

Human Capital Investment in Light of Digital Transformation in the Higher Education Sector in Algeria.

GHEZALI Redha^{1♦}, BENYAHIA Atika²

¹ Laboratory of Research and forward-looking in comparative political studies,
Tiaret University (Algeria), redha.ghezali@univ-tiaret.dz

² Laboratory of Research and forward-looking in comparative political studies,
Tiaret University (Algeria), Atika.benyahia@univ-tiaret.dz

Received: 31/08/2024

Accepted: 05/05/2025

Published: 25/05/2025

Abstract:

Modern organizations seek to optimize the utilization of individuals and their intellectual assets through human capital investment, which has acquired new practical characteristics with the advent of electronic management and digital transformation. This study highlights the state of human capital investment in the higher education sector in Algeria amidst digital transformation. where the processes of building, activating, and maintaining human capital are now conducted through digital means, this shift has led significant improvements in the quality and efficiency of administrative, pedagogical, and educational services.

Keywords: Human capital, investment, digital transformation, automation, higher education.

JEL Classification: J24, O33

♦ corresponding author

1. Introduction:

Human and intellectual capital have gained critical importance in the current era, due to the great expansion of knowledge and the fierce competition to acquire, develop and capitalize on it, making these assets as crucial as other material and financial assets in modern organizations. Consequently, Modern management methods, such as human capital management, have emerged to invest and maximize the utilization of knowledge and intellectual assets possessed by individuals.

The widespread adoption of digitization and digital transformation processes has significantly impacted the work environment and contemporary management practices; this often requires restructuring the organization, its processes, as well as the relationships. Therefore, it is important to understand the role of human capital and effectively managing and investing it in the context of digital transformation.

The higher education and scientific research sector in Algeria is witnessing intensive governmental and ministerial efforts to ensure a digital transformation that responds to global changes and enhances the sector's performance and efficiency. This necessitates an exploration of the specifics of managing and investing human capital within Algerian universities in light of digital transformation. Thus, the study's problem can be stated as follows:

- How does digital transformation impact human capital investment in Algerian universities?

The sub-questions:

- What are the foundations of digital transformation? To what extent has digitization been adopted in the higher education sector in Algeria?
- What is meant by human capital, and how is it invested within organizations?
- How has digitization impacted the investment of human capital in Algerian university?

The study hypothesis:

Digital transformation significantly influences the processes of human capital investment within Algerian universities

Study Objectives:

This study aims at:

- Identifying the conceptual dimensions and intellectual foundations of human capital and digital transformation.
- Understanding the efforts towards digitizing higher education sector in Algeria.
- Analyzing the impacts of digital transformation on the processes of building, activating, and maintaining human capital within academic institutions.
- Providing important recommendations that serve the topic and enhance scientific knowledge regarding digitization in contemporary human capital issues.

Study Methodology:

A descriptive analytical approach was employed to present various contents, information, and theoretical foundations of both digital transformation and human capital within a theoretical framework. Additionally, a legal approach was used to understand

governmental and ministerial decisions regulating digital transformation in the higher education sector. This facilitates the analysis of the relationship between the study variables and test the hypothesis. Therefore, we have opted to address the topic through the following sections:

- Digital transformation - a study of the concept and foundations.
- Theoretical framework of human capital.
- Implications of digital transformation on human capital investment in Algerian universities.

2. Digital Transformation - a study of the Concept and Foundations:

Digital transformation and the widespread reliance on digital technology are the most notable features of the 21st century, due to the numerous benefits they provide, especially in the labor sector. This section explores the conceptual and operational dimensions of digital transformation.

2.1 Digital Transformation and Related Concepts:

To understand the semantic dimensions of digital transformation, we will define it along with the associated concepts, as follows:

2.1.1 Digital Transformation Definition:

Digitization is concerned with restructuring processes, means and working methods through the integration of digital tools and technologies, with the aim of improving effectiveness, innovation and development. It also refers to the broad adoption of modern digital technology to replace traditional methods. Therefore, Digital transformation is fundamentally based on the integration of digital technologies and smart ICTs (Salah Zabi et al., 2022, p. 06), followed by mastering and controlling them. As a result, digital transformation has become a fundamental feature of this era due to its crucial role in enhancing the comfort and well-being, both within organizations and throughout society.

2.1.2 Concepts Related to Digital Transformation

There are some concepts that are in line with digital transformation, most notably:

E-Governance: It aims to ensure effectiveness and transparency in governmental or organizational processes by regulating the legal documentation required for digital transformation, promoting transparency and accountability, securing data, and enhancing innovation and technological development.

Cybersecurity: It includes the safeguarding of data, systems, and digital information against cyberattacks and various threats. It is a critical component in ensuring the success and integrity of digital transformation.

Artificial Intelligence (AI): Oxford Dictionary describes it as the theory and the development of computer systems to be able to accomplish tasks that typically require human intelligence. It is also defined as a field of science and technology that involve cognitive disciplines such as computer science, philosophy, mathematics, and engineering, combined to develop computer functions that mimic human mind abilities.

Information and Communication Technology (ICT): encompassing hardware, software, networks, and applications that are fundamental to digital transformation.

Automation: the automated execution of processes and tasks through technological means,

without human intervention, aiming to reduce effort and costs and accelerate the operations.

2.2 Digital Transformation Goals and Requirements:

The goals of digital transformation define the desired outcomes, while the requirements establish the essential conditions needed to achieve these objectives.

2.2.1 Digital Transformation Goals

The purpose of the widespread adoption of digital technology is to bring about significant improvements in the efficiency and quality of services, as follows: (Djamal. S, Kamal. M, 2024, p. 71)

- Workflow automation leads to obtaining substantial benefits such as simplifying procedures, reducing time and effort, and keeping pace with technological advancements.
- Customer satisfaction: This applies to customers both internally and externally, as well as to all stakeholders associated with the organization.
- Increasing the coordination and teamwork through the advanced communication and information transfer systems and the conducive environment to the exchange of expertise and knowledge.
- Cost reduction such as burdens and expenses associated with traditional archiving and management, which can be mitigated through the adoption of digital databases, media and information systems.
- Utilization of modern technologies: such as the integration of digital platforms, advanced equipment, and artificial intelligence, to deal with extensive and complex data sets effectively.
- Development of leadership and management styles: this involves leveraging digital information management systems to foster principles of accountability, integrity, and transparency, in leadership and management practices. Additionally, it encompasses enhancing efficiency and sustaining a competitive advantage.

2.2.2 Digital Transformation Requirements

A successful digital transformation requires the following:

- * Regulatory requirements: the set of supportive and governing regulations and legal frameworks for digital transformation, they define the boundaries of transactions, activities, and procedures within a legal context, reflecting the genuine commitment to adopting and executing a digital transformation initiative.
- * Technical requirements: digital transformation demands an infrastructure that supports electronic automation, including technologies, systems and networks, equipment and digital devices as well as development and security systems.
- * Financial requirements: the allocation of adequate financial resources is necessary to fund the digital transformation processes, both prior to and following implementation. Including monitoring and improving the infrastructure performance, acquiring software and hardware, maintenance and updating systems and practices, and other related expenses.
- * Human requirements: this includes the need for specialized personnel and human resources with technical knowledge and expertise in digital technology, who are responsible for ensuring the success and sustainability of the digital transformation

project. Along with providing opportunities for regular training and professional development to maintain current skills and refine knowledge, especially given the rapid scientific and technological advancements in this era.

3. The Theoretical Framework of Human Capital:

In the meantime, social and economic development is fundamentally measured by knowledge and technology, where human capital and intangible resources hold significant importance as key indicators of success. (Miciuła Ireneusz, 2016, p. 38)

3.1 Human Capital Definition and Components:

Human capital has become increasingly important as a key source of innovation and creativity, allowing for the enhancement of organizational competitiveness and consistency.

3.1.1 Human Capital Definition

The term human capital emerged simultaneously with the growing recognition of the pivotal role of individuals and their substantial contributions to achieving organizational objectives. According to Theodore Schultz, it is everything acquired by labor in terms of skills, abilities and experiences (A. Benyahia, A. Mahmoudi, 2020, p. 271). Kaplan and Norton (1999) define human capital as the value of the knowledge and skills possessed by people that can help developing organizations they work for. It represents an organization's knowledge, potential, skills, intellectual capacity, creativity, and organizational behavior (Samah Souleh, 2016, p. 06). Miciuła (2015) defines it as the set of inherent values in a person, which cannot achieve returns without his active participation and involvement. (Miciuła .I, 2016, p. 39). Based on these perspectives, we can define human capital as the entirety of an individual's intellectual and creative capacities, as well as the skills and competencies that can enhance performance quality and increase productivity.

3.1.2 Human Capital Components

Human capital comprises various components; the most prominent ones are:

Abilities: Ability is closely related to capability, referring to the potential to perform a specific task. It is defined as the alternative combinations of functions and tasks a person can accomplish, representing a form of objective freedom to achieve a complex set of functions. (Pedro Flores-Crespo, 2007, P. 46)

Knowledge: Knowledge is an evolving mixture of information, values, expert insights and experiences that provides a practical framework for evaluating and integrating new experiences and information (Jennex, Murray E., 2007. P. 02). It is sometimes defined in relation to information, as it is a set of information used to solve specific problems. (Samir Fawwaz H, 2008, p. 16)

Competencies: They represent the cognitive, sensory, emotional, and even physiological knowledge that collaborate to form solutions to specific problems.

Skills and Talents: Both are similar to competencies, but the dimensions of skills are defined by knowledge, ability, desire, and opportunities. However, talent is associated with outstanding performance and intelligence; it represents high intellectual strengths that qualify its possessor for excellence.

Experiences: referring to a collection of cumulative knowledge held by individuals, acquired through specific situations, experiments, and other means.

Creativity & Innovation: Innovation is to add something new to an existing object or process; it is related to "implementation." In contrast, creativity is the cornerstone and starting point of innovation, encompassing the imaginative process of developing new ideas. (Sheu-Usman O. A & Isaac .A, 2015, p 01)

3.2 Human Capital Investment and Digital Transformation

Digitization has evidently impacted management methods, executive and strategic functions, including human capital investment.

3.2.1 What Is Human Capital Investment?

Investment in human capital refers to the total costs, burdens and expenses allocated to developing the capabilities, skills, and creative talents of individuals to enhance their productivity. According to the Organization for Economic Cooperation and Development (OECD), developing the skills and capabilities of individuals in order to increase productivity and add value to the organization is the primary goal of investing in human capital. In the same context, the concepts of HC development and HC management can be used to convey similar meanings to HC investment. (Amine Meziani et al, 2024, p.46)

In an organization, there are many aspects of human capital investment, such as Recruiting, building, Activating and maintaining human capital.

3.2.2 Dimensions of Human Capital Amidst Digital Transformation

The following are some characteristics of HC investment in the context of digitization:

- Building human capital: attracting human competencies, expertise, and professionals in digital technologies, whether from external sources or by developing a proprietary human capital within the organization. This can be achieved through supporting creativity, innovation, education, and training, as well as preparing a conducive infrastructure and environment that fosters innovation and creativity, such as digital databases for building and documenting technical knowledge.
- Activating human capital: methods such as open meetings, brainstorming mechanisms, and collaborative work through the exchange of knowledge and experiences are increasingly employed. This is facilitated by communication media, digital tools, and collaboration platforms such as SLACK (Heather A Johnson, 2018, p.148), IDEASCALE, and SPIGIT, which enable rapid professional conversations and knowledge sharing, extracting ideas from employees and customers, evaluating and implementing them, leading to digital innovation.
- Maintaining human capital involves continuous training and development programs, empowerment, and both material and moral incentives. This includes knowledge and performance management systems to track employee development, ensure the continuous flow of knowledge, and promote ongoing improvement.

Digital transformation has led to a redefinition of human capital concept, whereas investment previously focused on traditional training, education and developing basic skills, today it emphasizes enhancing digital skills, building adaptability and resilience, focusing on soft skills and redesigning work environment, given that hybrid and remote work have become a reality.

4. Implications of Digital Transformation on Human Capital Investment in Algerian Universities

In this section, we will examine the reality of digitization in higher education and scientific research sector in Algeria, highlighting the legal framework and the key ministerial arrangements aimed at ensuring a successful digital transformation. We will also explore its implications for human capital investment processes within universities.

4.1 An Analytical Reading of Algeria's Efforts to Digitize the Higher Education Sector.

Digital transformation in higher education refers to the shift from a traditional system to a new framework based on digitization and advanced ICTs across all aspects, policies, and procedures of academic and pedagogical university operations. In order to enhance the quality of services provided, ensuring alignment with global standards in this domain (Salima .A and Mohamed A. El-Shami, 2023, p. 463). Chronologically, Algeria's real entry into the world of digitization has been somewhat delayed. Despite the Ministry of Post and Telecommunications adopting Law 03/2000, which laid the foundation for significant infrastructure development, the law remained ambiguous to materialize until 2019. It was not until the Algerian government imposed social distancing measures in response to the COVID-19 pandemic that the digitization in many vital sectors became an imperative for ensuring their continuity and protecting public interests (Amina Naimi, 2023, P. 68). The Algerian government has committed to enhancing digital services in universities following the COVID-19 pandemic, as evidenced by the series of laws it has issued. Article 8 of Executive Decree No. 21-134 of 2021, titled "Directorate of Networks and Digital Development," stipulates that it is responsible for defining the sector's strategy in developing information and communication technologies, establishing an effective infrastructure, improving the quality of technology-based services and organizing a monitoring unit to ensure digitization quality. This unit comprises four sub-directorates: Basic Structures and Networks, Information Systems, Information Security, as well as Knowledge Support and Digitization Systems (Executive Decree No. 21-134, 2021, pp. 12-14). The Ministry of Higher Education and Scientific Research also has issued a series of decisions, as highlighted in the official bulletin of the ministry as follows: (<https://shorturl.at/huMeJ>)

- Article 02 of Decision No. 1242 dated September 22, 2022, states the establishment of a specialized committee tasked with diagnosing existing resources, digital infrastructure, capabilities, human resources and ensuring the coordination of online education processes among universities.

- Articles 03 and 04 of decision No. 1243 dated September 25, 2022, include the creation of a national committee to evaluate and improve internet services. This involves forming a committee of experts from various universities across the country, such as professors from the Higher School of Computer Science and universities of science and technology, to develop public policies and enhance internet services, assess, support, and propose measures to improve network bandwidth.

- Decision No. 1400 dated October 2022, includes the establishment of a national committee to promote the visibility and classification of higher education and scientific research institutions, as well as to develop the necessary regulatory and technical mechanisms.

- Decision No. 1244 dated September 25, 2022, includes the establishment of a national coordinating committee to monitor innovation and university business incubators. Specifically, Articles 02 and 04 ensure the monitoring of technology support centers, innovation, and business incubators, to enhance connections between the ministry of higher education, the ministry of knowledge economy, and small and emerging enterprises. Additionally, a committee was created under decision No. 1350 dated October 4, 2022, to oversee the implementation of the cooperation agreement utilizing national expertise both domestically and abroad.
- Pursuant to Decision No. 1406 dated November 17, 2022, 'the National Digitization Committee was established, along with the definition of its duties, composition and procedures, particularly concerning the monitoring, implementation, and enrichment of the master plan for the digitization of the higher education sector. The master plan for the digitization of higher education includes 07 main axes, the most prominent of which are: Digitization for users training and resources modernization; Digitization for visual training and innovative pedagogy; Digitization in the service of research activities; and national and international relations, etc. These axes include 16 strategic programs and 102 projects. (Amal Abbas, 2023, p. 279).

All of that reveals that the peak of digital transformation efforts in Algerian higher education sector occurred between 2021 and 2022, in the aftermath of Covid-19 pandemic, when many countries accelerated their digital transformation. During this period, the broad outlines were precisely defined, along with the establishment of a comprehensive institutional and legal framework to regulate the process. Regardless of whether these endeavors serve as a means or an end, they clearly reflect the Algerian government's genuine desire and commitment to adopt digital transformation in higher educational sector. This raises questions about the extent of its impacts on university life.

4.2 Mechanisms of Human Capital Investment in Light of Digital Transformation in the Algerian Universities

The impact of digitization in universities extends beyond executive functions to include strategic aspects such as human capital investment. In this section, we will address how human capital investment is evolving in response to the sector's digitization.

4.2.1 Building Human Capital

The process of building human capital is increasingly occurred within a digital framework that aligns with the requirements of digital transformation, as outlined below:

A- Planning and attracting qualified competencies: The beginning was by providing qualified human resources responsible for ensuring the sector's digitization (Ministry of Higher Education and Scientific Research, 2022, pp. 27-48)

- At the central level: the National Digital Committee was established, comprising a president appointed by the Minister, a Secretary General, Director General of Education, Director of the Information System, Director of National Office Of University Works, Director of the PROGRES software package, Director of Cooperation and 14 members specialized in information technology. This committee oversees the development of platforms and the national information system.

- At the regional level: attracting 3 to 4 engineers and teachers with the ability to listen and intervene effectively.
- At the local level: a digital strategy office had been established and staffed with the necessary human expertise, within the limit of 14 members who are responsible for monitoring and developing local digital projects.

Furthermore. Universities have been granted the authority to identify their human resource needs and competencies, as well as to establish financial positions and jobs related to cybersecurity, digital systems professionals, and digital design. These roles are intended to oversee the institution's media and digital affairs, from digital calls for applications and announcements, to the appointments in coordination with the general directorate of the civil service. This ensures the broadest possible dissemination, particularly during the covid-19 pandemic and the transition to education through Moodle platforms (E-learning), which has increased the demand for website designers and developers of educational platforms specific to each university.

B- Competency development: the training and development process in the context of digitization is both a means and an end. A key principle of digital transformation is simplifying and accelerating procedures, especially in training and development, this includes stages such as needs assessment, program planning and design, as well as review and evaluation (Madiha Bakhouché, 2018, p. 271). In contrast, preparing a qualified workforce in the field of digital technology requires teaching working methods, organizing training workshops, developing skills, and fostering creativity. This is evident in Algerian universities through training workshops and virtual symposia designed to teach faculty members technical knowledge and methods for incorporating lessons online via Moodle platform after digitizing them into various formats (Doc, Txt, PPT, PDF, and HTML).

During the first semester of 2023, all faculty members were trained through the Constantine 1 platform, focusing on the training of technical and administrative staff to enhance their proficiency and use of computer systems, in order to equip them with the necessary technological knowledge and to monitor the technical competencies of faculty members through E-assessment platforms.

This underscores the digital building of HC within Algerian higher education institutions amidst the sector's digitizing.

4.2.2 Activating Human Capital

A set of new digital mechanisms has emerged to activate and motivate human capital amidst digitization as follows:

Electronic Brainstorming (EBS): the digitization of universities has created a flexible work environment that is not limited to traditional in-person attendance. Meetings, periodic committees, scientific forums, and remote workshop can now be conducted through digital media such as Zoom and Google Meet, allowing for the effective utilization of knowledge, ideas, decisions and administrative activities.

E-Learning: along with the sustained continuity of academic knowledge flow, the integration of E-learning within the educational framework provides communication channels among faculty, students, and administration. It enhances the relationships among

these groups, ultimately benefiting the university institution as a whole.

Digital business incubator : also known as "Business Seed," it was established in 2024 to empower business incubators and startups while fostering effective innovation, it collaborates with various economic and social partners, media and communication companies, providing essential support for innovative projects holders through high-quality digital services, including team selection, training and development services, financing mechanisms, digital marketing, and more. (<https://business-seed.mesrs.dz>)

Academic Internationalization: it involves expanding the scope of education and scientific research to include international dimensions, such as international collaboration, student mobility, scientific research, cultural exchange, and digital engagement. The Algerian university's openness to the external environment, exemplified by its subscription to Times Higher Education, has amplified research and academic efforts and enhancing their quality on a global scale. The 2024 times higher education young university rankings analyzed 134 million citations from over 16.5 million research publications and surveyed 68,000 researchers. In 2024, 21 Algerian universities were ranked, an increase from 11 institutions in 2023 and 9 institutions in 2022.

Digitization of Repositories and Research Services: this includes the establishment of a National Digital Library in 2024, which enables researchers to access the library's research systems via a website. This initiative also encompasses the digitization of scientific research and publication to facilitate the dissemination of scholarly works and ideas. For instance, it involves establishing a portal for electronic journals (ASJP) and digital repositories for academic institutions, and integrating intellectual property rights within Dspace. Additionally, subscribing to the PNST center and the national documentation system SNDL, enabling Algerian students and researchers to browse and download materials for free. Incorporating RFID technology into educational services and libraries to address challenges in collection management, lending, and monitoring. Thus simplifying procedures and facilitating work and scientific research. With the goal of fostering continuous inspiration, consultation, and cognitive motivation, a platform named ALUMNI has been created, providing access to the successful experiences of graduates along with their firsthand testimonials regarding their achievements. (Ministry of Higher Education and Scientific Research, OP. cit, p. 53)

All of this contributes to preparing a conducive work environment that helps activate and support innovation, creativity, and knowledge within universities, while capitalizing on these elements to achieve the desired standards of academic quality.

4.2.3 Maintaining Human Capital

Efforts are being made to maintain human capital through several key strategies:

Digitization of Procedures: Implementing a unified approach that ensures transparency and fairness, thereby enhancing the satisfaction of university community members and fostering belonging sense.

Hybrid Education: Transitioning to a model that combines classroom learning with online education, provides students with greater flexibility and reducing classroom overcrowding, as well as faculty members and administrators.

Reducing Administrative Complexities: Moving beyond the hierarchical bureaucratic model to simplify procedures and streamline processes, thus granting the university institution greater flexibility in managing various aspects of university life. Through coordinating educational management processes across different pedagogical structures and integrating them with digital systems to facilitate online registration and payment, digital grading, adopting electronic signatures and document validation, as well as implementing electronic attendance records.

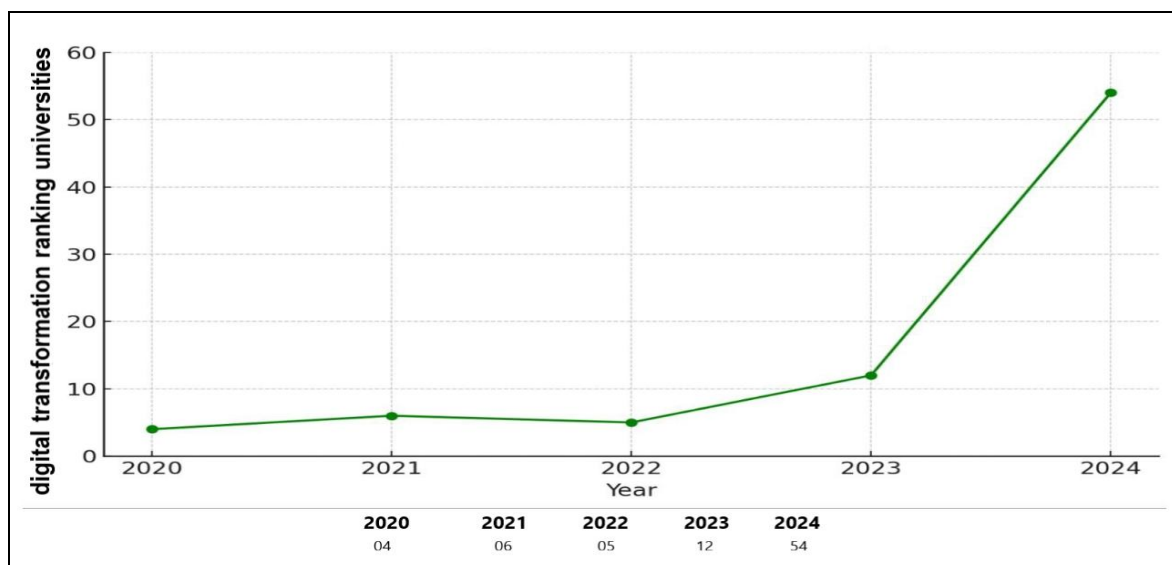
Enhancing Communication Mechanisms: through modern communication technologies, whether in formal or informal interactions.

Providing Adequate Infrastructure: by ensuring the availability of necessary equipment to address emergencies and guarantee service quality, this includes securing networks to improve service delivery and maintaining updated protection programs and systems to sustain performance and productivity.

4.3 Critical Evaluation:

Based on the aforementioned mechanisms, the interactive relationship grounded in the principle of mutual influence between human capital investment processes and digital transformation in higher education institutions in Algeria becomes evident. Digitization significantly contributes to facilitating and fostering HCI processes, conversely, it necessitates a highly skilled human resource capable of keeping pace with technological advancements and challenges, this has positively reflected on university life in its entirety, both internally or externally. the Algerian universities has thus witnessed a significant improvement in key global rankings such as the Times higher education rankings, which are based on indicators directly related to digitalization, including educational services quality, innovation and infrastructures.

Figure 01: Digital Transformation Ranking of Algerian Universities (2020-2024)



Source: by the authors based on (www.timeshighereducation.com)

The figure 01 illustrates one of the most significant outcomes of digital transformation in Algerian universities, namely, the evolution of their digital ranking on a global scale, showing an upward trend of their rankings. After a period of low ranking from 2020 to 2022

(with only 4 to 6 universities ranked). Algerian universities began to experience an increase in their rankings, reaching 54 ranked universities on 2024, coinciding with the peak of digital transformation in the sector.

Despite the significant achievements of the sector's digitization, particularly in terms of HC investment, it remains fraught with obstacles and challenges, most notably resistance to change caused by digital illiteracy among the elderly, disparities in internet coverage and digital services between universities particularly those in isolated areas. As well as digital research skills gap and the limited culture or self-directed learning among individuals within universities. This constitutes a serious challenge for Algerian higher education sector.

5. Conclusion:

The digitization of human capital investment in universities is a relatively recent approach that has accompanied the digital transformation, enabling major global universities to achieve significant quantitative and qualitative gains, such as academic quality, innovation and excellence. This has inspired the Algerian Ministry of Higher Education and Scientific Research to accelerate the digitization of the sector and join the global digital transition, which has impacted human capital investment processes within universities. These processes involve building, activating, and maintaining human capital through digital mechanisms and procedures that streamline time, effort, and costs, thereby promoting the development of human capital within Algerian universities and serving the sector's reputation and quality as a whole.

The most prominent points derived from the study are:

- Digital transformation within organizations requires advanced skills and human competencies, conversely, digital transformation is reflected on the automation of processes and human capital management such as knowledge construction, activation, sharing, and storage in digital repositories.
- There is an interactive relationship and a mutual influence between human capital investment and digital transformation.
- Digital transformation in higher education sector in Algeria involves integrating technology into various aspects of university life. This includes online learning, platforms, digital resources and administrative tools to improve efficiency.
- The automation of human capital management in academic institutions aids in identifying areas of creativity and innovation, supporting and investing in them to achieve quality at various administrative levels more quickly and cost-effectively.
- The digitization of higher education and scientific research sector has substantially enhanced educational services quality by expediting administrative procedures, adopting hybrid education, and automating most administrative and pedagogical processes, these advancements has played a crucial role in improving the reputation and international ranking of certain Algerian universities and their laboratories. (figure 01)
- HCI within digitization is hindered by various challenges, such as inadequate infrastructure and weak digital skills... etc.

Recommendations: based on these results, we provide the following recommendations:

- ✓ For a successful digital transformation, it is essential to consider the needs of

employees, particularly those of older employees, this consideration is critical for mitigating resistance to change and avoiding technical unemployment.

- ✓ Providing ongoing monitoring and periodic training programs allows individuals to keep pace with rapid technological and digital advancement.
- ✓ the investment of HC and creative assets in universities should align with national developmental priorities, such as research in green technology and its role in advancing the green economy, additionally, incorporating digital technologies across various disciplines to ensure that students acquire the skills needed for the digital age.
- ✓ As an extension of the topic, we recommend studying the subject “ self-directed learning within human capital in the context of AI technology advancements “

6. References:

- Ministry of Higher Education and Scientific Research. (2022). **Guiding Plan for Digitization (SDN): A Vision for Digitizing the Higher Education and Scientific Research Sector**, Part 01.
- Oladipo Akanbi Sheu-Usman & Aun Isaac. (2015). “**CREATIVITY, INNOVATION AND ENTREPRENEURSHIP**”, in book: *Contemporary Entrepreneurship*, edited by Kadiri I.B & Olota O.O Technical and Entrepreneurship center, university of Ilorin.
- Flores-Crespo Pedro. (2007). ‘**Situating Education in the Human Capabilities Approach**’, in book: *Amartya Sen’s Capability Approach and Social Justice in Education*, edited by Melanie walker and Elaine Unterhalter, Palgrave Macmillan, New York, NY.
- Murray E. Jennex. (2007). “**What is Knowledge Management?**” In *Knowledge Management in Modern Organizations*, edited by Murray E. Jennex, 1-9. Hershey, PA: IGI Global.
- Mikalef Patrick & Parmiggiani Elena. (2022). “**An Introduction to Digital Transformation**”, in book: *Digital Transformation in Norwegian Enterprises*, Artificial Intelligence & Business Analytics Lab, Norway.
- Executive Decree No. 21-134 dated 24 Sha'ban 1442 AH, corresponding to April 7, 2021, concerning the organization of the central administration of the Ministry of Higher Education and Scientific Research, **Algerian Official journal**, Issue 27, published on April 11, 2021.
- Bakhouch Madiha. (2018). "Mechanisms for Developing Human Capital in the Context of the Shift towards a Digital Economy," *development and human Resources Management Review -researches and Studies*, Blida 2 university, vol 06, N 09.
- Abida Salima and Mohamed Ali Hassan El-Shami, (2023). "The Role of Digital Transformation in Enhancing Higher Education Quality," **Creativity Journal**, Blida 2 university, Vol 13, N 01.
- Abbas Amal. (2023). "Requirements of the Guiding Plan for Digitizing the Higher Education Sector—Reality and Aspirations," **Journal of Legal and Economic Research**, Aflou university center, Vol 06, Special Issue.
- Johnson A Heather. (2018). SLACK, *Journal of the Medical Library Association*, Dartmouth College, Hanover, NH Vol 106, N 01.
- Meziani Amine et al, (2024). **Investment in human capital in light of digital transformation**, entreprise review, Algiers 3 university, Vol 14, N 01.
- Ireneusz Miciuła, (2016). ‘The Measurement of Human Capital Methods’, *Folia Oeconomica Stetinensia*, University of Szczecin, Pologne, Vol 16, N 01.
- Souleh Samah, (2016). "The impact of Human Capital Management on the Innovativeness of research Center: The Case of Scientific Research Centers in Algeria", **Journal of Financial, Banking, and Business Economics**, Biskra university, No. 01.
- Benyahia Ahmed. Mahmoudi Ahmed, (2020), "Human capital and social capital as sources of sustainable competitive advantage Case of SAIDAL group (Unity of DAR BEIDA)", *Economic Sciences, Management and Commercial Sciences Review*, M'sila university, Vol 13, N 02.

- Sadfi djamel et al., (2024). "Knowledge Management Requirements and Their Role in Digital Transformation in Higher Education and Research Institutions from the Perspective of the Faculty Members of Khemis Miliana University," **Journal of Contemporary Economic Studies**, M'sila university, Vol 09, N01.
- Zabi Salah et al., (2022). "Investing in Human Capital as a Mechanism for Achieving Digital Transformation in Algerian Universities: A Field Study at Mohamed Boudiaf University of M'sila," **Journal of Development and Applied Economics**, M'sila university, Vol 06, N 01,
- Al-Hawwari Samir Fawwaz, **Towards Customer Knowledge Relationship Management : Integrating Knowledge Management and Customer Relationship Management Process**, doctoral thesis, Faculty of Information System and Technology, The Arab Academy for Banking and Financial Sciences, Jordan 2008.
- Amina Naimi, (2023). **digitalization and higher education in Algeria**, International Conference paper, 2nd International Conference on Recent Academic Studies ICRAS 2023, all sciences proceedings, Konya, Turkey.
- Business Seed Incubator, **Digital Business Incubator: Nurturing Ideas, Entrepreneurship, Stimulating Growth, and Building the Future**, on: Official website of the Digital Business Incubator, available at: <https://business-seed.mesrs.dz>. (consulted on July 10, 2024, at 12:07 AM).
- Ministry of Higher Education and Scientific Research, **Collection of Ministerial Decisions**, on: Ministry of Higher Education and Scientific Research website, available at: <https://shorturl.at/29I3F>, (consulted on July 8, 2024, at 11:08 AM).