Almuqadimah of Human and Social Studies Journal Volume (11) Issue (1),(June- 2026) pp580-591
ISSN: 2602-5566 EISSN :2716-8999

The Reality of Digitization in the Field of Scientific Research in Algeria: An Approach in Media and Communication

واقع الرقمنة في مجال البحث العلمي في الجزائر: مقاربة في مجال الاعلام والاتصال

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Received Date 21/08/2025 **Acceptance Date: 04/06/2026**

Abstract

The digitization of scientific research has become a cornerstone for enhancing knowledge production, dissemination, and accessibility in the modern academic environment. In Algeria, the integration of digital technologies into research practices faces both opportunities and challenges. This study examines the reality of digitization in Algerian universities from a scientific approach, highlighting its role in improving research visibility, academic collaboration, and access to global knowledge networks. It also addresses structural, technical, and cultural barriers, such as limited infrastructure, insufficient training, and resistance to change. By adopting a comprehensive analytical perspective, the paper underscores the importance of fostering digital literacy, institutional support, and strategic policies to ensure effective digitization in Algerian scientific research.

Keywords: Reality؛ Digitization؛ Scientific Research؛ Media؛ Communication.

ملخص:

أصبحت رقمنة البحث العلمي حجر الزاوية في تعزيز إنتاج المعرفة ونشرها وإمكانية الوصول إليها في البيئة الأكاديمية الحديثة. وفي الجزائر، تواجه عملية دمج التقنيات الرقمية في الممارسات البحثية فرصًا وتحديات في آن واحد. تتناول هذه الدراسة واقع الرقمنة في الجامعات الجزائرية من منظور علمي، مبرزةً دورها في تحسين مرئية البحوث، وتعزيز التعاون الأكاديمي، وتوسيع الوصول إلى شبكات المعرفة العالمية. كما تعالج الدراسة العوائق البنيوية والتقنية والثقافية، مثل محدودية البنية التحتية، ونقص التدريب، ومقاومة التغيير. ومن خلال تبنّي مقاربة تحليلية شاملة، تؤكد الورقة على أهمية ترسيخ الثقافة الرقمية، وتوفير الدعم المؤسسي، ووضع سياسات استراتيجية لضمان رقمنة فعّالة في مجال البحث العلمي بالجزائر.

الكلمات المفتاحية: الواقع؛ الرقمنة؛ البحث العلمي؛ الاعلام؛ الاتصال.

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1. Introduction

One of the main reasons for the advancement of nations is their focus on the educational system, making it a priority for building an equitable society. Education is considered a vital sector upon which any country relies, as it serves as an indicator of societal progress. Therefore, most countries strive to enhance the level of education, particularly for researchers in the field of scientific research. In recent years, digitization has emerged as a transformative force in the field of scientific research worldwide, reshaping how knowledge is produced, accessed, and disseminated. In Algeria, the process of digitization has gradually gained importance as universities, research institutions, and government bodies seek to modernize their research systems and align them with global standards. The integration of digital tools, online databases, and electronic publishing platforms has opened new opportunities for researchers to access international knowledge networks and enhance collaboration

For Algerian researchers, the pursuit of knowledge has increasingly revolved around the challenge of selecting the right information amidst an overwhelming abundance of references and data within advanced information systems and the global information network (the Internet). This has made tracking information and managing the enormous and ever-growing intellectual production increasingly complex, if not impossible, using traditional library methods and systems.

In response to these technological transformations, a new generation of libraries has emerged, characterized by the extensive use of information and communication technologies and advanced systems for storing, retrieving, and disseminating information. These digital libraries play a strategic role in supporting education and scientific research.

2. Introduction to Scientific Research in Algeria

The practical organization of scientific research in Algeria began with the establishment of the Ministry of Higher Education and Scientific Research in 1970. This ministry played a key role in the educational reform strategy initiated in 1971, leading to the creation of the National Organization for Scientific Research and the National Research Council in 1973. The former was tasked with implementing research projects, while the latter was responsible for defining research orientations and developing the National Research Plan based on the country's socio-economic development needs. This organization initially mobilized university faculty members from Algeria’s three main universities: Algiers, Oran, and Constantine. Meanwhile, the

National Research Council initiated discussions on research program content, particularly in sectors critical to Algeria, such as energy, technology, agriculture, housing, and education (ahmed, 2008, p. 28)

Following independence, Algeria did not immediately prioritize scientific research due to the country's difficult circumstances at the time. During this period, research projects were proposed and directed by French institutions, notably the Algerian-French Scientific Cooperation Institution, which was established in 1967 and remained active until its dissolution in 1972. However, after the creation of the Ministry of Higher Education and Scientific Research in 1970 and subsequent higher education reforms, efforts to organize scientific research began. In 1973, two key institutions were established (Nouredinne., 2016, p. 50) :

* **The National Research Council**: This body serves as the central authority responsible for shaping theoverall direction of scientific research in the country. Its role includes defining priority areas for research and formulating the National Research Plan, which acts as a roadmap to guide research activities and ensure alignment with national development goals.

* **The National Office for Scientific Research**: Unlike the Council, this office is mainly concerned with execution. It is in charge of implementing the research initiatives outlined in the National Research Plan. This involves managing projects, allocating resources, and ensuring that research activities are carried out effectively.

* **The historical context**: This period marked a foundational stage in the development of the national research system. It was characterized by the establishment of a formal research administration, the creation of dedicated research centers, and the structural organization of the National Research Council. Together, these efforts laid the groundwork for a more coordinated and institutionalized approach to scientific research

3. Challenges Facing Universities and Scientific Research

Former U.S. President Bill Clinton, in advocating for an increase in the government's annual budget for scientific research ranging between $70 billion and $83 billion—highlighted the vital role of research in national progress. Similarly, French President Jacques Chirac, in defending the restructuring of France's scientific research institutions, stated: "Thanks to scientific research, 90,000 job opportunities have been created in the telecommunications and information technology sector.". (Development, 2006, p. 452)

Universities and scientific research play a vital role in advancing knowledge, fostering innovation, and driving societal development. However, they face numerous challenges that affect their effectiveness and sustainability. Limited funding, inadequate infrastructure, and brain drain hinder research quality and competitiveness. Additionally, rapid technological changes, globalization, and ethical concerns place growing pressure on academic institutions. Addressing these challenges is essential to ensure universities remain dynamic centers of learning and discover. There are countless examples illustrating the importance of scientific research in driving economic prosperity. The world has recognized that nations now face a major civilizational challenge in the field of scientific research and development. These challenges have intensified with the emergence of the new global order and the widespread use of communication and information technologies, which have transformed the world into a small village dominated by nations that control the tools and means of science, knowledge, and power. (Ibrahim, 2003, p. 64)

Scientific research is defined as the systematic investigation following specific scientific methods and approaches to establish, verify, modify, or expand scientific facts . The purpose of science is to seek the truth, and research serves as the means to answer questions and solve problems. The need for research arises when ambiguity, uncertainty, or a lack of knowledge exists. Thus, scientific research has become a fundamental pillar of intellectual and practical advancement across all fields of human activity. (Al-Khathami, 2005, p. 114)

One of the key conditions for effective scientific research is the adoption of a rigorous scientific approach, ensuring methodological accuracy and integrity. Additionally, research must incorporate innovation, meaning the introduction of new contributions. This, in turn, depends on extensive reading of past and contemporary scholarly works, as reading is half of innovation, and intelligence completes the discovery of the new . (Atef, 2002, p. 412)

Amidst these transformations, both universities and scientific research face several critical challenges, which can be outlined as follows:

- **The Challenge of Knowledge Explosion**

The responsibility of transforming our society from underdevelopment to progress and growth falls on universities and scientific research. Universities play a crucial role in providing qualified professionals capable of addressing societal problems, anticipating future challenges, and implementing the necessary measures to counter them, all within the framework of development plans and programs.

The term "knowledge explosion" was introduced by information specialists to describe the overwhelming increase in available information in

modern society. Similar terms include "information revolution," "information crisis," and "information flood." The concept of knowledge explosion reflects the rapid and continuous changes in information production, recording, dissemination, organization, analysis, storage, and retrieval through various technological and intellectual methods. (Zaher, 2002, p. 41)

A defining characteristic of the modern era is the massive increase in intellectual production across all fields. As an inevitable consequence of this information flood, individual researchers have become less capable of independently keeping up with scientific advancements. No single researcher can maintain the required level of expertise in their field without engaging with ongoing scientific developments in related disciplines.

- **The Challenge of Reform and Globalization**

The information and communication revolution has transcended the barriers of time and space, imposing a new global reality that necessitates considering the future-oriented dimension of scientific research and education. As a result, education policies must prioritize lifelong learning, ensuring that individuals continuously acquire knowledge. In today's world, an illiterate person is not just someone who cannot read and write, but someone who has not learned how to learn. This highlights the growing need for universities and scientific research, but what kind of universities and research institutions does a nation require in the context of 21st-century globalization?

This question demands a fundamental transformation in the role and objectives of higher education, both nationally and globally, in response to quantitative and qualitative changes in knowledge production. At the same time, in today's rapidly evolving global economy, high productivity sources increasingly rely on knowledge and information. Consequently, investing in human capital has become a strategic necessity, and universities have emerged as key instruments for societal development.

It is, therefore, crucial for nations to develop clear policies in response to globalization. These policies must prioritize the advancement of higher education institutions, not just as centers for producing graduates, but as foundations for building a knowledge-based society. (Zaher, 2002, p. 43)

Thus, in the era of globalization and international economic blocs, universities and scientific research institutions must adopt a strategic vision to assess, analyze, and adapt to an ever-changing environment filled with potential risks that could threaten the sustainability of higher education institutions. This strategic vision would enable academic decision-makers to identify mechanisms for assessing possibilities, setting priorities, and allocating resources effectively. By doing so, universities and research institutions can enhance their ability to adapt to environmental demands and global challenges. (Al-Hamza, 2010, p. 115)

- **The Challenge of Knowledge Management**

In the contemporary knowledge-based economy, managing knowledge has become a critical factor for organizational success, innovation, and competitiveness. Knowledge management (KM) involves the systematic process of creating, capturing, sharing, and applying knowledge to achieve strategic objectives. While it promises to enhance decision-making, foster innovation, and preserve institutional memory, knowledge management also presents a number of significant challenges . One of the major challenges facing knowledge seekers today is the selection of accurate and relevant information from an overwhelming abundance of references and documents, particularly on the Internet. With the massive revolution in information and communication technology, which has made knowledge accessible to every individual and institution at an affordable cost, new scientific concepts have emerged, such as the knowledge economy, the knowledge society, and knowledge management.

Knowledge management is a modern approach that focuses on harnessing collective efforts from various stakeholders with diverse perspectives. It represents the latest administrative methodology and is one of the most vital elements influencing the quality and efficiency of work. Knowledge management involves the creation, preservation, utilization, and sharing of knowledge. As a result, it has become one of the major challenges facing most universities and educational institutions today.

If we truly live in a knowledge society, then it is the university's responsibility to disseminate this knowledge and promote lifelong learning. In a rapidly evolving world, human knowledge is constantly changing—what students learn today may become obsolete tomorrow. To address this issue, universities must offer updated scientific curricula that equip students with the ability to adapt to ongoing advancements, ensuring that learning becomes a continuous process. (Hadi, 2009, p. 66)

Since the core function of a university is to integrate research and education, scientific research has a direct and transformative impact on academic training. However, because knowledge creation and research are highly complex processes, universities must embrace knowledge management to convert individual knowledge into collective knowledge. This is particularly important as rapid advancements in information and communication technology have reshaped the foundations of business and education management.

A university's success in today's world depends on its ability to operate in a dynamic and rapidly changing environment, where students possess advanced knowledge capabilities. Universities aiming for excellence in knowledge management must redefine their values and invest in their intellectual assets. This shift requires individuals to acquire new skills and

develop expertise in managing and utilizing knowledge effectively in an era of digital transformation. (Hussein, 2004, p. 101)

- **The Challenge of Digital Technology**

One of the most pressing challenges lies in the rapid pace of technological change, which often outstrips the ability of individuals, institutions, and policies to adapt effectively. Issues of digital inequality marked by unequal access to devices, internet connectivity, and digital literacy further exacerbate social and economic divides. At the same time, concerns related to privacy, security, and ethical use of data are increasingly prominent, as digital platforms collect and process vast amounts of personal information.

Moreover, digital technology poses challenges to traditional structures, such as labor markets disrupted by automation, cultural identities reshaped by globalized media, and educational systems adapting to virtual learning environments. These complexities highlight the need for balanced strategies that maximize the benefits of digital technologies while addressing their risks and unintended consequences . The increasing use of audiovisual educational tools is expected to expand the reach of education and increase the number of learners. Moreover, the widespread availability of computers, electronic devices, and online resources has become a crucial means of connecting professors with the scientific and technical community, helping them overcome significant challenges, particularly the shortage of physical libraries. (Ibrahim, 2003, p. 83)

Today, the world is witnessing an unprecedented revolution in science and technology, characterized by an information explosion driven by modern digital technologies. These advancements have permeated all fields, transforming their functions and services. In this evolving landscape, universities play a crucial role in preserving, retrieving, and disseminating knowledge through electronic resources.

A key development in this regard is the emergence of the Open University model, which provides an alternative educational pathway for individuals who missed the opportunity to attend traditional universities. This model promotes the democratization of education by making learning accessible regardless of geographic location.

Similarly, other innovative higher education models have emerged, including : (Hussein, 2004, p. 107)

The University of the Air, which utilizes mass media and communication tools to deliver higher education remotely.

The University Without Walls, where academic courses are broadcast via radio and television rather than being delivered in physical classrooms.

The Virtual University, which operates entirely online, enabling students to access educational content from anywhere in the world.

Most researchers agree that both universities and scientific research institutions require significant support and development to cope with the challenges posed by modern technology, the information revolution, globalization, and the evolving global system.

In response to these pressures and transformations, some universities have revamped their teaching and research methodologies by integrating digital technologies into their academic activities. They have embraced key concepts such as virtual universities, e-learning, and digital libraries to enhance educational quality and research capabilities.

In this context, Algerian universities have placed special emphasis on adapting to the digital age by establishing digital libraries a significant step toward modernizing education and scientific research in the country.

4- The Transition to the Digital Library

The transition from traditional to digital libraries marks one of the most significant shifts in the history of information management and access. Traditional libraries, while essential for centuries, were often limited by physical space, geographical constraints, and the availability of printed materials. With the advent of digital technologies, libraries have evolved into dynamic platforms that provide global access to vast collections of information resources, ranging from digitized books and journals to multimedia content and open-access databases. For decades, researchers and knowledge seekers faced the major challenge of accessing the required information. Libraries, global and local information centers, encyclopedias, archives, reports, and research studies were the primary sources of information. However, with the emergence and rapid expansion of information and communication technologies (ICTs), access to information has become widely available to the public. (Ibrahim, 2003, p. 85) As a result, the challenge for researchers has shifted from finding information to selecting the most relevant and accurate information from a vast and ever-growing pool of resources within advanced information systems and the global network (the Internet).

The information revolution represents one of the most profound transformations in modern history, fundamentally reshaping the way societies create, share, and utilize knowledge. Driven by advances in information and communication technologies (ICTs), it has accelerated the flow of data across the globe, breaking traditional barriers of time and space. This revolution has not only enhanced access to information but also redefined economic activities, educational systems, cultural exchanges, and modes of governance. At the same time, the information revolution brings with it numerous challenges. Issues such as the digital divide, information overload, data privacy, and unequal access to technological resources highlight the complexity of this transformation. While it offers unprecedented opportunities for innovation,

collaboration, and global connectivity, it also raises questions about equity, security, and the ethical use of information. .it has introduced new scientific concepts, utilizing ICTs to enhance efficiency, improve services, and ensure greater speed, accuracy, and comprehensiveness in information retrieval and dissemination. (Hussein, 2004, p. 105)

The digital revolution has profoundly reshaped the way societies create, manage, and access knowledge. Among the most significant transformations is the shift from traditional libraries to digital libraries. This transition is not limited to technological innovation; it also reflects cultural, institutional, and pedagogical changes that impact how individuals and communities interact with knowledge resources.

4.1.Defining the Digital Library

The concept of the digital library has become central to contemporary discussions on information management and access. Unlike traditional libraries, which rely on physical collections of books and journals, a digital library is a virtual space that stores, organizes, and provides access to electronic resources such as e-books, online journals, multimedia materials, and research databases. It is not only a repository of digitized documents but also a dynamic system that enables users to retrieve, share, and interact with knowledge across time and space. A digital library is more than a simple collection of electronic documents. According to Arms, it represents an organized system of digital resources, metadata, and services that support the acquisition, management, and dissemination of knowledge. Digital libraries incorporate e-books, scholarly journals, multimedia, and databases that can be accessed remotely, offering broader accessibility than traditional libraries. (Borgman, 2000, p. 222)

4.2.Drivers of the Transition

Transitions in society, technology, and institutions do not occur randomly; they are usually **driven** by a combination of internal and external factors. The term drivers of the transition refers to the key forces that push systems to evolve from one stage to another. These may include technological innovations, policy reforms, globalization, demographic shifts, or economic and environmental pressures.

Understanding these drivers is essential because they determine **the** pace, direction, and sustainability of change. For example, in the digital age, advances in information and communication technologies have accelerated the transition toward digital economies and knowledge-based societies. Similarly, global challenges such as climate change and resource scarcity are pushing nations to transition toward sustainable energy systems. Transitions in social,

economic, technological, and political systems rarely occur spontaneously; they are often the result of multiple driving forces that interact in complex ways. The notion of **drivers of the transition** refers to the underlying factors and mechanisms that push societies, institutions, or industries from one stage of development to another. These drivers can be internal such as organizational reforms, demographic changes, or technological innovations or external, such as globalization, policy pressures, environmental challenges, or crises that accelerate the need for adaptation. Several factors have accelerated this transition. First, the exponential growth of digital knowledge requires new storage and retrieval methods. Second, the demand for global access to research, particularly in academic institutions, has made digital libraries essential. The COVID-19 pandemic further highlighted their necessity, as universities worldwide relied heavily on online repositories and digital collections for continuity in education and research. (Smith, 2020, p. 330)

4.3.Challenges of the Digital Library

The emergence of the digital library has transformed the way knowledge is collected, organized, and accessed in the information age. Unlike traditional libraries, digital libraries offer vast opportunities for remote access, resource sharing, and multimedia integration, making them vital tools for academic research, education, and cultural preservation. However, despite these advantages, digital libraries face a range of challenges that influence their effectiveness and sustainability. While digital libraries offer convenience and access, they also face significant challenges. Issues of copyright and intellectual property rights remain a major obstacle to open access . Furthermore, disparities in digital literacy and technological infrastructure contribute to the "digital divide," limiting equal access to knowledge. (Borgman, 2000, p. 223) Long-term preservation of digital content and cybersecurity threats are also critical concerns.

4.4. Implications for Research and Education

The rapid transformations brought about by digital technologies, globalization, and new knowledge production models have significant implications for both research and education. In academic research, digitalization and advanced analytical tools have expanded access to vast amounts of information, facilitated interdisciplinary collaboration, and accelerated the pace of knowledge creation. At the same time, these developments raise questions about data reliability, ethical use of information, and the changing role of traditional research methodologies. Digital libraries play a transformative role in academia. They allow for interdisciplinary research, enhance collaboration across borders, and facilitate immediate access to vast scholarly resources. Students and educators benefit from the integration of digital materials into teaching and learning, while institutions benefit from

cost-effectiveness and sustainability by reducing reliance on physical spaces. (Smith, 2020, p. 332)

5-Conclusion

Based on the discussion presented, we believe that the Algerian university faces both immediate and future pressures and challenges, necessitating the adoption of specific strategic directions by the state in response to globalization. The focus should not only be on producing graduates but also on developing and supporting higher education institutions as key tools for building a knowledge-based society.

From this perspective, the Algerian university holds a significant responsibility to re-evaluate its philosophy, programs, and organizational structures to meet the demands of sustainable development within the context of the new global order. Universities aiming for excellence in performance must transform their values and invest in their intellectual resources. This transformation is directly linked to enabling individuals to acquire new skills that allow them to effectively manage and utilize information and knowledge.

The transition to the digital library marks a paradigm shift in the way knowledge is stored, disseminated, and consumed. While the benefits in terms of accessibility, efficiency, and inclusivity are undeniable, the challenges of infrastructure, copyright, and equity must be addressed. The success of this transition depends on strategic policies, investment in digital infrastructure, and promotion of digital literacy. Ultimately, digital libraries are not only repositories of information but also engines of innovation and global knowledge exchange.

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