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Toward the 4th-generation Universities (4.0): the new challenge of Algerian Universities

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Abstract:

This research paper examines the concept of the university 4.0 as an integrated framework for linking Education, Research, and Innovation with the broader community and industry in Algeria. It aims to assess the readiness of Algeria's Higher Education and Scientific Research (HESR) sector to transition to this model, while identifying the associated requirements, challenges, and opportunities. According institutional theory; analyze how the National Plan addresses organizational barriers to digital transformation while aligning with global trends in Mission-Driven Education and Research.

The study employs a conceptual and analytical review based on the classification of university generations, the compilation of national indicators, a description of digital and on-the-ground initiatives at Algerian Universities (AU), and a critical analysis of barriers and resources, categorizing these aspects into organizational, digital, leadership, methodological, sustainability, and international dimensions. National data on the readiness of 117 universities was used, highlighting 24 institutions identified as having achieved initial readiness. The research paper also detailed digital initiatives (Moodle platforms, RFID cards, and E- Payments), incubator programs and innovation centers, and curricular shifts toward interdisciplinary and adaptive competencies. The study concluded that Algeria has possesses of elements and momentum needed to move toward Industry 4.0. However, there are significant structural obstacles: However, the success of the transition requires addressing financial and structural constraints and developing effective governance and partnerships.

Keywords University 4.0; Algerian Higher Education and Scientific Research (HESR) sector; Algerian Universities (AU).

Jel Classification Codes: I23; I21; I28; I25; O33.

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1. INTRODUCTION

Nowadays, Generation is a term that refers to the conceptual framework that describes the evolution of the roles and functions of universities in society. Each generation, from the first to the fourth, represents a shift in interests and priorities, from a focus on teaching to a more complex integration of learning, research, and eco-societal impact. The emerging conception "4th generation university" or also known as "university 4.0" describes university deeply integrated into its local and global environment, and combining traditional learning with the contemporary vision of the new university 4.0 model. It extends beyond traditional teaching to institutional tasks that also includes research, innovation, and

entrepreneurship. Its focused also, on social and economic impact, and sustainable development.

Today, any university outside this framework is a university that does not keep pace with the developments and changes occurring in the educational environment and its quality globally. The HESR sector in Algeria has made significant developments in recent years, including the regulatory environment for human resources and employment, laws and legislation governing higher education, and the expansion of various types of university structures and institutions, including universities, national schools, and higher schools for various disciplines, including Artificial Intelligence school (AI).

The main question here is How ready are Algerian universities to integrate into the university 4.0 model today? Or What are the challenges facing AU today as they engage in the university 4.0 model؟

Two questions arise from the main issue. The first one; what is the university 4.0 model, and what are its defining characteristics and foundational requirements? and the second; How is the Algerian HESR sector positioning itself in the transition toward the university 4.0 model? Answering the above questions requires discussing the following: Reading into the concept of university 4.0, and Requirements for establishing University 4.0 in first, Key Aspects of Algerian HESR sectors to Transition to a university 4.0. Challenges and opportunities of university 4.0 in AU.

2. Methodology

The research adopts a descriptive and analytical case study framework to evaluate the structural transformation of the Algerian HESR sector. The study utilizes to achieve the main goal for it. the data collected of various sources, when we were use books; sites; articles…etc in the conceptional section. the second section focused on qualitative nature of collected and analyzed data. Primary source of the collected data of 117-university census on Ministry database National Higher Education and Research available on official website. For the 2024–2025 period, when emerging the digitalizing notion at AU, where the legislative environment developed and enact laws that frame this aspect, an environment conducive to the presence of business incubators (BI) and entrepreneurship houses (EH) since 2019. From this cohort, 24 pilot universities and colleges were purposively selected by the National Committee (established under Decree No.40, dated January 19, 2025) to undergo the initial experiment in university 4.0 integration. The universities selected as a pilot program within the framework of reforms in the Higher Education Sector (HES) Based on its readiness for digital transformation, its ability to integrate technology, and its capacity to leverage scientific research to serve the knowledge economy, entrepreneurship. Also, have made progress on key indicators focused on integrating digitalization and modern technologies into education and scientific research, keeping pace with contemporary demands and enhancing the quality of education. and enhancing partnerships with industry and the community. According; The evaluation framework utilizes institutional theory to analyze how the National Plan addresses organizational barriers to digital transformation while aligning with global trends in mission-driven education and research.

3. The University 4.0 Model: Defining Characteristics

3.1. Conceptual Framework

Universities have undergone significant changes over different periods of time called generations. The transition from the traditional role of the university witnessed in the first generation to a new - higher - generation has been characterized by many developments at many levels (Table 1). In addition, the university's mission and organization are changing profoundly. From first-generation universities whose institutions are focused on education and based on a fully government-funded science, to the second generation — added research to education. The third-generation university discovered of adding value to teaching and research as a concept describing a university that has become a more active participant in value creation and knowledge transfer processes (Wiseema.J.G, 2009), to today's emerging concept of university 4.0, based on global universities fully integrated into their local innovation ecosystem to address global societal challenges and drive regional economic growth (Tucker, 2024). What has changed is the shift from knowledge transfer to enabling value creation in the broader innovation ecosystem. While knowledge transfer means that the university generates value and "transfers" it to the private or public sector, the role of value creation in the ecosystem is based on mission-driven collaborative knowledge creation, open innovation and multi-stakeholder partnerships within a regional innovation ecosystem. The value-driven university is called a university 4.0 (Elsevier, 2024).

The report "Towards the 4th generation university" by Elsevier and TU Eindhoven, defines a university 4.0 is actively engaged in co-creation processes with industry and government. bodies and civil society, fostering vibrant local innovation through trusted partnerships to foster vibrant local innovation. ecosystems. It is a global university that It embraces open innovation and is embedded in the local innovation ecosystem, with the aim of tackle societal challenges and catalyze regional economic growth (Elsevier, 2024).

3.2- Foundational Requirements (Education, Research, and Governance)

Generally; It was divided into groups. The first named General Requirements, when universities 4.0 should clearly show their contributions to society and work closely with industry and the public sector. They emphasize regional partnerships while being part of the global scientific community. Research must drive collaboration, allowing universities to remain independent yet lead innovation without merely following industry trends. These universities should look beyond technology to address broader social impacts. Their characteristics can vary based on local innovation ecosystems, including size and research development. To assess performance, a mix of qualitative and quantitative indicators is needed. Policymakers should involve all stakeholders, including regions, cities, industry, universities, and society (Pringle David, 2024, p3). And the second Specific Requirements; who's define by four aspects. in first we find "Teaching 4.0" focuses on innovative learning methods that make education more global, personalized, and accessible, adapting to the needs of future jobs. It shifts from

traditional teacher-centered approaches to student-centered ones, emphasizing online, flexible, and practical learning experiences. The second is "Research 4.0" aims to create an entrepreneurial university that bridges gaps between various fields, promoting transdisciplinary collaboration. This approach fosters skills and innovation, driving start-ups and new market opportunities while facilitating knowledge transfer for economic and social growth. Third is "Governance 4.0" emphasizes financial autonomy for universities, encouraging efficient resource management and strategic planning. This governance model ensures accountability, continuous improvement, and a culture of innovation while supporting staff development and academic integrity. And finally; "Industry'4.0' and Smart University" highlight the integration of digital technologies, creating a connected campus that enhances learning and collaboration. Digital learning processes and tools enhance the educational experience, encouraging a more engaging environment (Abdellatif Miraoui, 2025).

Table (1): Comparison between the four generations of universities (GUs)

	1st G	**2nd GU**	**3rd GU**	**4th GU**
Goal	Education	Education and research	Education, research and knowledge transfer	Mission-driven (challenge-based) education, research &valorisation
Role	Protection of truth	The cognition of nature	Creating economic value	Creating social value
Method	Stochastic	Monodisciplinary science	Interdisciplinary science	Transdisciplinary science & multi-actor innovation
Language	Latin	National	English	Multiple languages (native and English)
Infrastructure	Classroom and Libraries	Classroom, libraries, and laboratories	Classrooms, libraries, laboratories, business incubators, technology parks, design offices, and special platforms for communicating with the community.	Classrooms, libraries, laboratories, business incubators, technology parks, design offices, special platforms for communicating with the outside community, and telecommunications

				infrastructure.
Managemen t	Chancellor	Part-time scientists	Professional management	Professional management and local experts
Human capital development (outputs)	Professionals	Professionals & scientists	Professionals, scientists & entrepreneurs	Professionals, scientists, entrepreneurs & ecosystem participants (incl. artists, customers, etc)
Orientation	Universal	National	Worldwide	Ecosystem
Organization	Colleges	Faculties	Institutes & Centers	Innovation spaces
Interaction with the environment	Isolated	Local community	Industrial partnerships	Integrated with global & local ecosystems
Technology integration	Minimum	Basic	Systemic and integrated with digital tools	Advanced (digital) technology and AI integration
Financing model	Religious and royal funding	Government support	Public-private partnerships	Various fields including entrepreneurial initiatives
Partnerships	None	Other academics	Industry	Industry, NGOs, communities governments
Stakeholder involvement	Closed	Limited	Active	Very active with feedback loops

Source: (wissemaj.g. , 2009, p. 23)

4. Signs of transition in the AHESR sector

One of the requirements of the contemporary AU is to steer the HES at a steady pace, moving it from a traditional, static model to a more sophisticated and dynamic model to universities 4.0, in line with global trends in innovation, digital transformation, and socio-economic development. This transformation is a strategic step that is more than important today to modernize universities, in line with the accelerated technological developments and the growing and changing needs of the labor market. In 2025, 117 universities of higher education in Algeria, of which only 24 universities and higher schools meet the requirements for integration into the university 4.0 model as the first experiment in Algeria. (AMHE Scientific Research, 2025). those are as follows:

- University of Setif 1
- University of M'sila
- University of Constantine 1
- University of Annaba
- National Polytechnic School Constantine
- University of El Oued
- University of Algiers 1
- Higher School of Automated Media Bejaia
- University of Houari Boumediene Bab-Zouar
- University of Blida 1
- High School of Automated Media Algeria
- University of Algiers 3
- National Higher School of Mathematics - Scientific and Technological Pole Abdelhafid Ahdadan
- National High School of Artificial Intelligence Scientific and Technological Pole Abdelhafid Ahdadan
- University of Bejaia
- University of Science and Technology
- University of Saida
- University of Tlemcen
- National Polytechnic Oran
- High School of Automated Media Sidi Bel Abbes
- University of Sidi Bel Abbes
- University of Oran
- National Polytechnic School Algiers
- Polytechnic for Architecture and Urbanism EPAU

4.1- Key Aspects of AHESR sector to Transition to a university 4.0

The AHESR sector's vision to integrate into a university 4.0 included the following aspects:

4.1.1. Regulatory aspects: The most important of which is the establishment of the National Committee to follow up and accompany higher education institutions in the transition to university 4.0, Decree No. 40 dated January 19, 2025. Establishing a national committee to accompany and follow up higher education (HE) institutions for the transition to a university 4.0 (AMHE Scientific Research, 2025, p105), Its tasks include the following:

- Develop a strategy to ensure adaptation to new challenges and opportunities presented by technological and scientific development in HE
- Develop a national plan to transition to university 4.0, taking into account the local context, national priorities and global trends;
- Follow up on the implementation of projects and programs related to the transformation of a university 4.0;
- The committee accompanies university institutions to address organizational

barriers to digital transformation;
- The committee organizes sensitization and information sessions on the importance of becoming a university 4.0;
- The committee encourages university institutions to include technological divisions, support entrepreneurship, and draw on the humanities and social sciences to accompany and understand transformations in society.

4.1.2. Digital aspects

Smart & Digital Transformation is a major step for the HES, including the digitization of the HES and institutions for the second year in a row 2024-2025.All stages of university registration were digitized through digital platforms. There are 69 digital platforms covering all aspects of pedagogy, governance, and university services until May 2025. The digital platforms are part of the implementation of the digital master plan adopted by the ministry, which consists of 7 strategic axes, 16 strategic programs and 102 operational programs. The most important of them:

- Progress platform for multi-using: a digital platform or tool that the Ministry of HE has mobilized, the purpose of which is to improve services for the benefit of the university family for employes, professors and students (Registration, Scores and Orders…etc.).
- **RFID**: University ID card, student cards for multi-purpose: This card is distinguished by combining several essential functions in one electronic card, such as transportation services, dining, accommodation, and access to the university and educational facilities
- Acceptance of the E-Payment service by using the gold cards (for its self or any person have it) instead of traditional queues reduced time and effort and facilitated the process of paying registration dues.
- Activate the student's university E-Mail service.
- Adoption of E-Learning Platforms by using Moodle Platform, AI (by create Artificial Intelligence House)
- Developing smart campuses such as creating a National Higher School of Artificial Intelligence (sidi Abdellah), and developing the already existing list that has adopted university 4.0.
- In 2025, Create one Digital Business Incubator (DBI): is an initiative of the MHESR in Algeria that aims to empower emerging institutions and BIs as well as encourage innovation. The digital incubator provides full support to the project, from idea incubation to market entry, local and international expertise. It plays an effective role in contributing to fostering a culture of innovation by building a diversified knowledge economy (Digital Business Incubator, 2025).
- Increased focus on developing digital skills and remote learning infrastructure, including sector employees, workers and professors and students through specialized, limited-term, paid, and sometimes low-cost training courses, internally and externally.

4.1.3. Entrepreneurship and Innovation aspects

- **Strengthening partnerships between universities and the business sector** (academia, industry, and government) in a triple relationship to achieve the overall and larger goal of economic, social, sustainability, and governance.
- **Support for startups and incubators within universities:**107 incubators (Anvredet, 2025), and one digital business incubator across higher education institutions.in addition, to 107 centers to develop innovation, 91 technology and innovation support centers, and 51 AIHs and 33 manufacturing laboratories, in addition to registering 11800 innovative projects and 500 projects Labeled an innovative project with 5000 registered projects to establish businesses 4200 projects registered on the Startup DZ platform and 1700 patent applications and invention.(AMHE Scientific Research, 2024).1963 Patent Applications, 154 Incubated Projects, 84 Entrepreneurship Centers (MHESR, 2025).
- **Emphasis on research commercialization and patent development**.

4.1.4. Interdisciplinaire & Adaptive Curricula aspects

- Moving from rigid programs to flexible, competency-based education.
- Integration of emerging fields (AI, renewable energy, biotechnology).
- Focus on soft skills (critical thinking, creativity, leadership).

4.1.5. Sustainability & Societal Impact aspects

- Research focused on sustainable development goals (SDGs).
- Green campuses with renewable energy and Eco-Friendly infrastructure.
- Community engagement and solving local/regional challenges.

4.1.6. Internationalisation & Collaboration aspects

- Increased partnerships with foreign universities and research centers.
- Attracting international students and faculty through exchange programs: On April 8,2025 the MHESR launched the digital platform "Study in Algeria" (MHESR, 2025) for the admission of foreign students to Algerian higher education and training institutions, at their own expense, Or within the framework of international cooperation and exchange, 2907 Foreign students from Palestine, MALI, SADR, MAURITANIA, 2762 African Students; 2660 Arab Students; 56 Students from Asia. (MHESR statistics, 2025)
- **Participation in global rankings and accreditation systems**: According the international classification, «US News Raking "2025-2026 version, Six Algerian universities entered the classification, including three universities that adopted the university 4.0 model in year 2025.Where the university of Sidi Bel Abbes ranked the first, University of Setif1 ranked the second and University of Annaba ranked the third. (US News, 2025). The classification was based on four main criteria: academic reputation (25%), production Research (15%), research impact (50%), and international orientation (10%). It is also required that Universities are ranked among the top 250 universities in the global reputation survey or publish 1250 Research paper published between 2019 and 2023 in the Web of Science database.

4.2. Critical Analysis: Challenges and opportunities of university 4.0 in AU

In general, a comprehensive and accurate diagnosis facilitates and accelerates the transition to university 4.0 by utilizing a SWOT analysis of both the internal and external environments. In the internal environment, strengths are identified and reinforced, while weaknesses are addressed or mitigated; in the external environment, this is done by identifying opportunities to be optimally leveraged and identifying threats to be avoided and eliminated. The most significant of these challenges can be summarized as follows:

- **Infrastructure and Funding:** Requires significant investment in digital and research facilities (using BIG DATA for education, AI, IoT…).
- **Faculty Training (The Digital Literacy Gap):** Need for upskilling professors in new technologies and teaching methods and Development of smart campuses with IoT; AI integration. Also, Increased focus on digital skills and remote learning infrastructure "Education 4.0"
- **Regulatory Reforms and Bureaucratic Resistance:** Adapting legal frameworks to support innovation and entrepreneurship. While Decree No. 40 provides a legal basis, the transition from a "static" to an "entrepreneurial" model requires deeper regulatory reforms to support financial autonomy and patent commercialization.
- **Industry Linkages:** Despite the significant quantitative achievements reflected in official data. In specifically; Despite the high number of patents, the lack of venture capital and weak ties with the private sector prevent many incubated projects from reaching the market. this requires strengthening ties between universities and the private sector. The transition toward university 4.0 in Algeria faces deep-seated structural challenges that could limited its effectiveness. This contradiction is evident in five key areas:

Table (2): Comparison some of Quantitative Achievements and Qualitative Obstacles

Axis	Quantitative indicators (2024/2025)	Specific structural barriers
Digital Transformation	• 69 digital platforms covering pedagogy, governance, and services. • 7 strategic pillars outlined in the Digital Master Plan • Platforms such RFID, and Electronic Payment systems	• Digital competence gaps: Resistance to change, particularly among older professors, who demonstrate varying levels of proficiency in using modern technologies (such as Moodle and other learning platforms) • Bureaucracy: Slow integration between new platforms and legacy enterprise systems
Entrepreneurship & leadership and Innovation	• 107 business incubators • 107 innovation support centers	• Funding barriers: A lack of venture capital and affordable financing mechanisms for commercializing inventions, as most investments are focused solely on the incubation phase rather than on growth or market entry. Despite the establishment of

	• 11800 innovative projects and 5000 startup projects • 1963 patent applications	industrial branch institutions within universities and the listing of a few of them (no more than two) on the stock exchange for the first time, this remains a small step in a sector as large as higher education. • The disconnect between academia and industry: A conservative corporate culture in which local companies do not view universities as a source of R&D
Curriculum	• Introducing emerging fields such as AI, Renewable Energy, Data Analysis, Network Security, Cybersecurity, etc • Focus on soft skills	• Institutional rigidity: resistance to changing traditional academic structures (such as the separation of the social and humanities and technical sciences into distinct colleges), which hinders interdisciplinary teaching • Inadequate training infrastructure: The lack of practical resources needed to develop skills such as artificial intelligence in most universities outside the capital (such as state-of-the-art departmental labs)
Sustainability and Social Impact	• Establish the National School of Artificial Intelligence • Policies supporting International Sustainable Development Goals at the MHESR	• Implementation gap: The weak link between research and actual community services on the ground, such as innovative applications of renewable energy in underserved rural areas • An underdeveloped green economy: The lack of incentives needed to implement "environmentally friendly" technologies on campus is exacerbated by the weakness of the national renewable energy infrastructure. which is still considered an emerging sector of the national economy
International Cooperation	• 2907 international students from various countries; Arab and foreign. • Launch of the "Study in Algeria" platform to attract international students	• The formal nature: reflects the gap between the number of announced partnerships (such as memorandums of understanding) and the depth of actual collaboration in joint research or reel academic exchange programs. • Cultural infrastructure: Challenges such as a shortage of qualified translators and English-speaking faculty make it difficult to attract international students, particularly those from outside the Arab world

Source: By Researchers

Quantitative achievements do not reflect the reality on the ground, figures such as hundreds of business incubators and thousands of projects may be in terms of policies, it is measurable, but they do not necessarily reflect the vitality of the entrepreneurial ecosystem. These initiatives are often concentrated in major cities, failing to provide a realistic picture

of the situation in other regions. Nevertheless, it is too early to judge the success or failure of the transition to a university 4.0 given the novelty of the approach. As the groundwork is laid to support this transition. Due to the recent trend towards transition which coincides with the ongoing development of the infrastructure needed to support it, and given the lack of sufficient experience on the part of the higher education authority in supporting and implementing it, its results are expected to become apparent in the medium and long term.

5. CONCLUSION

The transition to a Fourth Generation University model in Algeria is not a technological luxury but a strategic necessity for linking knowledge to the economy and society in the context of the challenges posed by digital transformation and sustainable development. Promising building blocks are in place today (leading universities, digital initiatives, incubators), but achieving the desired impact requires strong national leadership, institutional reforms, sustainable funding, and effective partnerships with industry and the international community. By adopting a phased and integrated approach that combines flexible governance, investment in human and technical infrastructure, and linking research to the job market, Algerian universities can play a pivotal role in national development and become engines for the production of value and exportable local knowledge.

The study concluded with a set of recommendations and suggestions as follows:

- ✓ Enhancing the Institutional Framework and Governance:
- Measurable goals, clear timeframes, and performance indicators linked to social and economic impact.
- Grant leading universities greater operational and financial autonomy to experiment with flexible governance models and accelerate the transformation of research findings into marketable products and services.
- Transparent, regular reports on the progress and impact of transformation plans.
- ✓ Strengthening digital infrastructure and technological capabilities: Unified Digital Infrastructure, Standardization and Development of E-Learning Platforms,
- ✓ Human Resource Development and Continuing Education: Launch of national training programs to keep pace with the digital transformation Intended for faculty members, researchers, and administrators, encourage faculty and researcher exchanges with international institutions and research centers to accelerate the acquisition of practical experience in university 4.0 models.
- ✓ Linking research to the national economy and strengthening partnerships with industry; like Tax incentives and legislation that encourage companies to invest in R&D in partnership with universities, along with mechanisms to protect intellectual property and promote technology licensing, Venture Capital Funds…
- ✓ Reforming Financing Systems and Promoting Financial Sustainability like Encourage new revenue models for universities (consulting services,

specialized vocational training, and technology-based commercialization of startup products) while ensuring transparency and accountability.

- ✓ Reengineering educational curricula to align with the University4.0: Emerging fields such as artificial intelligence, renewable energy, and biotechnology
- ✓ Building a Culture of Innovation: Support for innovation events (hackathons, student project competitions), Encourage the dissemination of open research results and the creation of national knowledge databases that facilitate reuse and collaboration
- ✓ Focus on regional empowerment and reducing disparities: Special Implementation Plans for Universities in Less Developed Regions.

6. Bibliography List:

1. Abdellatif Miraoui. (2025, 06 26). L'U N I V E RSI T É DE DE M A I N, Comment former les nouvelles générations ? VERS L'UNIVERSITÉ 4.0. on https://www.utbm.fr/wp
2. AMHE Scientific Research. (2024, 06 28). The higher education and scientific research sector have made significant strides in modernizing Algerian universities. on https://www.mesrs.dz.
3. AMHE Scientific Research. (2025, p105). official bulletin of higher education and scientific research; Algeria: Legal Affairs Directorate.
4. AMHE Scientific Research,. (2025, 06 25). Statistics of the higher education sector. on www.mesrs.dz
5. Anvredet. (2025, 06 26). Map of incubators on https://anvredet.org.dz
6. Digital Business Incubator. (2025, 06 26. on www.business-seed.mesrs.dz
7. Elsevier. (2024). Towards the 4th generation university, The transformative role of TU/e in delivering innovation and impact in the Eindhoven region. Analytical Services.
8. MHESR. (2025, 06 26). Innovation, valorization. Retrieved from Ministry of higher education and scientific research: on https://www.mesrs.dz
9. MHESR. (2025, 04 08). Study in Algeria, Explore Algerian Universities on www.studyinalgeria.mesrs.dz
10. MHESR statistics. (2025, 06 26). statistics. Retrieved from www.mesrs.dz
11. Pringle David. (p3, 2024). Universities 4.0:New powerhouses for regional innovation, and global impact? Luxembourg 19, 1st floor, 1000 Brussels, Belgium: Science Business Publishing International SRL.
12. US News. (2025, 06 26). Search U.S. News Best Global Universities. (Clarivate, Editor) Retrieved from www.usnews.com
13. Wissemaj.g. (2009), towards the third-generation university: managing the university in transition, Edward Elgar publishing limited, UK, p 23