THE IMPORTANCE OF NANOTECHNOLOGY FOR THE DEVELOPMENT OF THE ALGERIAN ECONOMY: A SWOT ANALYSIS

Nebia Mostefai  
*University of Saida Dr Moulay Tahar, Algeria*  
ORCID: https://orcid.org/0000-0002-1632-8479

Azzeddine Nezai  
*University of Saida Dr Moulay Tahar, Algeria*  
ORCID: https://orcid.org/0000-0003-0091-2993

Noureddine Abdellah  
*University of Saida Dr Moulay Tahar, Algeria*  
ORCID: https://orcid.org/0000-0001-8480-1179

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**Purpose.** The purpose of this study is to analyzing the environment of nanotechnology, and it uses in the Algerian economy, and determining strategies for developing nanotechnology in Algeria as a strategic option for economic diversification based on the results of this analysis.

**Results.** The study showed that there is an overall growth in the market share of nanotechnology, while in Algeria there is dynamism in this industry, but it is slow. The results of the study analyzing the environment for the application of nanotechnology in the Algerian economy have proven that there are strengths specific to the economy of this country in terms of the existence of energy, agricultural, water and human resources. These strengths were accompanied by opportunities linked to the large size of the Algerian market, and to the strategic geographical location of Algeria with the availability of major infrastructures. On the other hand, the application environment of this technology has weaknesses, most of which are related to organizational and management problems and technological backwardness. Four strategies have been proposed for the successful application of nanotechnology in order to develop the Algerian economy on the medium and long horizon.

**Scientific novelty.** The scientific novelty of the results obtained is the treatment and the study of the possibilities of development of the Algerian economy by approaching the theme of nanotechnology as a source of economic diversification in Algeria. A strategic diagnosis of the environment for the application of this technology in the development of the Algerian economy, giving strategic solutions based on the results of this diagnosis.

**Practical value.** The SWOT analysis approach has become a modern strategic analysis approach to diagnosing the environment of any important subject. In our study, the SWOT approach allowed building a clear conception of the application environment of nanotechnology as a source of economic diversification. The proposed SWOT matrix strategies can be considered as mechanisms used by decision makers in order to achieve the success of the application of nanotechnology as a source of economic diversification in Algeria.

**Key words:** nanotechnology, strategic vigilance, economic intelligence, SWOT analysis, Algeria.
Introduction. The world is going through the fourth industrial revolution, which is headed by technological developments, its products cover global markets and it has also become an effective tool in creating economic diversification, relying on advanced scientific knowledge.

But this scientific and technological development has created strong and weak states -so to speak-, the first is the owner of the scientific abundance included in the production of various goods and services, which in turn gave production intensity, and the second, which is the receiving states of those commodities, or rather the consuming countries, which are accustomed to importing ready-made goods due to the scarcity of scientific knowledge and technological developments in them, which made them low-headed for the first category, even though they possess most of the primary resources to create wealth and also benefit from technological developments.

Among the most prominent of these developments is nanotechnology, which has entered the world in the era of the micro-digital revolution, as the nanotechnology market is booming and totals trillions of dollars in developed countries. Thus, innovation in this area is an opportunity and can also be a mitigating factor that can ensure the social and economic development outside hydrocarbons of a country like Algeria.

Accordingly, an increasing number of initiatives related to nanotechnology research, education and industry have recently been launched by Algeria to quickly build scientific capabilities and track global developments in the field of nanotechnology [1]. The Research Unit in Nanotechnology and Science (URNN) was established in 2017, and the achievement project was approved by The Scientific Council, the Board of Directors of the Center for the Development of Advanced Technologies (DTA), and the Permanent Sector Committee (CSP) of the Ministry of Higher Education and Scientific Research. Accordingly, the interest in nanotechnology among other promising technologies is linked to the new phase of reform economic development in Algeria with a focus on science and technology (S&T) to promote sustainable development [2].

On the other hand, despite the rapid development in the field of nanotechnology globally, Algeria is still progressing at a slow and modest pace towards research, development and application in the field of nanotechnology. From this point of view, it has become necessary to analyze the environment of the applications of this technology in various sectors in order to identify the strengths and weaknesses, the opportunities and the threats that characterize this technology in Algeria, and to adopt clear strategies for the development of this technology and its uses.

To learn more about this technology and its applications and the benefits it brings to the Algerian economy, we can highlight the following issue: what is the importance of nanotechnology and its applications in the economic sectors in Algeria?

Review of literature. 1. Definition of nanotechnology. The study does not focus on nanotechnology as a purely scientific and physical subject, which requires careful analysis of this technology, but the study focuses on the importance of this technology
as a tool that can play an economic role in creating an economic diversity of products. Moreover, we will be exposed to a simple definition about nanotechnology and its applications in some sectors, without diving deep into its applications and application methods.

Accordingly, some specialists define it as infinitesimal technologies [3] or as a technology made with the smallest unit of measure.

The name “nanotechnology” is derived from the name of nanometer, which is a unit of measurement equal to one billionth of a meter and 100 times smaller than the DNA molecule and it is originally a Greek word “nano” which means “dwarf” [4].

The name “nanotechnology” is given to any technology that works at the level of infinitesimals. It is also considered as the science of modifying molecules or atoms to create products that achieve high economic returns at low costs [5]. It is also known as an application of various physical, chemical, biological, engineering, medical, and pharmaceutical sciences, and it is used to design and manufacture tools and equipment at a scale not exceeding 100 nanometers through the gathering of atoms [6].

2. The historical development of nanotechnology. The world learned about nanotechnology through the scientist Richad Feynman in 1959 when he indicated that there are many rooms at the bottom, but it has the ability to do very accurate work [7]. That was the starting point for studying new technology. And was embodied in reality by the American scientist Drexler who published a book entitled “Creation Engines” in which he talks about atoms and molecules as basic components that must be reached for technology to control, and that was in 1986 [8].

However, it is very clear that the period of use of nanotechnology cannot be determined. At the end of antiquity and the beginning of the Middle Ages, specifically in the fourth century AD, the cup of the Roman Emperor Lycurus contained gold and silver nanoparticles, when the cup is exposed to a light source, its color changes from green to dark red [9].

3. The impact economic of nanotechnologies. The emergence of nanotechnology has unlocked huge prospects for developing new products and applications for a wide range of industrial and consumer sectors, as new technological developments have opened up a multi-billion dollar industry in recent years, and the global market impact is expected to reach one trillion US dollars by 2015, with about two million workers [10], and today nanotechnology is a research priority not only for the United States but also for various European and Asian countries. Thus, the period 2000–2010 was marked by the emergence of nanotechnology. According to a recent report by the World Technology Assessment Center (WTEC), nanotechnologies will be widely used in 2020 and will have a significant impact on our lifestyles, production, communications, energy use, and the preservation of our environment [11].

We must therefore pay attention to this technology to achieve economic objectives. For example, the European Union has set up scientific programming in the field of nanotechnologies through several complementary measures aimed at positioning itself as an international leader. The “Nano Action Plan 2005–2010”
defined in 2004 included 8 objectives[12]:
  - Combine research, development and innovation;
  - Existence of European infrastructures and centers of excellence (localization and network policy);
  - Strengthening human resources: interdisciplinarity, networking and mobility;
  - Promote industrial innovation: safe products, standards and intellectual property protection;
  - Integrate the societal dimension by responding to expectations and concerns;
  - Protection of public health, the environment and consumers;
  - International cooperation: knowledge exchange with count;
  - Have a coherent and visible strategy at European level.

4. Nanotechnology applications in various sectors. The underlying drivers at the heart of most nanotechnology applications are the potential to improve material properties, develop new functions and/or reduce the amount of (chemical) materials needed for a function. The global interest and huge spending on research laboratories dedicated to this technology has given it endless applications, and a great benefit that made it penetrate all sectors, it has even been called a multifunctional technology. In this context, we will present an important number of sectors that have hosted nanotechnology, namely:

  Energy. The world’s demand for energy varies, but it is increasing. That is why it has become very necessary to rely on nanotechnology in the production of photovoltaic or thermal energy, depending on the consumption of solar energy, because it works to raise the efficiency of use and reduce costs [13].

  The thing that causes concern in the energy industry is what some studies have found that indicate the demise of traditional energy sources in the future, such as oil, because of accumulated uses as opposed to nanotechnology.

  In terms of energy consumption, nanotechnology is a way to rationalize electricity consumption for lighting, as light bulbs convert only about 5 % of the electrical energy into light.

  As for the efficiency of energy production, the lighting efficiency can be raised by using nanoparticles that operate at a different rate than the internal combustion rate [14].

  Food. Like any other sector, the food industry is driven by innovation, competitiveness and profitability. Food benefits from nanotechnology in terms of packaging and in terms of the product itself; in terms of packaging, nanoparticles are employed by using silver, magnesium and zinc in the food industry so that they are more solid, light and resistant to temperature changes, in addition to preventing oxidation and preventing the growth of microbes. Nanotechnology can also produce foodstuffs that replace animals and grains with carbon, hydrogen and oxygen atoms in the air and water [5]. One example is a chitosan based Nanobiopolymer developed which has antimicrobial properties, useful for coating surfaces that will come into contact with food, and is also a naturally occurring biomaterial [15].
Farming. Nanotechnology creates a radical change in agricultural production systems, from the production process to preservation to processing to packaging to transportation and then to waste treatment. This technology is involved in the production of pesticides and Nanofertilizers that increase soil fertility. It also facilitates the process of plant absorption of nutrients and fertilizers, which leads to faster growth of plants and improvement of their products, and the applications of nanotechnology in the food and agricultural sector include the development of new functional materials and products in addition to methods and tools to ensure food safety and biosecurity [16].

Medicine. The medical field was also more fortunate in the applications of nanoscale, and as a result of the huge uses, whose size is not estimated, we will be satisfied with some medical fields such as:

(a) Diagnosis. The small-sized particles used in this technology gain access to the human body, blood and cells, as they can facilitate the diagnostic process in laboratories such as using nanoparticles to identify the genetic sequence of any sample under examination and diagnose the disease in the fastest time. It also plays a major role in reducing drug consumption by delivering the drug directly to specific cells, and depositing the drug in the diseased area only.

(b) Treatment of cancer and thrombosis. They are used in the treatment of cancer diseases by using nanoparticles that are directed to cancer cells with the drug and prevent their spread instead of using traditional chemotherapy. The international research laboratories seek to reach the manufacture of laboratories that can be carried in the palm of the hand, and the manufacture of robots smaller than the head of a pin, which can enter and move in the blood veins and are able to perform very precise surgeries. It can also treat clots by expanding blood arteries very efficiently by using Nanorobots that remove clots from the arterial wall without surgery and at lower costs [13].

Water. Nanotechnology helps in the process of filtering water from all impurities and pollutants, eliminating all pathogens that result from water consumption, and it also works to filter salt water (desalination), all with high efficiency and in short time [17].

Harvard studies indicate that the Algerian economy is in dire need of economic diversification in order to create growth and economic development, and that through the economic structure, which in turn depends on the extent of diversification and development in production capabilities, especially in exports, and this is proven by the study of Lazhar [2], whose content revolved around the efficacy of the economic diversification model adopted by Algeria since 2016 and the most important challenges it faces, especially with the sharp decline in fuel prices, as this study found the weakness of the Algerian economy in diversifying its structure, and there was no diversification of exports specifically. In another study [18], it was found that the Algerian economy has not yet known the level of diversification and is still aware of its oil dependency.
Materials and methods. The purpose of this study is to analyzing the environment of nanotechnology, and it uses in the Algerian economy, and determining strategies for developing nanotechnology in Algeria as a strategic option for economic diversification based on the results of this analysis.

1. Objectives of the study.
- Highlight the role of nanotechnology in economic development;
- Explain the concept Interdisciplinary by clarifying the relationship between the physical, chemical, engineering and economic sciences in nanotechnology, and its benefits in the economic field in Algeria economy;
- Diagnosing the environment of nanotechnology and its uses in the Algerian economy;
- Building strategies for developing nanotechnology in Algeria as a strategic option for economic diversification.

Through this study, we can also discuss the adoption of nanotechnology as one of the technological ways that can be a key to diversifying the economic incomes of the Algerian economy. It is a measure that goes beyond human perception, scientific and traditional concepts and techniques.

2. Methodology of the study. In order to respond to the problems of the study and to verify the hypotheses of the study, we followed the descriptive analytical approach by reviewing the concepts related to nanotechnology and its applications and by analyzing its economic impact, and on the basis of the results of the SWOT analysis, we have suggested potential strategies for the successful application of nanotechnology as an option for economic diversification in Algeria.

3. Strategic vigilance for the application of nanotechnology in the national economy. Thomas Edison says “1 % is inspiration, 99 % effort and brow sweats”, this phrase in itself summarizes all that we want to mention. Development in all areas of life and sectors requires a greater effort and a challenge to the prevailing circumstances, and by all the means that we have and which avoid negative consequences.

Although both strategic vigilance and economic intelligence are elements that the corporation relies on to confront its competitors and remain in the market, we can benefit from its application to the national economy by how to seize available opportunities and search for solutions to confront threats that express weaknesses that plague the national economy.

With the knowledge that we consider “nanotechnology in itself” an available opportunity and at the same time a point of strength to revive the national economy, although we are looking for how to apply it.

Strategic vigilance depends on the fusion of technological vigilance, competitive vigilance, environmental vigilance and other types of vigilance to finally come out with a decision that serves the economic interest. And in the right way, this strategy allows the continuation of activities despite external and internal threats [20].

We can offer four important strategies, or the so-called SWOT matrix, as follows: S-O: Strategies (Strength-Opportunities Strategies);
W-O: Strategies (Weaknesses-Opportunities strategies);
S-T: Strategies (Strength-Threat Strategies);
W-T: Strategies (Weaknesses-Threats Strategies).

These strategies require caution for the success of the nanotechnology project in the field of its applications in order to reach the revival of the national economy.

In the beginning, we must present the meaning of the terms used.

**Strengths.** They are the available elements that lead to the success of economic projects, including the strength of the national economy [21].

**Weaknesses.** Expresses the elements that must be addressed and turned into strengths or avoided in smart ways [21].

**Opportunities.** Expresses the available elements or means that can the national economy used to benefit from them, and they can be internal opportunities in the local sense or external opportunities in the foreign sense, and we have the ability to exploit them [22].

**Threats.** Factors or effects, causing dangers and leading to the failure of economic projects, and they can also be internal or external [22].

In order to benefit and exploit all the previous points and the success of economic projects and the application of nanotechnology, we must harmonize all points in the presence of all threats and reach alternative strategies, knowing that we seek to apply nanotechnology in all economic projects, which calls for decision-makers to rely on vigilance and economic intelligence.

**Results and discussion.** 1. **Nanotechnology in Algeria.** At a time when studies indicate that the global market for nanotechnology is expected to exceed 125 billion US dollars by 2024, and this is according to the “Research-and-Market.com” report, where nanomaterials acquire the highest market share in the global market for nanotechnology. Nanoparticles own more than 85 % of the global market share for nanomaterials, and according to applications, the first three applications of this technology are as follows: electronics, energy, and biomedicine, which owns 70 % of the global market share for nanotechnology.

In terms of global defense, the market scored about 3 billion US dollars in 2017, and the automobile market acquired approximately 5 % of the global market share for nanotechnology [19].

In light of this global momentum in nanotechnology, Algeria is moving at a weak pace towards research and development in the field of nanotechnology, because, as we noted earlier, the Research Unit in Nanoscience and Technology (URNN) was established only in 2017. Among the tasks of the Nanotechnology Research Unit are the following: scientific research and development; partnerships with governmental, private, social and economic actors and collecting CDTA, CRTT, CNRDPA, CDER.

However, in the last framework agreement for scientific and technological cooperation that was concluded on September 22, 2020, the research unit for nanotechnology was not present, which expresses a lack of interest in this field despite it being units that are brought together by scientific research and technological
development. This explains the absence of a possible strategy for implementation in the future. The field of nanotechnology, which we seek to make it an effective tool in economic diversification and create an alternative to the income of the economy by integrating this technology in all sectors, especially those marginalized sectors, although it is considered a source of wealth besides the hydrocarbon sector, and through it we achieve the distant dream; a dream of “Economic balance”.

Through the tasks of the unit in charge of research in the field of nanotechnology, the size of the gap between Algeria and the countries of the world that has included this technology in its products, in its medical, agricultural and other sectors, becomes clear. As most of the products marketed in the world markets are a source of nanoparticles, while Algeria is still opening up a unit of two tasks for it.

Through the above, and to make this technology an effective tool in the Algerian economy, we will try to drop the SWOT analysis and matrix by searching for all the strengths that express the opportunities available for the application of this technology and then looking for weaknesses that express the threats facing the Algerian economy, which it forms a barrier in front of it that prevents it from applying this technology and creating diversity, but this depends on its vigilance strategy supported by economic intelligence.

2. SWOT analysis of nanotechnology in the Algerian economy.

2.1. The strengths of application of nanotechnology. As we have previously mentioned that strengths are the elements that can be used for the success of any economic project. The available resources necessary for the economy are:

Natural resources, such as minerals of all kinds, which can be extracted, transformed and utilized more in the industrial sector.

We referred at the beginning to the applications of nanotechnology in the field of industry, which are unlimited. For this reason, countries that do not have a source of raw material for industry have come to dominate world markets with their nanoparticles. So how can a country that owns all kinds of raw materials, proceed to import those industrial goods?

Wood material of all kinds, and this includes converting it into wooden supplies, whether intended for furniture of all kinds, shipbuilding, or otherwise.

Each material in the era of the nanoscale revolution will give greater returns, if nanotechnology can penetrate the wood industry, and give the consumer comfortable output with a lower cost and a short time.

The agricultural field: agricultural lands cover the largest part of the total area in Algeria, including the desert lands, and the diversity of agricultural products according to the diversity of the agricultural regions and the climate. This field alone is considered as an element of wealth creation in Algeria, and when following the American approach in taking care of this source, by using Nanofertilizers and Nano-pesticides, this gives a greater return than agricultural products. In animal husbandry field, meat is another of the commodities in increasing demand, and in order to increase our animal products, it must be taken care of by treating it with Nano-pharmaceuticals, and giving it Nano-
foods that help it grow rapidly, and give it physical strength.

Solar energy: Algeria knows sunny weather all year long, especially as it has become the subject of the hour, and a source of renewable energies that others need. By using nanotechnology that the world has reached in this field, we can come out with a new source of wealth, knowing -as we mentioned earlier- that the global demand for renewable energy is growing strongly.

Fuels as a raw material and petroleum refining benefits by making use of its derivatives: nanotechnology is able to introduce modern technologies in the extraction and prospecting of hydrocarbons instead of relying on foreign companies. Then, benefit from petroleum derivatives in the industrial field, especially in the field of using gold and silver nanoparticles that give the manufactured materials rigidity and light weight.

Tourism sector: Algeria is famous for its beautiful scenery and tourist areas. On this point, some may ask: How do we apply nanotechnology in the tourism field? The answer is that some countries -that depend on tourism- provide Nano-tourism services that help attract tourists. The UAE, for example, provides in its hotels pillows that flash in the dark, and bed sheets that read and adjust the body temperature and this is for the comfort of the guest.

The human resource: annually, thousands of people graduate from universities, institutes and professional training centers, and hold qualified levels for employment. Among these people are those who have the ability to work in the field of nanotechnology, and others who carry smart ideas that the productive institutions and factories in the field of innovation and commodity diversification can benefit, thus avoiding the risk of competition, and giving them a longer life in the market, especially when their products are in line. As marketing has become a profession that many of our young people care about.

2.2. The weaknesses of application of nanotechnology. When we talk about weaknesses, we mean by them the defects that must be eliminated or improved and turned into strengths, and with regard to this type of strategy, the weaknesses of the Algerian economy can be summarized as follows:

Knowledge economy and interest in technology. Algeria knows a reluctance to pay attention to scientific knowledge and interest in technology by depriving those interested in research of capital and not qualifying laboratories according to international standards, which led to a brain drain to foreign countries.

Not linking scientific research centers with economic institutions. The latter must benefit from what the research laboratories have reached, as they work to apply the results of research in their production processes in order to be able to integrate the findings of researchers, the aim is to achieve the goal that revolves around the diversity of sources of economic wealth.

Reluctance to create diversity. Since the Algerian economy entered into an economic crisis in 1986, economists have been calling on previous governments to create economic diversification by paying attention to other sectors such as agriculture,
industry, and tourism, and not to rely on hydrocarbons as a main resource for the economy. However, we always know the same path and the same fate.

Monopolization of projects by government institutions and marginalization of the private sector.

*The absence of accountability.* It is the most important element of good governance, which helped to disburse misplaced financial resources.

The absence of control for public funds which leads to the waste of public money without an expected economic renaissance.

2.3. *The opportunities of application of nanotechnology.* It is the most powerful stage in which the economy is in dire need of economic intelligence, to seize those opportunities that are available and unexploited, as we mentioned earlier, these opportunities can be internal or external, what is important is the ability to exploit what is available. We can mention a group of available opportunities such as:

*Market size.* Which is characterized by a large size and we mean by it “the size of the increasing demand for goods and services”. When exploiting the resources mentioned previously- and when they are converted into products using nanotechnology, this reduces the intensity of nanoscale consumer imports, whether on basic or luxury materials on the one hand, and on the other hand, employing these available resources means providing additional jobs, reducing unemployment, and achieving extra income, thus improving citizens’ purchasing power and reducing poverty.

*Geographical location.* Algeria is characterized by a strategic geographical location, and it can benefit from the neighboring African markets by increasing its nanoscale exports to these markets, especially for some commodities that may be scarce in the markets of these countries, for example olive oil and all kinds of natural honey.

Foreign relations allow the Algerian government to launch a campaign to promote its products and encourage exporters to export to the markets of these countries, and it can also benefit from the nanotechnology development of these countries.

Infrastructure, especially roads, ports and airports can be exploited in the field of foreign trade, especially as we are in the middle of three continents (Europe, Asia, and Africa).

2.4. *The threats of application of nanotechnology.* These threats can be internal or external factors and influences, including:

- Excessive dependence on fuel revenues;
- The marginalization of all other productive sectors;
- Poor levels of research laboratories, which prevents them from not continuing the search to the last stage and obtaining positive results;
- Lack of concern for technological development and its uses;
- The link between financial capacity and fuel revenues weakens the capacity of scientific research and technological development;
- Lack of motivation for researchers and lack of coordination among them, which
constitutes a dispersion of ideas and results reached;
- Lack of quality in the products of goods and services, which causes consumers to alienate consumers from consuming local products;
- Consumer preference is oriented towards imports;
- The widening technological gap between Algeria and most countries of the world;
- Failure to adapt to the global market.

3. The potential strategies for applying nanotechnology in Algeria economy. After knowing all the strengths, weaknesses and opportunities available for exploitation, the SWOT Matrix strategies can be considered as challenges that decision-makers put their sights on for success in the application of nanotechnology, which are the four previously mentioned strategies:

3.1. The strength and opportunities strategy. This strategy is called the offensive strategy, and the decision-makers of each country wish to be in this situation, so that they possess both strengths and opportunities, and in this case they can include nanotechnology in all products of goods and services. This results in a diversification of commodity and service products, in addition to the availability of a market opportunity, which is expressed in the volume of demand for these goods. This gives strength to the economy by reducing imports of various foreign commodities, whether they are food or medicine consumer goods, or agricultural such as plant fertilizers, or clothing. This technology avoids the risk of competition from foreign commodities dependent on nanotechnology applications and we can support and diversify our exports. This strategy is considered the best for the national economy in terms of creating diversification in incomes.

3.2. The weakness and opportunities strategy. It is also called the harmony and support strategy. Decision-makers in this case seek to improve internal weaknesses. If they do not have strengths but have some opportunities, then they should try to exploit those opportunities in the application of nanotechnology and convert weaknesses into strengths, and this can be done in the Algerian economy through:
- Strategists in this case could rely on the counterfeiting of some nano-products;
- Foreign investment can be used as an opportunity in the field of nano-production;
- Partnerships can be made with foreign investors in the same field;
- Acquiring all forms of technology, whether through direct purchase, property rights financing, or obtaining licenses and strategic alliances;
- Take advantage of the Algerian immigrant brains;
- Cooperation between the public sector and the private sector together in the field of nanoscale.

3.3. Strength and threats strategy. In this as, the strategy focuses on exploiting the strengths available to decision-makers, in order to avoid the impact of threats or at least reduce them. What threatens the Algerian economy and what threatens nanotechnology is the excessive dependence on fuel revenues. When their prices collapse, this causes a
financial crisis, and it stands as a stumbling block in the way of financing projects related to technology and its development. This is the biggest threat indicator, and it prompts us to take into account the diversity of production structures and the diversity of their outputs through the use of available wealth and modern technology. Thus, the national economy entered into the import substitution policy, by meeting the requirements of the local market with what is local.

3.4. The strategy of weakness and threats. A defensive strategy is included in this field, through which decision-makers try to get rid of weaknesses, and at the same time avoid threats, and it is the most dangerous strategy, where internal weakness meets an external threat. In such a case, the companies works to make efforts to survive or disappear, the economy may turn to external debt, which is considered a trap from which it is difficult to get out, or rather, eliminate the future of next generations. If the economy has reached this state, then this means that the decision-makers do not know to keep pace with the Fourth Industrial Revolution, which does not know the limit of saturation from technological developments. Currently, it has reached the use of nanoparticles in all its products and businesses, and in the future it will arrive to integrate artificial intelligence with nanotechnology and create Nano-robots ready to make decisions in the place of humans. In addition, if we talk about the Algerian economy upon reaching such a strategy, what the decision-makers should do is make efforts to exploit all resources, reduce the volume of imports and import intermediate goods or some raw materials to meet some market requirements, even if the raw materials allocated for production are nanoparticles. This forces the producers to have scientific knowledge of how to use it in their products and to move towards a nanoscale production culture.

Conclusions. Since the economic crisis of the early eighties, the Algerian economy still suffers from the same defects, and is moving in the same direction, depending on hydrocarbon revenues, and neglecting all productive sectors, even though Algeria is rich in its resources.

Through the strengths and weaknesses of the Algerian economy, the national economy can come out of its shell by introducing a new global technological development, which is nanotechnology, to narrow the gap between the Algerian economy and the global economy.

It is also possible to benefit from the strategies presented as challenges, which are strategies that belong to the decision-makers of the institution, but can be exploited in the economy as a whole.

Accordingly, through the search results, we recommend the following:
- Increasing interest in scientific research and technological development in research centers and linking it to economic institutions;
- Implanting a culture of nanotechnology among producers, which will defeat them from the intensity of competition from the West;
- Increasing focus on nanotechnology, or as some call it the Nano-digital revolution;
Take into account the evolutions and challenges of the development of this technology in terms of the safe design of nanomaterials by evaluating the safety at the design and innovation stage of the development of these materials in order to reduce the cost of risks.

The scientific value of the results obtained is the treatment and the study of the possibilities of development of the Algerian economy by approaching the theme of nanotechnology as a source of economic diversification in Algeria. A strategic diagnosis of the environment for the application of this technology in the development of the Algerian economy, giving strategic solutions based on the results of this diagnosis. The proposed strategies can be considered as mechanisms used by decision makers in order to achieve the success of the application of nanotechnology as a source of economic diversification in Algeria.

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