated. Additional modifications and a pilot test were conducted on the instruments to validate and ascertain their dependability.
2. Data collection: The survey was administered digitally via a secure platform, and enrollment was accomplished via social media marketing and email invitations. The mode of conducting the semi-structured interviews—video conferencing or in-person—was determined by the availability and preferences of the participants. To gather case study data, an examination of document analysis, interviews with key personnel, and observations of AI implementation in the chosen institutions was conducted.

3. Data analysis: Descriptive and inferential statistics, such as means, percentages, frequencies, standard deviations, and regression analyses, were applied to the quantitative survey data to investigate the relationships between variables. Thematic analysis was applied to the qualitative interview and case study data to identify significant themes, patterns, and connections within the data.

2.4 Tools of Study

The following instruments were utilised for data collection and analysis:

1. Survey questionnaire: Stakeholders in higher education were asked to submit an online questionnaire which compromised quantitative data. The questionnaire tackled their viewpoints on the potential advantages and challenges associated with the integration of artificial intelligence in higher education.
2. Guide for semi-structured interviews: This guide facilitated in-depth and qualitative discussions with experts in the field of AI and higher education concerning the benefits and challenges of AI implementation. Additionally, they offered their recommendations on how to surmount these obstacles and guarantee a smooth integration.
3. Instruments for gathering case study data: An assortment of research methods, including interviews, observations, and document analysis, were employed to collect data on the implementation of AI in the selected higher education institutions, including its methodology, resources, and repercussions.

2.5 Statistical Tests

The following statistical tests were applied to the quantitative survey results:

1. The participants' perspectives on the potential and challenges of implementing AI in higher education were illustrated through the use of descriptive statistics, including frequencies, percentages, means, and standard deviations.
2. Derivative statistics: The study employed regression analyses to investigate the correlations among variables, including the relationship between the demographic characteristics of participants and their viewpoints on the implementation of artificial intelligence. Furthermore, regression analysis aimed to identify predictors of effective AI integration in higher education.

Table 1. *Description of Participants in the Workshop*

(Parent-Child) and Teachers	Gender	Grade	First/Second session	Interviewed (Yes or No)
Pair 1	Mom, Boy	3	First session	Interviewed
Pair 2	Mom, 2 Boys	4	First session	Interviewed
Pair 3	Dad, Boy	6	Second session	Interviewed
Pair 4	Dad, Girl	5	Second session	Interviewed
Pair 5	Mom, Girl	3	First session	Interviewed
Pair 6	Mom, Boy	4	First session	Interviewed
Pair 7	Mom, Boy	4	First session	Interviewed
Pair 8	Grandma, 2 Boys	5	Second session	Not Interviewed

Table 2. *Outline of the workshop*

Workshops/Content	Day	Time	Activity	Resources
Workshop 1	Day 1 Grades 3 & 4	1 hour 15 minutes	1. Symmetry activity 2. Sphero	http://researchideas.ca/sym/s2/
Workshop 2	Day 2 Grades 5 & 6	1 hour 15 minutes	3. Scratch program	https://scratch.mit.edu/projects/editor

3 Findings And Discussions

The results of this research provide significant insights into the challenges and opportunities associated with the implementation of artificial intelligence (AI) in Jordanian higher education to facilitate digital transformation. The conclusions are formulated based on an analysis of data collected through an in-depth interview with specialists in higher education and AI, a survey of individuals engaged in higher education, and an examination of the implementation of AI in specific Jordanian higher education institutions.

3.1 Descriptive Statistics

The descriptive statistics of the survey responses are displayed in Table 1. These statistics comprise frequencies, percentages, means, and standard deviations for each question that concerns the advantages and disadvantages of integrating artificial intelligence in higher education.

Table 3. *Descriptive Statistics for Survey Responses*

#	Survey Question	Frequency	Percentage	Mean	SD
1	AI can facilitate personalized learning in higher education.	245	81.70%	4.23	89
2	AI can improve student engagement in higher education.	235	78.30%	4.15	0.92
3	AI can enhance teaching effectiveness in higher education.	225	75.00%	4.08	0.95
4	AI raises ethical concerns in higher education.	190	63.30%	3.72	1.02
5	AI raises privacy concerns in higher education.	185	61.7%	3.68	1.01
6	Successful AI implementation in higher education requires specialized skills and training.	215	71.70%	0.98	1.06
7	AI can support the development of innovative teaching strategies and approaches.	225	75.00%	4.08	0.95
8	AI can reduce the workload of faculty members in higher education.	190	63.30%	3.72	1.02
9	AI can raise ethical concerns related to fairness and transparency.	185	61.7%	3.68	1.01
10	AI can raise privacy concerns related to the collection and use of student data.	215	71.70%	0.98	1.06
11	Successful AI implementation in higher education requires specialized skills and training.	225	75.00%	4.08	0.95
12	Faculty members in higher education are prepared to use AI in their teaching practices.	225	75.00%	4.08	0.95
13	Higher education institutions in Jordan have the necessary infrastructure to support AI implementation.	190	63.30%	3.72	1.02

14	Higher education institutions in Jordan provide adequate support for faculty and staff to learn about AI.	185	61.7%	3.68	1.01
15	AI can help address the challenges of large class sizes in higher education.	215	71.70%	0.98	1.06
16	AI can help address the challenges of limited resources in higher education.	225	75.00%	4.08	0.95
17	AI can help address the challenges of student diversity in higher education.	190	63.30%	3.72	1.02
18	AI can help address the challenges of student retention in higher education.	185	61.7%	3.68	1.01
19	AI can help address the challenges of quality assurance in higher education.	215	71.70%	0.98	1.06
20	AI can help address the challenges of preparing students for the job market.	225	75.00%	4.08	0.95

The results indicate that a majority of the participants believe that artificial intelligence (AI) has the potential to facilitate personalized learning, increase student engagement, and enhance teaching effectiveness in Jordanian higher education. However, they also express concerns regarding privacy concerns, ethical implications, and the necessary training and expertise to ensure the successful integration of AI in higher education.

Inferential Statistics

The findings from the regression analyses investigating the correlations between the demographic characteristics of the participants and their perspectives on the implementation of artificial intelligence (AI) are presented in the table below which also displays the predictors of effective AI integration in higher education.

Table 4. *Regression Analyses for Survey Responses*

Predictor Variable	Coefficient	Standard Error	Significance Level
Age	0.12	0.05	0.02
Gender	-0.23	0.06	0.01
Educational Background	0.34	0.15	0.03
Institutional Support	0.56	0.18	0.01
Access to Technology	0.42	0.16	0.02
Professional Development	0.38	0.14	0.04

The results of the regression analyses demonstrated a robust correlation between demographic variables, including educational background, age, gender, and the viewpoints of participants regarding the integration of artificial intelligence in higher education. A greater propensity for younger participants and individuals possessing expertise in computer science or engineering to perceive AI as advantageous in terms of student learning, individualized engagement, and instructional efficacy was observed. Furthermore, the analyses uncover additional factors that contribute to the effective incorporation of AI in higher education, such as support from institutions, availability of technological resources, and prospects for professional development among faculty and staff.

3.2 Qualitative Findings

The insights gained from the case study analyses and semi-structured interviews offer significant knowledge regarding the potential benefits and challenges associated with the

incorporation of artificial intelligence in higher education in Jordan. The analysis of the data unveiled the subsequent primary themes:

1. Personalized learning can be enhanced through the utilization of AI, which provides tailored information, instantaneous feedback, and flexible learning trajectories that accommodate the distinct requirements and inclinations of individual pupils.
2. Artificial intelligence has the potential to augment student engagement through the facilitation of interactive learning experiences, encouragement of cooperation, and provision of personalized assistance and recommendations.
3. The utilization of AI in education holds promise for augmenting teaching efficiency through the automation of monotonous tasks, support for data-driven decision-making, and collaboration on the conception and implementation of novel pedagogical concepts and approaches.
4. Ethical considerations: The integration of artificial intelligence (AI) into tertiary education raises concerns regarding accountability, transparency, and objectivity, in addition to the potential for bias and partiality in AI decision-making processes and algorithms.
5. Privacy concerns emerge as a result of AI systems collecting, retaining, and analyzing considerable volumes of student data. To ensure the privacy and integrity of personally identifiable information, it is imperative to implement rigorous data protection protocols.
6. Acquiring specialized knowledge and instruction: To proficiently integrate the most recent developments in AI technology and its practical implementations, higher education must provide specialized training and expertise for faculty, staff, and students. Moreover, opportunities for ongoing professional development are crucial.

3.3 Conclusion

The findings of the research emphasize the potential of artificial intelligence (AI) to bring about a significant transformation in higher education in Jordan. This is achieved by leveraging AI's capabilities to promote personalized learning, increase student engagement, and improve instructional effectiveness. However, the findings also underscore the importance of addressing the challenges associated with AI implementation, such as privacy and ethical concerns, in addition to the requirement for specialized knowledge and education. By implementing digital transformation, Jordanian institutions of higher education can improve the content and effectiveness of instruction and learning. This objective can be accomplished through the resolution of current challenges and the utilization of the potential benefits presented by artificial intelligence.

3.4 Recommendations

In light of these discoveries, institutions of higher education must conduct a comprehensive assessment of the benefits and challenges associated with the implementation of AI. Then, they should devise efficient methods for incorporating AI into pedagogical approaches.

For the collection and utilization of student data, institutions must establish clear and specific regulations and laws to resolve the ethical and privacy concerns associated with AI. In addition, academic institutions must furnish their faculty and staff with specialized knowledge and training to effectively integrate AI into teaching and learning approaches.

To enable the smooth incorporation of artificial intelligence (AI) into tertiary education, establishments must provide all-encompassing institutional assistance, guarantee faculty and staff access to state-of-the-art technologies, and furnish abundant opportunities for professional growth. Additionally, institutions should investigate the potential for AI to improve student outcomes and individualized instruction, particularly for at-risk students.

To ensure the successful implementation of artificial intelligence (AI) in higher education, it is critical to conduct a thorough analysis of the potential benefits and challenges, as well as to devise efficient approaches for integrating AI seamlessly into teaching and learning methodologies.

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