

WIP: Implementing and Deploying Artificial Intelligence Solutions in Higher Education Institutions

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Abstract— This innovative practice WIP paper discusses the importance of deploying Artificial Intelligence (AI) in Latin American Higher Education Institutions (HEIs). It presents the preliminary findings of a workshop in Mexico that brought together nineteen Latin American universities' academic and IT leaders to define strategies for AI deployment. AI can shape higher education (HE) by advancing skills and technologies, generating and sharing knowledge, and supporting people adjusting to technological changes. However, AI integration in HEIs is limited, and there are significant global gaps, particularly in resource-constrained contexts and countries without guaranteed infrastructure. Thus, the intended outcomes of this work are the dynamic involvement of participants, who were encouraged to introduce novel topics that contribute to the overall AI discourse to yield a comprehensive and adaptable global strategy for AI implementation and deployment in HEIs through collective wisdom. Under this rationale, we designed and conducted a workshop sequence. A survey was conducted before the workshop to obtain leaders' opinions about AI deployment in HE. Later, participants were distributed in teams, and a unique restriction was considered for their proposals to generate a deployment strategy. As findings, academic institutions have been slow to adopt AI, but the new generation patterns have forced them to embrace it. They are considering automating their operations to improve student services and attract more students. However, the primary challenge is the lack of strategy. Conclusive remarks emphasized the collaborative efforts among universities to fortify and enhance the implementation and deployment of AI solutions within HE. In the future, we aim to establish a foundation for future collaborations on innovation projects related to AI in education among the workshop attendants.

Keywords—higher education, educational innovation, ChatGPT, artificial intelligence in education

I. INTRODUCTION

Although the term Artificial Intelligence (AI) dates back to 1955 [1], it has never reached a level of mass recognition like the one we see now. Today, AI is widely implemented in multiple social, economic, and political spaces. It has also impacted various processes in higher education (HE), such as teaching and learning, management, and professor reskilling by automating tasks, analyzing content, and improving decision-making processes [2], [3], [4]. AI can create personalized learning experiences and have the potential to revolutionize the evaluation and feedback process [5], [6], [7]. However, developing AI education policies is crucial. These policies should focus on governance for privacy and security and operational aspects like infrastructure and training [8]. Moreover, policymakers emphasize the importance of integrating AI across disciplines to ensure affordable, high-quality education globally, aligning with the goals of education for sustainable development [9].

Higher Education Institutions (HEIs) are implementing AI deployment strategies to address challenges and progressively focus on incorporating cutting-edge technologies to enhance administrative, academic, and pedagogical aspects [10], [11]. In Mexico, institutions like Tecnológico de Monterrey, Instituto Politécnico Nacional of Mexico, and the National Autonomous University of Mexico have revamped their curricula with AI-focused programs, concentrating on incorporating cutting-edge technologies to meet global educational needs [10], [11], [12], [13]. These institutions are navigating barriers such as IT infrastructure, skills challenges, budget constraints, and governance issues while leveraging enablers like executive support for AI implementation [14].

HEIs in Mexico that have adopted AI solutions have taken steps to establish a solid legal framework and encourage

collaboration among academic, technical, and administrative personnel who specialize in AI applications [15]. They prioritize decision-making structures that use efficient computational algorithms and machine-learning techniques [16]. Furthermore, they incorporate AI applications such as predictive modeling, intelligent analytics, and assistive technology to address educational issues and enhance the quality of education in the Latin American context [7].

However, AI solutions without proper deployment strategies can lead to chaos due to data leaks, solution crashes, and ethical issues. Gaps may include matters related to budget constraints [17], the need to incorporate cutting-edge technology to meet global educational standards [11], and the importance of addressing AI-based cyber threats while harnessing AI for cybersecurity enhancement [14]. Additionally, the integration of technology in teaching and learning requires a focus on technological, pedagogical, and organizational dimensions, influenced by contextual factors that impact the choice and availability of technology use [18]. To mitigate these risks and improve AI deployment in HEIs, leaders must prioritize strengthening institutional governance for cybersecurity, revisiting cybersecurity KPIs, and enhancing cybersecurity awareness campaigns [19]. Addressing these challenges can lead to more effective AI deployment strategies.

Discussions about AI deployment strategies have been found in the literature. For example, George and Wooden [20] examined the integration of AI in various HE areas. They coined the term "smart universities," indicating an academic evolution of HEIs that assume AI and quantum computing in their processes. The work highlights benefits like enhanced efficiency in complementary services and personalized learning in teaching and learning. However, they discussed the necessary cautions regarding potential errors during AI deployment strategies, such as losing educational quality and introducing job displacement.

Memarian and Doleck [21] described an intersection between AI and HE established on Fairness, Accountability, Transparency, and Ethics (FATE). The authors reviewed 33 SCOPUS and Web of Science papers categorizing definitions of FATE as either descriptive or technical. Their findings indicate a need for further research bridging descriptive and technical definitions of the research works applying AI in HE. Also, they advocate for longitudinal, open-access, and reproducible studies in this field.

A workshop organized in November 2023 [22], convened around 80 participants from diverse sectors like education, technology, charity, and government for an AI in Education Summit. As part of the AI Fringe inspired by the UK government's global AI Safety Summit, the participants discussed the impact of AI on how people learn, what people learn, and how people work. Participants in the discussion stated multiple guidelines and concerns about AI implementations in education, which must be considered in AI deployment strategies for HEIs.

The Beijing Consensus on Artificial Intelligence and Education was the first document to offer guidance and recommendations for responding to AI's opportunities and challenges concerning Sustainability Development Goal 4 (SDG

4). Since its adoption, UNESCO has committed to investigating the implementation of AI in education [23].

According with UNESCO [23] HEIs have the potential to play a significant role in shaping the current era as the skills and technologies to develop AI are advanced, knowledge about AI is generated and shared, and people are supported to adjust and adapt to this and other technological changes. Yet, to date, AI has not been widely integrated into HEIs, developing fastest in a limited number of countries with substantial global gaps remaining, particularly in resource-constrained contexts and countries where the connectivity infrastructure that underpins AI technology is not assured. [23]

To our knowledge, no studies have been made in the opinion of directors from Latin American universities on the deployment of AI in HE considering strategies and detailed actions for HEIs in responsibly integrating AI and building internal capacity to create the right environment for informed and sustained engagement with AI across the HEI. As Fig. 1 suggests, most countries are still in a very early stage of researching AI in HEIs.

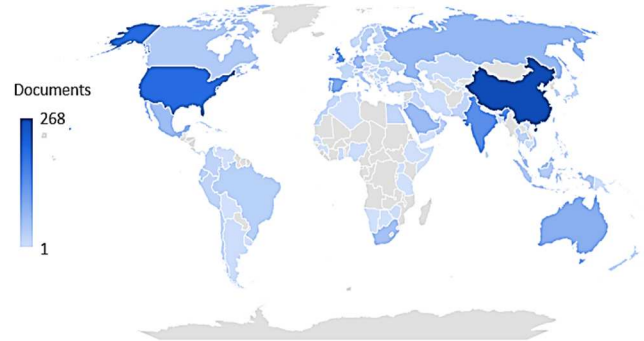


Fig. 1. The number of documents in SCOPUS from 2020 to date containing the words "artificial intelligence" AND "higher education" in the title, abstract, and keywords (n = 2293).

Thus, the objective of this work is to encourage the responsible and ethical implementation of AI by obtaining the opinion of HEI leaders in Latin America on the deployment of AI in HE and a deployment process that contemplates different aspects of the institutions.

II. METHODOLOGY

This work was conducted during the Artificial Intelligence in Education Summit held between January 23 and 25, 2024, at Tecnológico de Monterrey, Monterrey, Mexico. The attendees of the workshop entitled "AI in Higher Education: Implementing and Deploying AI Solutions in HEIs" were invited by e-mail. Nineteen participants attended the workshop.

First, participants were asked to answer a 5-7 min questionnaire about their opinions on AI solutions for HEIs and deployment strategies. A quantitative exploratory methodology was followed. The 7 questions were based on previous work supported by Amazon Web Services (AWS) [see 24], but we focused on AI rather than digital transformation in general. Permission was obtained from The Chronicle to use the questionnaire and its adaptation, focusing on three main areas: 1) The Imperative of AI, 2) Where Colleges Stand on Strategy, and 3) Infusing AI Throughout the Campus.

Participants were presented with informed consent before the survey, which included the questionnaire's objective. They agreed to provide their demographics and responses. Table 1 summarizes demographic characteristics.

TABLE I. DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS (N=19)

Characteristic	Distribution (n)	
Gender	Female	9
	Male	10
Age	20-30	2
	30-40	3
	40-50	5
	50-60	8
	>60	1
Academic studies	Bachelor	4
	Master	10
	Doctorate	5
Type of institution	Private	16
	Public	3
Role at the institution	Coordinator	2
	Dean	1
	Director	9
	Researcher	3
	Assistant Manager	2
Years of experience	Vice provost	2
	1 to 5	9
	6 to 10	5
	11 to 15	3
Discipline	>15	2
	Computational sciences	2
	Economics	1
	Humanities	2
	Engineering	13
	Health	1

Additionally, they were asked about their AI usage, types, frequency, programming skills and languages. The collected data is presented descriptively in Section III.

After the questionnaire, a brief talk about the importance of AI in HE was conducted. Next, participants were organized into groups of academic and IT leaders. The groups were tasked with formulating a strategic blueprint for implementing and deploying AI solutions within a hypothetical HEI: 1) a large HEI with several campuses, 2) an HEI with a small budget, 3) an HEI with more than 50,000 students, and 4) an HEI with Online and face-to-face model.

Participants had to generate an AI deployment strategy for each of these assumptions encompassing key elements such as setting priorities, designing deployment plans, negotiating agreements with third parties, establishing ethical guidelines, formulating security plans, addressing infrastructure requirements, leveraging collective knowledge, and managing data governance, structure, and availability. Subsequently, a general proposal was generated, considering what each team suggested.

As this is a WIP, we only describe the results of the first questionnaire and the general suppositions and highlights for each group. The results of the whole workshop will be published in a future work.

III. RESULTS AND DISCUSSION

Of the workshop attendees, 17 participants said they were AI users. The main software they use can be seen in the following word cloud in Fig. 2A. These participants said they used the tools daily or at least 1 to 4 days a week. On the other hand, 11 participants commented on how to program, mentioning some languages such as those observed in the word cloud in Fig. 2B.

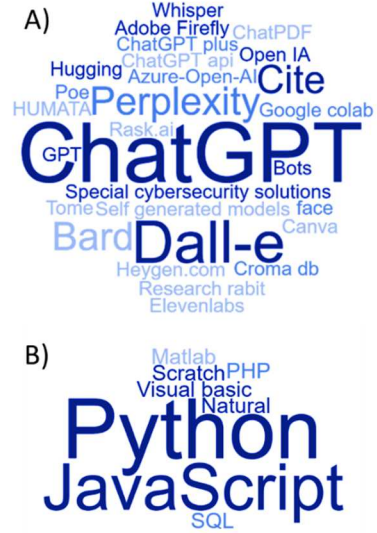


Fig. 2. Word cloud considering the list of A) AI tools used by the study participants and B) programming languages used by the participants. Word clouds are made with the free software <https://www.wordclouds.co.uk/>.

With this background, most participants strongly agree that AI deployment is crucial to the institution's future (see Fig. 3A), considering HE is mostly behind or about the same as the corporate world (see Fig. 3B). Still, they believe their HEI is mostly behind or about the same as other HEIs in AI deployment (Fig. 3 C).

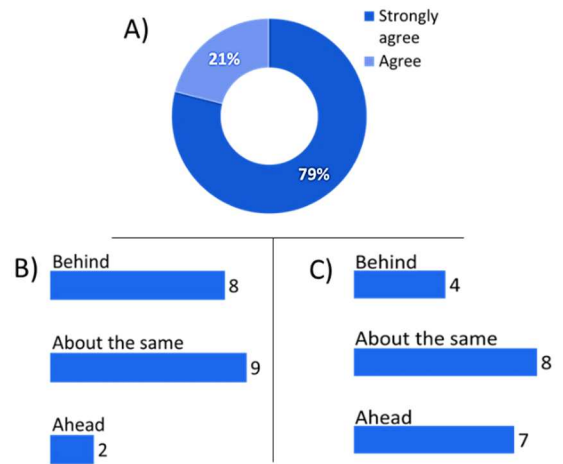


Fig. 3. Number of answers to the questions: A) AI deployment is crucial to my institution's future. B) When it comes to AI deployment, where does higher education stand compared to the corporate world? C) How would you rate where your college or university stands on AI deployment?

Fig. 4A shows the main reasons academic and IT leaders consider obstacles to AI deployment: the lack of strategy, department barriers, training, and reluctance, while the vice provosts or CIO/CTOs are leading the AI deployment (Fig 4B).

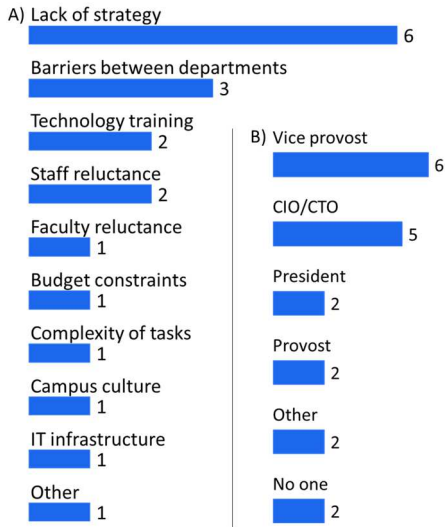


Fig. 4. Number of answers to the questions: A) What is your campus's most significant obstacle to AI deployment? B) Who is leading the AI deployment strategy on your campus?

Finally, participants indicated that improving students' services and educational experience online and in the classroom, as well as increasing operational efficiency and research, are topics of greater importance in AI deployment (Fig. 5A). Also, participants indicated that AI deployment would have a positive impact on research, student retention, academic advising, admission, and recruitment, but no effect on alum affairs, health services, facilities, and housing (Fig. 5B).

These results agree with Holon IQ's AI technology Applications Framework, which identifies four key technologies driving uses of AI in education: Vision, Voice, Language, and Analytics [25]. This study highlights AI's potential to improve learning processes and customer service and the challenges

organizations face in implementing AI initiatives. It also explores the optimism surrounding AI's ability to innovate and improve education efficiency, focusing on personalized learning, assessment, and feedback as key areas where AI is expected to impact significantly [23].

IV. FINAL REMARKS AND FUTURE WORK

Previous works have discussed AI deployment strategies for sociocultural environments, such as those by Pisica et al. [26] who conducted a study on the integration of AI in HE in Romania. The research highlighted the benefits and drawbacks of AI implementation, including psychological and data security concerns. The study also found a lack of strategies for AI deployment in Romanian universities. Wang et al. [27] analyzed 561 questionnaires collected from AI-implemented HEIs in China and found a correlation between HEIs' AI capability and students' creativity and self-efficacy. They recommend optimizing AI resources and utilizing AI to enhance teaching, learning, creativity, and performance. Alotaibi and Alshehri [28] analyzed 55 research works on integrating AI in Saudi Arabia's HEIs for the 2030 Vision for Comprehensive Development. They found that AI is crucial for meeting future learning needs, but improvements in pedagogical practices and professors' skills are needed.

Similarly, our work focuses on some Latin American HEIs. Thus, this work adds to the literature about AI implementation in HE. As observed in the preliminary results, there is potential to provide a strategy for AI deployment. Latin American HEIs want to be competitive with other world universities using AI.

As a path for future studies, it is pertinent to conduct a diagnosis of AI implementations in several Latin American countries that will allow comparisons between countries, identify gaps, learn from previous lessons, and be able to consolidate a mapping of the state of AI implementation in the region. We aim to encourage other researchers to take an interest in doing so from a global perspective.

In the extended version of this document, we will study whether any demographic characteristic is related to the participants' answers. We will also describe the strategies,

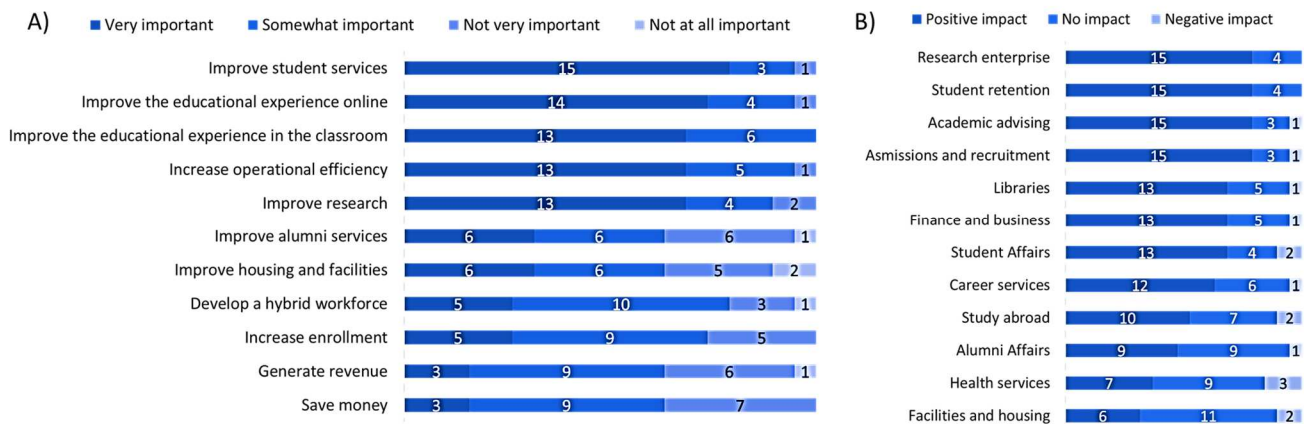


Fig. 5. Answers to the questions: A) Rate the importance of AI deployment at your institution on the following topics. B) At your college or university, rate how AI deployment will impact the following areas.

considering each scenario presented to the participants and the general strategy.

As suggested by the workshop attendants, these kinds of workshops and encounters, as well as faculty capacitation and AI innovative tools development from institutional research, can overcome the obstacles in this work. As future work, we aim to establish a foundation for future collaborations on AI-related education projects among the workshop attendants.

ACKNOWLEDGMENT

The authors would like to acknowledge the financial support of Writing Lab, Institute for the Future of Education, Tecnológico de Monterrey, Mexico, in the production of this work.

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