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Impact of Artificial Intelligence on Students' Engagement and Satisfaction in Public Sector Universities of Quetta

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ABSTRACT
The present study aimed to investigate the impacts of artificial intelligence on students' engagement and satisfaction level at higher education in Quetta. The proposed work employed a quantitative approach or was descriptive survey design of research in nature. Data was collected through an adaptive standardized Questionnaire using simple random sampling technique from a sample including all of the public university students of Quetta. This study was focused on investigating the impacts of artificial intelligence on students' engagement and satisfaction level at higher education. The present study was beneficial for educational planners, stakeholders, educational systems to incorporate AI- driven platforms in learning activities and make informed decisions regarding integration of AI-powered tools in the curriculum. SPSS Software version 23 was used as to summarize and interpret the data by analysis of descriptive and inferential Statistic. The findings of the present study will inform the policy makers and stakeholders and collaborators to integrate artificial intelligence (AI) powered platforms and adaptive systems in higher education to enhance the learning outcomes of the students.

Key words: *Artificial Intelligence, Engagement, Satisfaction and Higher Education.*

Introduction

In most parts of the world, recently technological uprising has taken place in last few decades, society transforms from traditionalized to modernized living conditions with the concept of creativeness or imaginativeness. In underdeveloped nation likely in India the process of learning should be more improved or prominent in higher education because prior to AI-driven platforms whole system of education was done manually in institutions, but with advancements in technology in the last few decades new concept Artificial Intelligence was introduced which transform people view of education or working (Jain & Jain, 2019). Artificial intelligence is defined as the capacity of devices to understand or to make adjustments. The concept of AI grows quickly in the digital era. Day by day the worth of artificial intelligence increases in numerous domains because of its adaptability and processing of information at high speed in an efficient way, AI can work to a greater extent than persons fostering robotic system. Specifically, the domain of education revolutionizes largely by AI driven platforms (Pratama et al., 2023).

Artificial intelligence is all about mimicking mentality of humans by machines actually comes under the domain of computer science, which involves grasping language, decision making and problem-solving activities just like humans for example natural language processing and robotics makes the field of artificial intelligence vast. Now in educational sector, it has been further incorporated in teaching-learning processes from individualized learning to data mining in the

educational field. However, the innovations regarding AI offers large scale applications and have a strong impact on transforming education (Wang et al., 2023). The integration of Artificial Intelligence powered-tools portrayed a crucial paradigm shift, ready to redefine structure of learners' engagement that hastily undergoes dynamic change in higher education. (Ezeoguine & Eteng-Uket, 2024). The determinants of artificial-intelligence have a impact on student's satisfaction at higher education and when the learners utilize artificial intelligence tools they become active participants, engaged participants become more involved or engaged in their learning journey (Dahri et al., 2024).

Engagement level of the learner's increases by AI's potential of personalized learning that promotes or addresses learning styles, interests and specific needs of each individual. Moreover, the students were facilitated by applications of AI, through personalized learning the learners became motivated by direct association of the teaching-learning practices (Frank, 2024). Positive relationship exists among students' involvement in their studies and the usage of AI-driven tools. Moreover, learners' involvement, motivation and interaction in their studies were enhanced by utilizing AI-tools like intelligent tutoring system, automated feedback mechanisms and adaptive learning platforms (Chaudhary et al., 2024).

Luckin et al. (2022) stated that in educational settings, Artificial Intelligence (AI) revolutionize the methods of teaching, learning environments and evaluation through its facility for application of technology, decision making and personalized learning. Accessibility, efficiency of learning and engagement were boost up by adopting AI-powered tools (Rashed & Addelfadeel, 2025). Therefore, artificial intelligence (AI) transforms traditional system of education into modernized system. Numerous studies have been administered on investigating the impacts of Artificial Intelligence on students' engagement and satisfaction but within developing regions of Balochistan, there is lack of exploration of these variables specifically in Quetta City. Moreover, modern education is ultimately dependent on AI's features, there is a strong necessitate investigating the impacts of AI on students' engagement and satisfaction specifically at higher education. Mostly studies utilize qualitative method and literature-based methods to investigate the impacts of artificial intelligence in higher education. Thus, this study will fill the gap quantitatively, by investigating the impacts of Artificial Intelligence on students' engagement and satisfaction at higher education in Quetta. Findings of the proposed work will provide applicable knowledge to the educators and stakeholders to develop strategies a to incorporate AI- driven platforms in learning activities and make informed decisions regarding integration of AI-powered tools in the curriculum.

Statement of the Problem

Despite growing body of knowledge regarding artificial intelligence, there is a dearth of research about the impacts of artificial intelligence on students' engagement and satisfaction at higher education (Imran et al., 2025). Current research will fill the gap through quantitative investigation and the proposed work will be worthy for the educators, policymakers and technology developers to develop strategies to incorporate AI- driven platforms in learning activities and make informed decisions regarding integration of AI=powered tools in the curriculum.

Research Objectives

The current study objectives will be**:**

1. To investigate the impact of Artificial Intelligence on students' engagement in public sector universities of Quetta.
2. To examine the role of artificial intelligence in fostering satisfaction in students.

Research Questions

1. To what extent does the artificial intelligence influence students' engagement in public sector universities of Quetta?
2. In what ways does Artificial Intelligence facilitates satisfaction in students?

Rationale of the Study

Numerous studies have been administered on investigating the impacts of Artificial Intelligence on students' engagement and satisfaction but within developing regions of Balochistan, there is lack of exploration of these variables specifically in Quetta City. Moreover, modern education is ultimately dependent on AI's features, there is a strong necessitate investigating the impacts of AI on students' engagement and satisfaction specifically at higher education. Mostly studies utilize qualitative method and literature-based methods to investigate the impacts of artificial intelligence in higher education. Thus, this study will fill the gap quantitatively, by investigating the impacts of Artificial Intelligence on students' engagement and satisfaction at higher education in Quetta. The researcher hopes that the result of the present research may be useful to future researcher's, to address a diverse sample as collaborative or social learning dimensions. This study is valuable and beneficial in many aspects firstly studying the impact of AI (Artificial Intelligence) on students' engagement and satisfaction at higher education have a potential to revolutionize teaching-learning practices; by offering adaptive learning environments, the present study aims to investigate impacts of artificial intelligence on students' engagement and satisfaction at higher education in Quetta. Secondly, it will provide developing body of information on AI generated benefits in education. Thirdly, this study provides opportunities for the educators and course designers to leverage AI-tools to improve students' learning in higher education. Ultimately, outcomes of the proposed study will inform the policy makers and educators to develop strategies to incorporate AI- driven platforms in learning activities and make informed decisions regarding integration of AI-powered tools in the curriculum.

Delimitation of the Study

This study is delimited to public sector higher education institutes of Quetta city and to accumulate data expediently this study is delimited to only Sardar Bahadur Khan Women's University (SBKWU), Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS) and University of Balochistan (UoB) Quetta.

Literature Review

Dahri et al. (2024) highlights that determinants of artificial-intelligence and how they have an impact on student's satisfaction, academic performance at higher education in Malaysia and Pakistani context by employing (UTUAT) uni-field theory of Acceptance and use of Technology in order to identify the factors that have an effect on adoption of AI-tools utilizing research design. The major outcomes of the researcher's disclosed that performance and effort expectancy, information accuracy of AI-generated tools, pedagogical fit, student's interaction were the main factors for both countries to adopt AI-tools for learning. The researchers argues that when the learners utilize artificial intelligence tools, they become active participants, engaged participants become more involved or engaged as mentioned by (Schwarz & Zhu, 2015; Zhu et al., 2025). As mentioned by Zhu et al., (2025), AI-powered chatbots enhanced the learner's participation level and interest level directly affect their engagement level. The social interaction of the learner's influence learner's perceptions and intentions to utilize AI generated tools as mentioned by (Al-Rahmi & Othman, 2013a, 2013b). The satisfaction levels of students make the learners to equip by utilizing AI tools.

Pratama et al. (2023), investigated how the learning activities of students as a whole were revolutionized by Artificial Intelligence, how their engagement towards learning, modification of their experiences regarding learning of each student's personal needs were revolutionized by

technological powered tools employing a qualitative descriptive approach. Because of new innovations in technology in higher education the upcoming trends of AI become more interesting, the technological based tools or plan of actions becomes a fruitful platform or gain importance for increasing student's learning outcomes and making ease for administration branch in streamline operations. By integrating AI features the administrative works were become productive in analyzing large data in a specific time. The researchers argues that integration of (AI) technologies open up numerous new opportunities in many sectors especially in the field of education converting the conventional method of teaching into more advanced concept as personalized learning. In this way the learner's become able to cope with modern educational challenges arise from the utilization of advanced features of technology.

The outcomes of the researcher's proposed work disclose that advancements in technology helped the learners in finding inaccuracies in pronunciation, analyzing learner's way of learning, following up the process of acquiring knowledge in classes in order to find subject matters. And beyond class, the usage of robotic instructors assists the learners reducing the requirement of additional help. Because of (Artificial Intelligence), the learner's attain assistance, their educational experiences become more adjustable, their skills and intellectual abilities were improved. As well as due to the concept of individualized learning each individual's needs were fulfilled. (Artificial Intelligence) can act as an individualized e-tutor helping learners in comprehend subject matter. providing them with additional resources, practices effective feedback in this way they gain direct guidance regarding their individual's needs, answering their inquiries, clarifying their concepts, providing them access to educational materials like books, reports, visual aids and editorials, making the students as independent learners as learning at their own tempo. The learners were facilitated by online learning throughout the world and the educators utilize AI powered-tools in order to deal with their students with diverse needs.

Bin-Salem (2024), highlights the influence of Artificial Intelligence accumulation in individualized learning and investigates the effect of AI on learner's attainment and involvement towards technology employing a case study method using qualitative research approach or collecting data from educators or learners from different levels of education through observation, document analysis and interviews. The outcomes of the researcher's proposed work disclose that individualized learning was heightened by (AI) powered tools like it facilitates differentiated learning means teaching in a way that meets the criteria of diverse students with diverse needs, delivering real-time assessments and tailoring roadmaps of learning. Because of these interactive or adaptable tools, the learner's academic performance improves as they get good scores or learners' engagement towards their studies increases. For implementing such AI driven tools, the instructors were also developed in their profession that how these technologies helped them in their career advancements with the application of personalized learning. The researcher also argues that integration of AI-driven tools or platforms, the ethical concerns or data privacy issues elevated according to some instructors or learners towards integrating (AI) powered tools in teaching learning process.

Ezeoguine and Eteng-Uket (2024), investigated that how Students' engagement in higher education influences by Artificial intelligence powered-tools by employing a descriptive survey. The sample of 204 university students were selected from population of 15,875 undergraduates from Port Harcourt University using stratified random sampling and mean. One-way or two-way ANOVA were utilized for collecting data. The major outcomes of the researcher revealed that the utilization of AI powered tools largely influences the students in terms of engagement in their studies and difference exists among their engagement level and the findings highlights AI incorporation in higher education inclusively in order to engaging students in equitable manner.

The higher education environment was largely influenced due to insights contributed by AI and as a result the engagement level of the learners enhanced.

Ma'amor et al. (2024) highlights the relationship between students' academic performance, their experience as personalized learning and student engagement and the utilization of AI powered-tools by employing a correlation study. The collection of data was done from UITM Puncak Alam Campus and Faculty of Business and Management using questionnaire as a research tool and utilization of descriptive demographic analysis, regression analysis and correlation were conducted to analyze the data. Major outcomes of the researcher disclosed that majority of the concerned population uses artificial intelligence-powered tools for their studies. Due to this learner's academic performance and engagement in their learning sessions significantly improves. Furthermore, in comparison with traditional methods of learning AI facilitates the students' in searching knowledge and improving their academic performance.

Chaudhary et al. (2024) highlights how academic performance and students' engagement were influenced by (AI) Artificial Intelligence driven-tools. The researchers' claim that at higher education Artificial Intelligence driven tools have a significant impact on learners' engagement and learning outcomes utilizing quantitative survey from public universities of Lahore involving sample of 500 university students. The researchers utilize structured questionnaire with sections including demographic, uses of AI-tools, engagement level of students and supposed learning outcomes. Descriptive and statistical analyses as correlation and multiple regression analysis were utilized for analysis. The major outcomes of the researchers', disclosed that positive relationship exists among students' involvement in their studies and the usage of AI-driven tools. Moreover, learners' involvement, motivation and interaction in their studies were enhanced by utilizing AI-tools like intelligent tutoring system, automated feedback mechanisms and adaptive learning platforms. Additionally, critical thinking skills and academic grades of the learners improved by using AI-driven tools frequently as a result they demonstrate fruitful academic performance. Ultimately, addressing poor academic performance and learner's disengagement would be a deliberate move by incorporating artificial intelligence powered tools in educational practices.

Muslim et al. (2025) examines how students' engagement, satisfaction, academic success, interaction and personalized learning were influenced by Artificial Intelligence in distance education by employing quantitative research design. Structured questionnaire was used in order to collect data through simple random sampling from sample of 99 students enrolled at distance learning programs across Pakistan. Cronbach's Alpha was used for reliability of the instrument and the data was analyzed through Pearson correlation and descriptive statistics. The major outcomes of the researchers revealed that artificial intelligence plays an important role in order to improving academic support, elevating personalized learning, enhancing overall satisfaction and encouraging students' engagement in online educational settings. Learning experiences were transformed by demonstration of artificial intelligence powered tools making them student centered and adaptive. Students' individualized needs were addressed by AI-powered tools as they became able to learn complicated academic terms. Moreover, through AI's personalization of content, the students became efficient learners which results in self-directed learning. Integration of artificial intelligence in terms of engagement makes facilitation for the students to feel connected or became active in their learning practices. However, through AI powered tools the academic activities of the students improved and from these facilitations students became strongly satisfied.

Rashed and Addelfadeel (2025), evaluates the effect of utilizing AI on learners' satisfaction and their willingness to learn. The researchers argue that AI-driven technologies adapted educational

contents according to the needs of the learner's pace. The satisfaction of students' drastically enhanced by individualized-learning experiences with incorporation of artificial intelligence by employing descriptive Correlational design of research. And the data was collected from Nursing College-Misr University for Science and Technology by utilizing convenient sampling. The major outcomes of the researchers revealed that the usage of AI in education is directly proportional to students' satisfaction and Positive correlation exists among them. ChatGPT was considered as the most extensively used AI tool. Moreover, provision of immediate assistance, facilitation of personalized learning and engagement were facilitated or improved by AI's potential as academic readiness. Ultimately, enriching students' academic experience and learning outcomes.

Almufarreh (2024), states that the educational landscape was extensively interrupted by arrival of Artificial Intelligence. Novel progress of AI's contribution as generative AI creates new opportunities for the learners' tailoring to the needs of each individual in their studies significantly impacts the education. For example, extensive usage of ChatGPT, increase students' experiences or abilities in terms of their learning. The data was collected by utilizing survey questionnaire from Saudi Arabian university by employing two-stage method of ANN (Artificial Neutral Network) and Partial Least Squares Structural Equation Modeling (PLS-SEM). The researcher argues that students' satisfaction depends on continuous and prolific utilization of Artificial Intelligence-tools. The major outcomes of the researcher disclosed that generative AI ultimately, relies on three factors as perceived utility, content utility and emotional wellbeing that drives both satisfaction and adoption.

Conceptual Framework

Independent Variable	**Dependent Variables**
Artificial Intelligence	Students' Engagement
	Students' Satisfaction

Conceptual framework illustrates the relationship between the independent variable and dependent variables of the study.

Research Methodology

This study investigates the impacts of artificial intelligence on students' engagement and satisfaction at higher education among undergraduate students of public universities of Quetta, employing a quantitative research design and utilizing simple random sampling for ensuring equal probability and minimizing selection bias. The sample size involves 453 university students utilizing formula for the estimation of population. Target population consists of total 31000 students approximately for the proposed work as (Sardar Bahadur Khan Women's University (SBKWU) = 8000 students, Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS) = 9000 students and University of Balochistan (UoB) Quetta = 14000 students). The questionnaire survey was used as the instrument for data collection which consists of structured questionnaire and the items were measured on the 5-point Likert Scale ranging from "strongly agree" to "strongly disagree" to gauge students' views regarding AI (Artificial Intelligence) usage and its impacts on students' learning activities. The questionnaire items were adapted from Dahri et al. (2024) and Muslim et al. (2025). In order to ensuring validity and reliability of the questionnaire pilot study was conducted which involves 50 students. The collected data will be analyzed through descriptive and inferential statistics as percentages and regression analysis in order to determine the relationship between dependent variables and independent variable.

Data Analysis and the Results

The results of the data analysis regarding proposed study is mentioned in this section including demographic profile of the participants as well as the results of descriptive statistics in percentages or frequencies and inferential statistics in regression analysis.

Data Analysis

Descriptive Statistics

Table 1: Age wise distribution of the respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
20-25	241	53.2	53.2	53.2
25-30	180	39.7	39.7	92.9
30-35	31	6.8	6.8	99.8
35-40	1	2	2	100.0
Total	453	100.0	100.0	

Table 1 shows that majority of the respondents fell in the age group of 20-25 consisted of 53.2 % and it was followed by the age group of 25-30 consisted of 39.7% of the respondents.

Table 2: Gender wise distribution of the respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	153	33.8	33.8	33.8
Male	300	66.2	66.2	100.0
Total	453	100.0	100.0	

Table 2 shows majority of the population constitutes of male participants (66.2%) representing views regarding impacts of AI usage on students' engagement and satisfaction and following female as 33.8% respondents.

Table 3: University wise distribution of the respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
UOB	150	33.1	33.1	33.1
SBK	150	33.1	33.1	66.2
BUITEMS	153	33.8	33.8	100.0
Total	453	100.0	100.0	

Table 3 shows the equal proportion with little deference that seen in the case of BUITEMS university students.

Table 4: AI (Artificial Intelligence) Usage

	Frequency	Percent	Valid Percent	Cumulative Percent
Very often used	184	40.6	40.6	40.6
Often used	182	40.2	40.2	80.8
Rarely used	33	7.3	7.3	88.1
Used sometimes	54	11.9	11.9	100.0
Total	453	100.0	100.0	

Table 4 shows that majority of the population used Artificial Intelligence (AI) very often (40.6%) in their learning activities.

Table 5: Artificial Intelligence and students' engagement and satisfaction at higher education

S.No	Items	SA (%)	A (%)	N (%)	DA (%)	SDA (%)	Total (%)

1.	Using Artificial Intelligence AI increases my active involvement in the learning process.	52.5	38.2	6.4	2.9	0.0	100
2.	Using AI tools-infused learning practices enhance my engagement in my classroom	17.4	63.4	17.2	2.0	0.0	100
3.	Using AI tools increases my participation in my classes	56.1	33.1	9.3	1.5	0.0	100
4.	AI tools help me create learning experiences in collaboration with my peers	20.1	63.6	13.5	2.9	0.0	100
5.	The use of AI has increased my engagement in online learning activities.	58.9	30.7	7.5	2.9	0.0	100
6.	I am satisfied with using the AI tools as a learning tool.	30.7	50.6	13.5	5.3	0.0	100
7.	The AI tool is effective for gathering knowledge.	26.3	55.8	12.4	5.5	0.0	100
8.	I am satisfied with the outcomes of using AI-tools in my research.	29.6	61.1	4.6	4.6	0.0	100
9.	Using AI tools positively influences my satisfaction with my study interactions.	68.0	25.4	3.8	2.2	7	100
10.	I believe that that AI has played a significant role in improving my satisfaction in academic progress.	34.4	56.5	5.3	3.8	0.0	100
Strongly Agree= SA, Agree= A, Neutral= N, Disagree= DA, and Strongly Disagree= SDA							

Table 5: exhibit compelling evidence that Artificial Intelligence significantly enhance students' engagement and satisfaction at higher education. 52.2% of the respondents strongly agreeing that Artificial Intelligence usage increase their active involvement in learning process. Similarly, over 63.4% of the respondents believe that using AI- tools infused learning practices enhance their engagement in classes. A notable 56.1% strongly agreed that using AI-tools increased their participation in classes. In terms of engagement 63.6% respondents reported that AI-tools help them create learning experiences in collaboration with their peers. However, only 58.9% of respondents strongly agreed that usage of AI increased their engagement in online learning activities. About 50.6% of respondents agreed that they were satisfied with using AI tools as a learning tool. According to the data 55.8% of the respondents agreed that AI tool is effective for gathering knowledge and 61.1% of the respondents only agreed that they were satisfied with the outcomes of using AI tools in their research. Additionally, 68.0% of the respondents strongly agreed that using AI tools positively influences their satisfaction with their study interactions.

Ultimately, 56.5% of the respondents only agreed that AI played significant role in improving their satisfaction in their academic performance.

Inferential Statistics

Table 6: Modal Summary of Regression Analysis

Dependent Variable	Summary		ANOVA	
	R2	Adjusted R2	F	Sig.
Students' Engagement	.037	.035	17.567	.000[b]
Students' Satisfaction	.005	.003	2.483	.116[b]

Independent Variable: (AI) Artificial Intelligence Usage

Regression Analysis: Two separate regression analysis were operated in order to investigate the relationship between the independent variable as (AI) Artificial Intelligence and the dependent variables as (Students' Engagement and Students' Satisfaction). Based on the outcomes of Table 6, the R2 value for AI usage and students' engagement is (R2= .037) indicating that the independent variable influenced 37.0% of the dependent variable and the remaining 63.0% of the variance ascribed to the dependent variable that came from other factors. For the relationship between students' Satisfaction and the usage of AI, the R2 value (R2= .005) indicating that AI usage only 5.0% influences students' satisfaction. The remaining 95% of variance comes from other factors.

Findings

Proposed study aimed to investigate the impacts of artificial intelligence on students' engagement and satisfaction at higher education. The major outcomes of the proposed work explained compelling evidence that usage of AI (Artificial Intelligence) significantly increases students' engagement and satisfaction.

The primary objective was to investigate the impact of Artificial Intelligence on students' engagement in Public Universities. The study discovered that 52.2% of the respondents strongly agreeing that Artificial Intelligence usage increase their active involvement in learning process. Similarly, over 63.4% of the respondents believe that using AI- tools infused learning practices enhance their engagement in classes. A notable 56.1% strongly agreed that using AI-tools increased their participation in classes. In terms of engagement 63.6% respondents reported that AI-tools help them create learning experiences in collaboration with their peers. However, only 58.9% of respondents strongly agreed that usage of AI increased their engagement in online learning activities.

The second research objective was centered on examining the role of artificial intelligence in fostering satisfaction in students. The results point out that about 50.6% of respondents agreed that they were satisfied with using AI tools as a learning tool. According to the data 55.8% of the respondents agreed that AI tool is effective for gathering knowledge and 61.1% of the respondents only agreed that they were satisfied with the outcomes of using AI tools in their research. Additionally, 68.0% of the respondents strongly agreed that using AI tools positively influences their satisfaction with their study interactions. Furthermore, 56.5% of the respondents only agreed that AI played significant role in improving their satisfaction in their academic performance.

Ultimately, the study discovers that a strong relationship exists among AI usage and students' engagement and satisfaction. The regression analysis further strengthened this revealing statistically a significant relationship between Artificial Intelligence usage and students' engagement and satisfaction. These results disclose that Artificial Intelligence facilitates a pathway for the learners to equip satisfying and engaging learning environment.

Conclusions

Proposed study expands our perceptive that how students' engagement and satisfaction significantly influenced by usage of Artificial Intelligence AI-powered tools among university students of Quetta city. The proposed work gives available evidence that students' engagement and satisfaction increase with increased usage of AI powered tools at higher education. Due to this fact, it is mandatory for educational institutions more exclusively develop strategies to incorporate AI- driven platforms in learning activities and make informed decisions regarding integration of AI-powered tools in the curriculum. Moreover, for facilitation of AI usage educational institutions should provide professional development and training in order to familiarize them with AI technologies and to integrate these technologies in teaching-learning practices.

Recommendations

- Educational Institutions should examine data regarding students' engagement in order to assessing the impacts of AI-powered tools.
- Educators or instructors should integrate AI-powered educational tools in the curricula to enhance the students' engagement and satisfaction in higher education.
- It is also recommended that the educational institutions or educators should universally cater the diverse populations of students
- Furthermore, educational institutions should provide professional development and training in order to familiarize them with AI technologies and to integrate these technologies in teaching-learning practices
- In conclusion workshops, conferences and trainings were conducted for professional development in order to emphasize the modernized usage of AI, its diverse applications, possibilities and future AI-powered applications.

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