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Understanding AI Education: The theoretical perspectives in Moroccan University Environment

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Abstract: A common decision for all kinds of universities should be to address the issues posed by the new industrial revolution, strengthen the bonds between industry 4.0 and universities, integrate ICTs into the curriculum, and improve their capacity to serve society through both internal and external synergies. Any advanced economy's progress is significantly influenced by the university. The rapid technical advances of the modern era involve new disruptive processes in the era of globalization and knowledge. To effectively meet the demands and overcome the obstacles of a dynamic environment, it is imperative that we adjust to the ongoing digital revolution.
This article offers a precise and well-articulated perspective on the crucial role of universities in the era of Industry 4.0 and the digital revolution. It highlights the pressing need for academic institutions to integrate information and communication
technologies (ICT) into their educational programs, as well as strengthen their ties with industry to better serve society. The analysis convincingly highlights the importance of contemporary technological advances such as artificial intelligence and blockchain, and recommends their integration into the Moroccan university system to improve its efficiency and relevance in a rapidly changing world.

Keywords: Artificial intelligence, Moroccan universities, industry 4.0,AI-Education.

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1) Introduction

The global phenomenon known as artificial intelligence (AI) is redefining the limits of innovation, technology, and economic advancement. As artificial intelligence continues to enter many areas of the global economy, countries are competing to develop a highly competent workforce in AI in order to stay competitive in the always changing market. Morocco is attempting to mold its AI education infrastructure to satisfy the needs of the contemporary world as it stands at the intersection of this revolutionary journey.

Countries including the United States, China, and several European countries have made significant investments in AI research and education, demonstrating the global competition for AI supremacy. An environment that is conducive to AI innovation is created by the dynamic global AI ecosystem, which is characterized by partnerships between industry, academia, and policymakers.

Furthermore, the importance of AI education has been acknowledged by Morocco, a country with a booming economy and IT sector. Universities in Morocco have started offering AI courses and programs. However, they have particular difficulties in developing and expanding AI education to satisfy industry and student needs.

In order to answer the following research question, this article sets out to investigate the state of AI teaching at Moroccan universities. **How can Morocco develop a strong ecosystem for AI education, navigate the global AI scene with ease, and give its students the tools they need to succeed in AI-driven fields?**

The fourth industrial revolution (IR 4.0) According to Schwab (2016), the transition between the physical, digital, and biological domains is occurring during the fourth industrial revolution (4th IR).

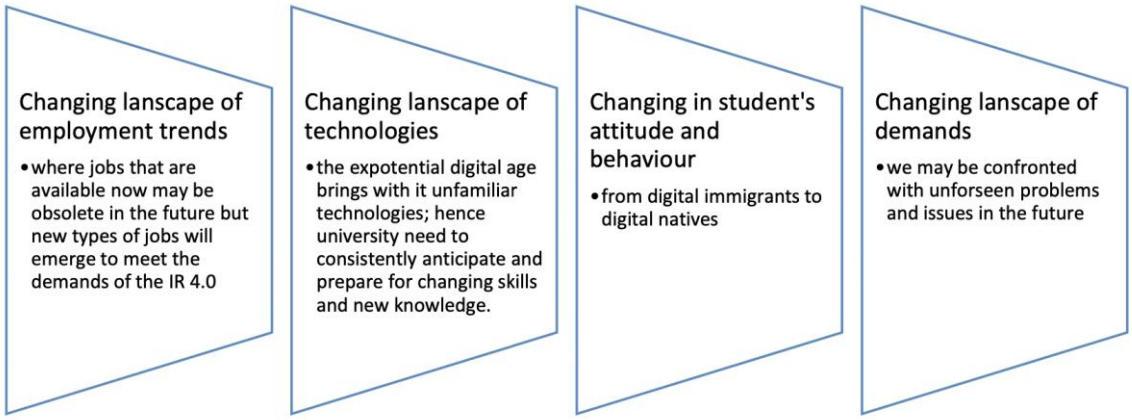
Our lifestyle, job, and interpersonal interactions have all changed as a result of each IR. In this dynamic climate, both managers and employees [1]must quickly adjust. It is imperative that they remain receptive and ready to embrace novel approaches, acknowledging the inevitable nature of risk and innovation. Organizations without the necessary expertise and without the ability to refresh themselves cannot compete in this dynamic environment. It is the responsibility of managers to run the company so that long-term employee transformation in vision, ideas, and attitudes occurs. Understanding how to apply knowledge management (KM) concepts to improve system and process performance is essential for organizations that view KM as a strategy.

Moreover, the introduction of IR 4.0 changed the face of educational technology. The new educational model for the future has been established in response to the rapid changes in knowledge.

This paper offers an enlightened view on the central role of universities in the face of the current industrial revolution, (Figure 1) highlighting the need to rethink educational methods to adapt to the era of digitalization. The recommendation to integrate emerging technologies such as artificial intelligence, blockchain and chatbots in Moroccan universities to address the challenges of efficiency and technological progress demonstrates insightful analysis and relevant suggestions to align the university system with contemporary needs.

[1] Shahroom, A. A., & Hussin, N. (2018). Industrial revolution 4.0 and education. *International Journal of Academic Research in Business and Social Sciences*, *8*(9), 314-319.

Figure 1: The need for AI education to meet industry demands (Source: Shahroom, A. A., & Hussin, N. (2018). Industrial revolution 4.0 and education)



2) Methods:

To explore the implications of AI education and emerging digital technologies, our research employed a systematic, criteria-based methodology. Primary data sources included academic literature, case studies, policy documents, and regulatory frameworks. The following methodological steps outline our comprehensive approach:

We initiated our investigation with an extensive literature search, utilizing databases such as the IEEE Xplore digital library, Web of Science, Scopus, and Google Scholar. Keywords like "AI education," "university 4.0," and "chatbots in educational systems" guided our search. The exploration, not constrained by a specific timeframe, aimed to capture the evolving history of these concepts. Emphasizing relevance, we prioritized recent publications. Titles, abstracts, and keywords guided our initial selection, with full-text publications being downloaded and thoroughly examined.

Employing a criteria-based approach, we sought case studies providing significant insights into the digitalization of universities University 4.0, and (AI) technologies, including their implementation and effects. Diverse sources, including scholarly publications, research institution papers, grey literature, and internet databases dedicated to AI education, contributed to our case study selection.

3) University 1.0 to university 4.0 Transition:

In any developed economy, universities have played, and must continue to play, a crucial role in the growth of innovation. It is, after all, the natural setting for the advancement and development of knowledge, and as such, society must absorb it. The dynamic environment in which the university works is defined by globalization, new procedures and, as a result, new working techniques, as well as quick technical advancements.

Furthermore, it is imperative to adjust to the changing times in this ongoing struggle, especially highlighting the need of resilience and change adaptation in the academic setting. The organization's ability to adapt quickly in the present is no longer enough; we also need to be able to predict the next phase of development, for which we must always be on the lookout and in constant reflection[2]. Although the University has already opened its doors to the digital world, there is still more work to be done, and this attentiveness appears to be based on that

[2] Tamer, H., & Knidiri, Z. (2023). University 4.0: Digital Transformation of Higher Education Evolution and Stakes in Morocco. *American Journal of Smart Technology and Solutions*, *2*(1), 20-28.

ambition. In the global context, the phrase "4.0" refers to the disruptive era that is reshaping the globe and, when applied to any area, signifies a dedication to the digital sphere, the digitization of processes, or what is known as "digital transformation."

Besides, the internet of things (IOT) is a developing technology that connects digital objects and devices to one other so that they can communicate without being limited by time or space. Millions of people use the internet on a daily basis throughout the world. Unlike previous industrial revolutions, which mostly affected manual labor, the one we are currently witnessing will have an impact on intellectually demanding employment in the twenty-first century. This is the fourth Industrial Revolution, the fusion of technologies revolution. Developments in robotics and artificial intelligence, along with the gathering and processing of vast amounts of data, or Big Data, have affected and will continue to affect the economy and, consequently, the qualifications required for jobs in all productive sectors. Similar to other industries, the digital revolution calls for universities and other higher education institutions to concentrate their development on the use of technology (Tamer, 2022).

According to Dewar (2017), a 4.0 university is one that is other-focused, primarily focused on serving students, engaged with the outside world, and connected to the surrounding productive environment. This definition pertains to the university's interconnectivity with other ecosystems. In particular, in order to make sense of the progression until version 4.0, Barnett (2014) breaks down the development of higher education into distinct phases. University 1.0, for example, would be the university that emerged during the medieval era (the main European universities date back to the 11th century), strongly influenced by spiritual and religious beliefs, and evolving toward a liberal arts education. The second iteration, Version 2.0, is more concentrated on the utilization of university research as a catalyst for technological advancement directed toward economic growth in post-industrial nations. It would be consistent with the universities established starting in the fifteenth century, whose curricula were progressively more accepting of diverse points of view. Version 3.0, which emerged a few centuries later, is referred to as the entrepreneurial university. Barnett (2014) defined it as a university that exists for its own sake, serving a variety of communities and functions, but above all, focusing on maximizing its own interests or strategy in an increasingly cutthroat environment. According to Pulido (2019), this University 3.0 is also characterized as a sophisticated and social organization that emerged in 19th-century Europe, fusing institutional autonomy and self-governance with the teaching and research functions.

According to Dewar (2017), university 4.0 will offer on-demand instruction in a variety of formats, with ongoing transfer between various modalities and closer cooperation between academic institutions and the digitally transformed production fabric. According to Pulido (2019), university 4.0 in this context refers to a university that experiences such disruptive change that it needs to reinvent itself in terms of organization, technology, and educational research strategy in order to meet the demands of a society that has undergone significant evolution. In fact, digital technologies are bringing about a new kind of organization, digital transformation, and a host of unpredictably changing developments that provide a variety of new issues. Therefore, University 4.0 is what modern universities are like—a transformation of earlier iterations in a rapidly advancing technical environment in the digital age that has to meet the needs and obligations of a globalized society.

4) The use of chatbots in the educational system:

Many scholars have created frameworks and prototypes to improve the learning-teaching process for the benefit of students, instructors, and administrative personnel. For example, using e-tutors can relieve human tutors of certain responsibilities like additional training or

reinforcement; as a result, teachers can use their extra time to do research or improve their methods of instruction (Quiroga Pérez, Daradoumis & Puig, 2020).
According to Colace et al. (2018), from the perspective of the student, chatbots for e-learning can offer a personalized learning experience in which the e-tutor adjusts the learning pace to each student without being forceful, pays individual attention to each student while also enhancing engagement and interaction through the assignment of projects and group work as well as the regular reminders and notifications. From an administrative perspective, chatbots can be utilized as either instructional agents or service assistants, according to (Quiroga Pérez, Daradoumis, and Puig (2020). While managing the library and answering frequently asked questions, service assistants can also assist with any administrative duties related to the registration and admissions process. Conversely, learning agents, such NerdyBot, AutoTutor, StudyBuddy, Chatbot, Confucius, and Duolingo, are used to produce knowledge on a particular subject for individual pupils, just like a human tutor would. However, there are a few drawbacks to both service-oriented and instructional chatbots, such as nascent technology, user ennui, and a deceptive sense of anonymity (Quiroga Pérez, Daradoumis & Puig, 2020).
In the fields of higher education in Morocco, the IA has created new opportunities and motivating challenges. She has offered enormous opportunities to strengthen governance fundamentally with increased effectiveness and efficiency (Nasrallah 2014). Within the framework of the implementation of AI applications in higher education in Morocco, we can understand AI as computer systems that can engage in human-like processes such as learning, adaptation, synthesis, correction, and utilization of various data required to handle complex applications. It is therefore essential to use AI in higher education since it should be very helpful to researchers, teachers, administrators, and students (Menon et al., 2014; Stefan et Sharon, 2017). Therefore, it is necessary to encourage the parties involved to use this cutting-edge technology, which should enable global advancements in the higher education system in Morocco. The governments in question want to raise the standard of education in all developed and developing nations. Adopting a contemporary technology like IA can help achieve this goal (Cremer et Bettignies 2013).
The value of artificial intelligence (AI) education is becoming more widely acknowledged in Moroccan universities. To satisfy the growing need for AI expertise, numerous colleges around the nation have begun to offer AI courses and programs. These programs frequently feature stand-alone courses covering a broad range of AI topics in addition to undergraduate and graduate degrees. Nevertheless, each university may have different requirements for these programs and different availability of them. When considering an AI education, professionals and students should research the programs offered by various colleges and select the one that most closely fits their interests and career objectives.

5) Challenges of incorporating AI into educational systems

There are various obstacles to integrating AI into Moroccan educational institutions, as the following issues address:

- **Digital infrastructure**: Morocco still has[3] difficulties with regard to its digital infrastructure, despite the country having made great progress in incorporating technology into its educational system. Moroccan attempts to establish a digital ecosystem that can safeguard its educational sovereignty are still confronted with obstacles, according to a ResearchGate article.

[3] ResearchGate: "Educational Sovereignty and Artificial Intelligence Challenges: The Case of Morocco

- **Agility of industries**: Not every [4]Moroccan industry is as developed as others to use AI technology. The nation is currently at the "Data Engineering" stage, with businesses focusing on digitizing, accessing, collecting, and analyzing data. This is the phase that comes before an AI system is put into use.
- **Lack of knowledge**: The development and implementation of AI-based educational systems is challenging[5] in Morocco due to a lack of AI specialists.
- **Language obstacles:** Natural language processing skills are necessary for AI-based educational systems, but this can be difficult [6]in a bilingual nation like Morocco.
- **Costs:** Creating and deploying AI-based educational programs can be costly, which presents a problem for developing nations like Morocco.

Notwithstanding these obstacles, AI has the power to completely transform Moroccan education. Personalized learning and adaptive teaching are two features that AI-based systems can offer to enhance learning results.

By building the first artificial intelligence school in Africa, the Euromed School of Digital Engineering and Artificial Intelligence (EIDIA) at the Euromed University of Fez (UEMF), Morocco has already taken strides toward integrating AI into its educational system.

But until AI is completely incorporated into Morocco's educational system, there is still more work to be done.

Consequently, while incorporating AI into their educational systems and realizing the promise of big data and learning analytics, responding national policies must take the following factors into account:

To promote fairness and inclusivity, give educational establishments and students access to digital infrastructure.

Aim to eradicate prejudice from algorithms and shield students from discrimination on the basis of gender, color, ethnicity, or socioeconomic class by regulating AI with accountability and transparency.

6) Discussions and Recommendations for implementing Artificial intelligence:

The implementation of artificial intelligence[7] (AI) in Moroccan institutions has the potential to transform learning and advance the nation's economy. A number of suggestions and actions have been put forth in an attempt to accomplish this goal:

- putting in place initiatives that allow renowned AI specialists and researchers to speak at workshops and talks at Moroccan institutions;
- Revolutionizing STEM education by introducing kids to cutting-edge technology like robotics and AI;
- Using ChatGPT and other AI tools to digitize education in Morocco in order to stay up to date with educational innovations;
- Working together between government agencies and academic institutions to advance AI, cultivate AI talent, bolster research and development, and encourage AI innovation;

Besides, a determined attempt has been made to use AI at Moroccan universities, as evidenced by these suggestions and programs, which could improve learning research, and economic development.

[4] ScienceDirect: "E-learning experience during COVID-19 pandemic management: Perception of secondary schools teachers' in Morocco

[5] Indeed.com. "References Available Upon Request: Is It Needed on a Resume

[6] Advoc: "Morocco: Artificial Intelligence in the Moroccan legal framework

[7] Unlocking the Future of Education in Morocco: How AI Could Revolutionize Learning

Moroccan institutions can help the nation's technological growth and educate students for the future labor market by embracing AI.
Otherwise, it is not simple to establish flipped classrooms[8] and virtual universities that support the ongoing development of the remote learning infrastructure.

- Rethink the university to set up a complete system of distance education in terms of planning, management, and evaluation for all cycles of higher education";
- Equipment and installation of IT infrastructure in each university establishment and provide it with a recording studio without forgetting the serious collaboration with specialists in the field"; "Technical and administrative support for the proper functioning of this teaching method";
- "Need to develop a new teaching-learning model based on an innovative, intelligent, and motivating digital pedagogy"; "Partnership with international platforms and cooperation with the media sector to improve educational scripting";
- "Technological means available to the service of the student linked to the distribution of equipment (laptop) and to the free internet connection of good speed for equal access to distance education"; and "Adopt a hybrid approach adapted to the context through the utilization of best practices and the inspiration of globally recognized models in the field"
- Implement robust safeguards for educational data to avoid misuse; anonymize data so that students cannot be connected to it; encrypt data to prevent analyst interpretation.

7) Conclusion

Morocco is attempting to establish a position for itself in the global artificial intelligence ecosystem, which is a dynamic and ever-evolving field. It is clear that the country is committed to developing AI talent and understands the revolutionary value of AI education. However, as this article has shown, Morocco has its own special chances as well as problems in this endeavor.
But there are challenges in store along the way. Proactive action is required to address issues including scarce resources, a lack of certified teachers, and the lack of standardized programs. Morocco must undertake calculated infrastructure investments, recruit and train AI specialists, and seek to create internationally acknowledged AI educational standards if it is to prosper in the global AI arena.
Modern schooling has a wide range of environments. According to Aladyshkin et al. (2020) and Karpov (2013), higher education institutions are currently evolving into institutionally complex structures that coordinate learning with the organizations of many professional areas of society and digital transformation.
In social terms the higher education sector is the most crucial and economically significant component of this framework. Scientific institutes, high-tech businesses, creative enterprises, industrial consortia, and innovative growth institutes make up its institutional foundation, which is what gave rise to university 4.0 (Aladyshkin, et al., 2020). Ecosystems turn into the places where favorable circumstances are generated for the effective transmission of technologies as well as for the advancement of science and technology. University 4.0 establishes the foundation for national economies to be globally competitive, and its ecosystem creates new,

[8] Bachisse, M., & Mouline, B. (2022). Assessment of distance learning in Moroccan Higher Education A systematic review of evidence. *Journal Of Social Science and Organization Management*, *3*(2), 184-191.

quickly expanding sectors, attractive technology marketplaces, and administratively and territorially advanced spaces with an advanced economy.

8) Limits of the research:

Given the theoretical overview's lack of specific empirical research, it's critical to recognize the study's inherent limitations. Here are some important restrictions to think about:

Absence of Empirical Data: The study lacks case studies and empirical data, instead relying on a theoretical overview. Consequently, the results are dependent on the body of current knowledge and could not represent the most recent or particular conditions in Moroccan universities.

Bias and Assumptions: Because the study is based on previously published research and knowledge, it is possible that some biases or assumptions have been included, which could affect the results. It's critical to recognize any potential gaps in the information provided by the sources.

External Factors: The overview might not take into consideration outside variables that could affect Morocco's AI education, such as shifts in international events, economic situations, or governmental policy.

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