

The Impact of Scientific Research Outputs on the Development of the Tourism Sector: Digital Tourism in Algeria as a Case Study

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Abstract:

In this research paper, we aimed to demonstrate the impact of scientific research and its outputs on the development of the tourism sector. The future of the tourism industry relies on a service-oriented tourism policy that is more focused on innovation. This policy primarily emphasizes investment in knowledge and scientific research, whose outputs are considered a mechanism for fostering innovation, promoting tourism development, and achieving competitive advantage. Additionally, we sought to present the key components and applications of digital tourism in Algeria as a case study.

Keywords: Scientific Research; Competitive Advantage; Technological Revolution; Innovation; Digital Tourism.

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Introduction:

Tourism has occupied an important position within the economic policies of many developed and developing countries alike, as tourism revenues constitute a significant proportion of the gross domestic product. International tourism witnessed an unprecedented revival during the first seven months of 2024, recovering approximately 96% of the levels that were prevalent before the COVID-19 pandemic. This recovery was driven by increased demand for travel in Europe and the reopening of markets in the Asia-Pacific region, which revitalized the global tourism sector.

According to the latest report issued by the World Tourism Organization, global destinations received around 790 million international tourists between January and July 2024. This increase represents an 11% rise compared to the same period in 2023, reflecting a gradual and steady restoration of confidence in international travel.

The World Tourism Organization's data also showed that the Middle East region led the global tourism recovery, with a 26% increase in the number of international tourists arriving compared to 2019, making it the fastest-growing region globally. Africa also recorded a 7% increase in tourist numbers compared to 2019, indicating a growing interest in tourism on the African continent.

Despite these positive results, the World Economic Forum, according to its 2024 Travel and Tourism Development Report, pointed out the growing challenges faced by the tourism and travel sector in maintaining its competitiveness. These challenges range from economic, environmental, and geopolitical issues and are expected to accelerate in the coming years with the development of modern technologies and artificial intelligence. This necessitates continuous development in the tourism sector to keep pace with these changes. In this context, the report identified the top 10 countries that managed to improve their tourism readiness in 2024, with Uzbekistan leading the list globally. Saudi Arabia ranked first in the Arab world, followed by the UAE and then Egypt (World Tourism Organization, 2024).

Study Problem:

The last decades of the 20th century witnessed a significant leap commonly referred to as the scientific and technological revolution, with one of its earliest manifestations being the emergence of new concepts, most notably Information and Communication Technology (ICT), which brought about profound changes across various fields, particularly tourism. Faced with these challenges and transformations, tourism organizations found themselves compelled to adapt to the new environment by investing in research and development activities. The outcomes of these activities largely depend on the extent to which these organizations possess innovation and creativity in tourism, which is considered a valuable competitive advantage in the tourism sector. Based on this premise, the main research question of this paper is as follows:

How do the outcomes of scientific research affect the development of the tourism sector? And what are the key components of digital tourism in Algeria as a model?

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Based on this main question, we propose the following sub-questions:

- What is the added value and actual impact of scientific research?
- What are the most important policies adopted in tourism innovation?
- What are the key features of digital tourism in Algeria as a model of tourism innovation?

Study Importance:

The importance of this study lies in clarifying the effective role and close relationship between the outcomes of scientific research and the development of the tourism sector. Innovation and the use of modern technologies in the form of applications and digital platforms have become essential in advancing tourism, especially in the face of intense competition between tourism institutions, which are distinguished by their ability to innovate and excel in offering tourism services. This provides them with a competitive edge, enabling them to remain viable and competitive in the market.

Study Objectives:

The study aims to achieve the following:

- Identify the relationship between research and development outcomes and the tourism sector.
- Highlight the policies and programs adopted in tourism innovation.
- Present the main features of digital tourism in Algeria as a model for the outcomes of scientific research and tourism innovation.

1- Fundamental Concepts of Scientific Research:

Scientific research activities are considered the main drivers of technological innovations, especially in institutions equipped with substantial laboratories and material and human resources.

1-1 Definition of Scientific Research:

Scientific research is the original and systematic investigation aimed at acquiring new knowledge or achieving a comprehensive scientific or technical understanding of a subject. Thus, scientific research deepens knowledge and is carried out by an organization to gain new insights, whether in scientific or technical areas. The research process is usually divided into two types (Ben Lakhdar & Cheni, 2023, pp. 03-04):

- **Basic Research:** This is pure research aimed at advancing science. It uses inputs such as labor, capital, and general knowledge to create new general knowledge or original results.
- **Applied Research:** This is goal-oriented research that includes original studies and seeks to identify possible applications of the results of basic research, with the aim of achieving pre-determined objectives through new applications.

Currently, scientific research activities represent the core focus given considerable importance at both governmental policy levels, by providing financial resources or legal frameworks, and at the institutional level, where entities such as universities and research centers actively engage in this domain.

1-2: Objectives of Scientific Research:

The objectives of scientific research can be summarized as follows (Goudri, 2004, p. 163):

- Discovering and enhancing knowledge, generating new ideas and concepts.
- Developing and innovating new products and improving existing ones that are in demand in the market.
- Improving and developing production or sales processes by reducing waste or loss and enhancing the competitive position of the project.
- Maintaining sales volume and market entry time.
- Diversifying products to meet the desires of the largest possible consumer base.
- Expanding sales to new geographic areas or penetrating new markets.
- Reducing the gap between invention and innovation.

1-3 Conditions for Increasing the Effectiveness of Scientific Research:

To enhance the effectiveness of research and development activities, the following conditions must be met (Saker, 2011, p. 12):

1-3-1 Attributes of the Research Director:

In large institutions, there are often dedicated personnel whose primary role is research and development. These individuals operate within an official organic structure, which corresponds to the size of the institution, and each structure is led by a manager. The characteristics that support the effectiveness of this role include:

- Mastery of management, training, and the efforts required for organizing, coordinating, directing, and controlling.
- Supervision of the project in a manner that ensures the institution's objectives are achieved.
- Careful and firm supervision of researchers and staff to ensure success.

1-3-2 Technical Competence of Research Staff:

One of the most important qualities that research staff must possess includes:

- Acquiring high-level technical knowledge.
- Having strong scientific skills.
- Being capable of effectively using specialized journals as essential sources of information.

1-3-3 Selection of Research Projects:

The precision in selecting such projects is a key element for the success of research and development programs. This process should involve the participation of all institution managers and staff to provide the necessary information. Additionally, it is important to differentiate between short-term and long-term projects. Short-term projects are typically suitable for minor improvements, while long-term projects are for major adjustments. The two types differ in terms of time, funding, and the level of risk involved.

1-4 The Role of Scientific Research in Enhancing Competitiveness:

Focusing on science and technology is one of the central indicators of a nation's progress and economic strength, and subsequently, its competitive ability. Scientific research serves as the main source for technological innovations, especially in large organizations. The larger the organization, the greater the need to stimulate research and development (R&D). Several studies have demonstrated a positive relationship between spending on research in developed countries and developing countries that import their products, along with the transfer of technology through goods and services. Importing countries' institutions may eventually uncover the specifications of these products, enabling them to imitate and invent alternatives.

Reverse engineering is one of the main avenues for industrial development and low-cost technological modernization. This method has been relied upon by East Asian countries such as China, Japan, and Korea since the beginning of their industrial rise, by replicating scientifically and technically advanced products with the aim of technology transfer.

Innovation arises from the development of scientific research activities, which is the practical application of knowledge in the form of new and improved technologies. It serves as a driving force for development and growth, equipping an economy based on R&D networks and information systems. This, in turn, improves technology and contributes to better means of achieving well-being, ultimately enhancing the competitiveness of these organizations and their respective countries (Al-Khaikani, 2010, pp. 102-103).

The research and development function plays a critical role in the core areas of an organization, aiming to create a competitive advantage as follows (Araba & Tamjagdin, 2007, pp. 13-14):

1-4-1 In the field of marketing:

Through its research, the organization gains an accurate understanding of consumer desires and preferences, enabling it to produce and deliver what best meets their needs. This effort is aimed at securing them as potentially permanent consumers. Hence, finding a new competitive advantage in marketing would allow for direct communication between the organization and the consumer. If this connection is established, the consumer becomes a key contributor to the organization in making strategic and competitive decisions.

1-4-2 In the field of production:

The production of new goods, the introduction of improvements to the organization's existing products, the ability to produce innovative new products, or finding new uses for by-products and waste can only be achieved through the knowledge generated in production research and its developments. The organization, operating in a challenging environment, is compelled to strengthen its competitive capacities and ensure the return on its efforts by continually engaging in such research and studies.

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1-4-3 In the field of materials:

Through scientific research activities, the organization gains the ability to control materials, which translates into control over production in terms of quantity, quality, and timing. This means the ability to produce new goods (or services), introduce improvements to existing products, optimize resource use, and ensure resource availability in the necessary quantities and at suitable costs. Achieving a serious competitive advantage in the materials domain is one of the fundamental pillars of competitiveness.

1-4-4 Equipment and manufacturing processes:

The knowledge produced in this field materializes in new ideas and various development proposals concerning methods, techniques, procedures, and organizational structures. These innovations aim to optimize production processes and rationalize the use of available resources. It is essential, however, to take into account the financial, material, and human resources available to the organization when conducting such research and studies.

1-4-5 In management methods and practices:

By creating a suitable working environment and finding a competent manager capable of taking on responsibilities, along with fostering a readiness for teamwork and voluntary participation, the organization can achieve optimal administrative management. This aligns the interests of individual employees with those of the organization, creating an internal climate conducive to proper, competitive work.

2- Innovation as a Tool for Change in the Tourism Sector:

Tourism innovation is a fundamental pillar on which the tourism sector relies to improve the quality of its products and services, aiming to achieve customer satisfaction and attract the largest possible number of tourists. The topic of tourism innovation has become a strategic priority for tourism institutions striving to achieve competitive distinction and maximize profits.

2-1 The Necessity of Innovation in the Tourism Industry:

Innovation is one of the most influential variables in an organization's ability to grow and sustain itself, especially as organizations expand in various fields and specializations to offer better products or services to their employees. Innovation, as a modern concept, seeks to introduce new methods that contribute to improving the organization's performance, whether it provides services or goods. Both require innovation as a process that translates new ideas into new products or services. The ultimate goal of innovation is to improve the use of resources and achieve better results compared to previous periods or in relation to competitors and their market positions.

In the context of the tourism industry, innovation entails achieving several crucial positive indicators for service industries, such as increasing productivity levels, improving quality standards, diversifying the products and services offered, and enhancing competitive capacities. These characteristics of the innovation process must

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align with the constantly changing nature of the tourism market, especially in terms of consumer tastes and preferences. This requires the adoption of innovative approaches and methods that are continually updated and characterized by a high degree of finesse and skill in dealing with customers. Tourism services are unique in that they cannot be classified as a specific, fixed product because they are usually tailored to individuals with varying tastes and desires. Additionally, tourism services or products cannot be stored or transported from one place to another as is the case with physical goods.

Furthermore, one of the most notable features of services is their perishability, such as hotel rooms and airplane seats, as well as the fluctuating nature of tourism demand and the inability to own a service. Another feature is inseparability, meaning that services cannot be separated from the service provider. Typically, the service is provided and completed at the same time by the provider.

These characteristics, among others, impose significant challenges on the tourism industry, requiring substantial efforts and appropriate measures to raise awareness about tourism services and to establish policies and various innovation programs that ensure their consumption by the widest possible customer base (Nouwari, 2016, pp. 813-816).

2-2 Factors Influencing Tourism Innovation:

Several factors determine the pace of tourism innovation, including (Weiemair, 2004, pp. 04-05):

2-2-1 Supply Changes:

The availability of new information and communication technologies has altered the competitive landscape for all economic actors. Marketing and advertising methods in tourism have undergone significant changes due to the rise of the internet, e-commerce, and the emergence of what can be termed virtual markets. Technology has created a new form of tourism business called digital tourism, which relies primarily on electronic marketing skills.

2-2-2 Demand Changes:

Customer desires and needs have shifted in response to lifestyle changes (such as demographic shifts, higher incomes, and flexible work hours), leading to changes in individual behavior. The direction and demand of customers play a fundamental role in driving tourism innovation, requiring adaptation to the interests and preferences of the client.

2-2-3 Competition:

Globalization and deregulation have intensified competition. Similar to other areas of economic activity, market conditions have promoted innovation in services (such as networks and reservation systems) rather than product innovation, as products can be easily copied by competitors.

2-3 Tourism Innovation Policies and Programs:

Among the key innovation scenarios in the tourism sector, which fall under what we call "strategic" innovation, are the following (Al-Ghazwani, 2020, pp. 165-167):

2-3-1 Radical Innovation Strategy:

This strategy is applied within the tourism industry by introducing new services and products that were previously unknown and are radically different from those already present in the tourism market. Notable examples of this innovation strategy include virtual tours using Google Earth, the creation of underwater hotels, and the use of robots in serving food and welcoming tourists. This strategy is characterized by its aggressive nature, often referred to as a "market leader" or "proactive" strategy, aimed at gaining a competitive edge by achieving the "triple lead"—the lead in ideas, lead in products, and lead in the market.

2-3-2 Incremental Innovation Strategy:

Tourism institutions adopt this strategy when they aim to defend their current market position. It is often referred to as a defensive strategy or a "follower strategy," contrasting with the aggressive first strategy. Here, the institution avoids risk and does not aim for market leadership. Instead, it adopts a defensive approach by introducing improvements and enhancements to existing products, placing them in a better competitive position without striving to make these products the best in the tourism market.

2-3-3 Differentiation Innovation Strategy:

Through this strategy, the tourism institution utilizes its ability to make several modifications and improvements to its various products to cater to specific segments within the tourism market. This strategy is typically used by small and medium-sized tourism enterprises, which aim to position their products, especially in their "maturity phase," for particular market segments. An example of this is offering economy tourism products targeted at business travelers, or adventure tourism products tailored to younger demographics, and so on.

2-3-4 Strategy of Appointing the Most Innovative:

Efficiency in work does not stem solely from the presence of modern equipment or tools but also from proper work organization and planning. This is achieved through the establishment of competent management, starting with assigning employees to tasks that match their skills, respecting their qualifications, and fostering knowledgeable leadership to achieve the desired goals. This, in turn, increases productivity. Conversely, poor organization has the opposite effect. This strategy relies on the individual efforts of committed innovators who possess high-level skills (Refai, 2012, p. 19).

2-3-5 Efficient Production Strategy:

One of the key concerns in economics is focusing on the methods through which production is carried out. Various production methods are employed as strategies to increase output, including labor-intensive production, capital-intensive production, and technology-intensive production. The tourism industry is both labor-intensive and capital- and technology-intensive. Efficient production in tourism is often tied to the concentration of capital and various foreign and local investments, which can lead to the

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emergence of new, innovative products and services in the tourism market, or the introduction of numerous improvements and developments to previously innovative products.

3- Digital Tourism in Algeria:

Digital tourism is one of the most significant applications of scientific research and tourism innovation. In this section, we will examine the model of digital tourism and explore the strategy adopted in this field in Algeria.

3-1 The Tourism Environment in Algeria:

Tourism activity in Algeria experienced a significant increase in 2023, with the total number of arrivals reaching 3,292,508 tourists, marking a 135.5% increase compared to 2022. Statistics on tourist flows in 2023 show a difference of 2,558,681 in favor of departures compared to arrivals at Algeria's borders, indicating a growing trend toward outbound tourism. The number of incoming foreign tourists grew by 66.68%, equivalent to 2,195,519 tourists compared to 2022.

In 2023, the hotel infrastructure was strengthened with the addition of 56 new hotels, offering a capacity of 6,171 beds. This brought the total number of hotels to 1,638 by the end of 2023, with a total accommodation capacity of 151,052 beds. Furthermore, travel and tourism agencies, which are among the key players in the tourism sector, reached a total of 4,999 agencies by the end of 2023. This represents a growth rate of 6%, with the entry of 507 new agencies into operation during the year, including 404 parent agencies and 103 branch agencies.

In terms of tourism investment, 2,235 projects were approved, providing a total accommodation capacity of 271,336 beds and creating 94,468 job opportunities. Additionally, the traditional crafts sector recorded the creation of 26,537 new activities in 2023, of which 17,950 were initiated by men and 8,587 by women. This led to the creation of 68,797 jobs (42,222 for men and 26,575 for women). By the end of 2023, the total number of activities had reached 447,716, with 1,159,264 jobs created (Ministry of Tourism and Handicrafts, 2023).

Tourism in Algeria has become a necessity rather than a choice, serving as an alternative resource to hydrocarbons. The tourism sector has laid out a strategy known as the Tourism Development Master Plan (PDAT) with a horizon of 2030, which was approved by the government in 2008. This plan clearly reflects the state's commitment to developing and supporting this critical service sector.

The Tourism Development Master Plan is based on five key dynamics (Ministry of Tourism and Handicrafts, 2023):

- Enhancing Algeria's appeal as a destination to increase its attractiveness and competitiveness.
- Developing distinctive tourism hubs and villages through rational investment and development.

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- Promoting a Tourism Quality Plan to enhance excellence in national tourism offerings by integrating professional development, education, and embracing information and communication technologies.
- Implementing a public-private partnership plan.
- Establishing a tourism financing plan.

3-2 Initiatives to Support Digital Tourism in Algeria:

The digital transformation in the tourism sector refers to the adoption of digital technologies to enhance the travel and tourism experience. This transformation involves changes in how tourist destinations are marketed and promoted, as well as improvements in booking processes and management, ultimately providing tourism experiences that leverage technologies such as virtual reality and augmented reality.

Algeria aims to make further efforts to develop and promote its tourism potential by utilizing modern technologies, such as specialized websites and applications that help disseminate and share various activities and events it organizes, in addition to showcasing its tourist sites. Some of the most important applications that significantly contribute to promoting tourist sites in Algeria include:

3-2-1 Safarway Application:

This is an excellent option for all travel and tourism enthusiasts worldwide. Launched in May 2020, it has attracted over 180,000 users due to its many diverse options (such as booking flight tickets, hotel reservations, selecting the best restaurants and tourist sites based on tourist reviews, and offering GPS services, among others).

The application saves time and effort in selecting the most suitable tourist destination and allows users to create their own profiles where they can upload photos from their trips, share travel experiences with other users, and write reviews about the hotels they stayed in, the restaurants they chose, and the tourist sites they visited. This makes it particularly appealing to Arab tourists, as it is the only application available in Arabic (El Wassat, 2024).

3-2-2 Murshid Algeria Application:

This app promotes local tourism and operates in three languages: Arabic, English, and French. Currently, it is limited to tourist attractions in the capital, Algiers, providing details on various sites, including their history, location, and directions on how to reach them. The app, which can be downloaded on smart devices running Android or iOS, helps users discover the key tourist spots not to be missed when visiting the capital. Soon, the app's content will be expanded to include all provinces and their main tourist attractions, with plans to turn it into an indirect communication platform (Ministry of Tourism and Handicrafts, 2024).

3-2-3 M'zab Valley Heritage Sites Application:

This mobile application, available for download via "Play Store" and initially designed in Arabic, provides users with information about the various historical sites and palaces in the M'zab Valley, which was classified as a UNESCO World Heritage site in

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1982. The application will soon be available in both French and English, offering interactive lists and maps of all the historical sites in the M'zab Valley. It allows tourists and researchers to explore the region using their smartphones (Algerie Presse Service, 2024).

3-2-4 Siyaha.DZ Tourism Application:

This Android application aims to facilitate travel and mobility for both clients and agencies. The app provides a platform for travel agencies to promote their services and products, while clients can find information and advice about their preferred tourist destinations. In addition to easing communication between agencies and clients, the app offers highly customizable advertising formats tailored for travel brands, enabling airlines, hotel chains, and other companies to directly target their intended audience (National Tourism Office of Algeria, n.d.).

3-2-5 Transportation Applications:

Algeria has several active applications offering transportation services for individuals (tourists, visitors, or daily commuters), known as VTC (Tourist Vehicle with Driver) applications. These apps make tourist vehicle services more accessible and are known for their reliability and lower prices compared to official taxis. Some of the best VTC apps in 2023 include (Lina Store Travel, n.d.):

- **Yassir Application:** With a user base of over 2 million clients and 5 million downloads from multiple countries, Yassir is highly suitable for transportation needs, whether for families, individuals, or visitors. The app is very easy to use—simply set your departure and destination points, select the type of car required, and confirm the service request. The app calculates the travel cost instantly, with the option to pay in cash or via bank cards.

- **Tem Tem Application:** This is another prominent transportation app, offering services in 39 Algerian provinces. In addition to transportation, it provides other services such as the sale of consumer goods, remote mobile and internet recharging without the need to travel. The app has garnered half a million downloads to date, reflecting the level and quality of services it offers to both domestic and international travelers. It also accepts payments via local or international bank cards.

- **Air Algérie Flights Application (Vol.dz):** This application allows users to book flight tickets at the best prices electronically, without the need to travel physically, for more than 30 domestic and over 40 international destinations. Other features include the ability to pay in cash, via the Gold Card, or bank cards, and to select your preferred seat and meal, if available.

3-3 Challenges and Opportunities of Digital Tourism in Algeria:

Digital tourism in Algeria faces a set of challenges and opportunities, which we will present as follows:

3-3-1 Challenges:

Digital tourism encounters several obstacles, including:

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A. Cybersecurity Challenges:

With the increasing use of digital technologies in tourism, it becomes essential to protect the personal and financial data of tourists. Thus, it is crucial for institutions involved in tourism to adopt necessary policies to safeguard data and prevent its misuse for purposes other than those declared.

B. Training Tourism Workers on Digital Technologies:

The digital transformation in tourism requires training employees to use digital technologies and platforms to ensure high-quality digital service delivery. Some workers in the sector may face difficulties in adapting to certain technologies or may prefer traditional methods of work.

C. High Cost of Investment in Digital Tourism:

Organizations in the digital tourism sector face the challenge of high initial investment costs for advanced digital tools such as apps, platforms, and more, especially for small and medium-sized enterprises.

D. The Digital Divide Among Tourists:

There may be a gap between tourists who possess digital skills and those who do not, which could prevent some tourists from fully benefiting from digital travel experiences.

3-3-2 Opportunities:

Digital tourism is not just a necessity but also an opportunity to adapt to the rapid changes in travel methods and tourist expectations. Modern technologies and their integration with human elements contribute significantly to improving the travel experience and increasing the number of incoming tourists.

4. Conclusion:

In light of the emerging realities brought about by economic globalization, including rapid advancements in knowledge and technology, organizations across various sectors, especially the tourism industry, have been quick to seek ways to keep pace with these challenges and changes. Among these ways, scientific research has become increasingly important due to its ability to introduce new ideas and improve organizational performance.

Innovation, which is the result of scientific research and development, has become a fundamental requirement for tourism organizations aiming to create a strong competitive advantage in the market and achieve sustainable development. Digital tourism is one of the most significant examples of tourism knowledge and innovation, allowing for the preservation of tourist consumer loyalty in an environment characterized by digitization and technological advancements. Like many countries around the world, Algeria has been influenced by the digital transformation, as evidenced by the various digital applications and platforms it seeks to incorporate into different sectors, particularly the tourism sector, thereby promoting its rich and diverse cultural and natural heritage.

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