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The role of spatial analysis in providing stimulating information to attract foreign investment to Algeria - a survey field study-

دور التحاليل المكانية في توفير المعلومات المحفزة لجذب الاستثمار الأجنبي للجزائر –دراسة ميدانية استقصائية–

Kebaili Abdennour [1*], Deghmoum Hichem [2]

[1] University of Algiers 3, kebaili.abdennour@univ-alger3.dz ,

[2] University of Algiers 3, deghmoum.hichem@univ-alger3.dz,

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Abstract

This research aims to clarify the positive role that spatial analyzes using geographic information systems GIS can play in providing stimulating information to attract foreign investment to Algeria, through the production of thematic and spatial maps that support making sound decisions related to the possibility and location of investment.

Through this research, we concluded that the use of GIS spatial analyzes can contribute to supporting the efforts of the Algerian government to increase its attractiveness to foreign direct investments and improve its investment climate, as well as accompanying investors and helping them to continue and expand their investment projects.

Keywords : Foreign direct investment, Geographic information systems, Spatial analyzes, Thematic analyzes.

ملخص

يهدف هذا البحث إلى إبراز الدور الإيجابي الذي يمكن أن تلعبه التحاليل المكانية باستخدام نظم المعلومات الجغرافية في توفير المعلومات المحفزة لجذب الاستثمار الأجنبي للجزائر، وذلك من خلال إنتاج خرائط موضوعية ومكانية تدعم اتخاذ القرارات السديدة المتعلقة بإمكانية لاستثمار وموقعه.

ولقد توصلنا من خلال هذا البحث إلى أن استخدام التحاليل المكانية لنظم المعلومات الجغرافية يمكن أن يساهم في دعم جهود الدولة الجزائرية لزيادة جاذبيتها للاستثمارات الأجنبية المباشرة وتحسين مناخها الاستثماري وكذا مرافقة المستثمرين ومساعدتهم على استمرارية مشاريعهم الاستثمارية وتوسيعها

الكلمات المفتاحية: الاستثمار الأجنبي المباشر، نظم المعلومات الجغرافية، التحاليل المكانية، التحاليل الموضوعية.

* Corresponding Author

1. INTRODUCTION

Our current era is experiencing a technological and economic development that has not been witnessed before. Modern technologies, including Geographic Information Systems (GIS), as well as information and communication technologies have allowed linking this world to a global network that made it a virtual digital world in which all borders have become more open and liberal in the face of goods, services and foreign investments, who is become an alternative source of indebtedness for financing development and reviving the economies of countries and a reason for acquiring modern technology and modern management and management methods. In view of the effective role of foreign direct investment in advancing development, improving the efficiency of human resources and acquiring expertise, management skills and rational leadership, the issue of attracting foreign direct investment has become one of the first priorities of countries' development policies, as it has become a market in which competition intensified between countries to win the largest share of these investments, by trying to improve and upgrade all factors affecting the investment climate, which are numerous and diversified in our days to include elements and components Until recently, it was considered secondary and ineffective, and the location of the investment or its geographical area is one of the most important decisions that the investor can take, as his choice is a strategic choice that cannot be undone in the short or medium term, while the investment climate is the environment in which he will grow up. And it grows, so the success and prosperity of any investment depends on these two factors.

Faced to this fact, we found an imperative need to carry out a study aimed to highlighting the positive role played by spatial analyzes, which is the main pillar and strength of GIS, in providing spatial information that would motivate foreign investors to invest in a country that uses and adopts these technologies and makes its investment climate more interesting and attractive for these investors.

We will work through this study to exhibit the role that spatial analyzes can play in providing stimulating information to attract foreign direct investment, based on the search for the appropriate answer to the following problematic:

The problematic: How do spatial analyzes using geographic information systems (GIS) contribute to providing stimulating spatial information to attract foreign direct investment in Algeria?

In order to be able to answer the problematic at hand, we determined the scope of the answer by proposing the following hypothesis:

Hypothesis: The spatial analyzes issued by GIS are a catalyst for attracting foreign direct investments to Algeria.

Display: To accomplish this research and answer the problematic posed in light of the hypothesis developed, we decided to address the following topics:

2. THEORETICAL BACKGROUND:

Scientific and technical development is accelerating in our present era with leaps and bounds that expand each time from the previous one. Our current era is often called the era of the scientific-technical revolution, or the era of the fourth industrial revolution (4th IR), and perhaps the most important factors that led to this situation are the development of basic sciences and technologies. Which in turn produced advanced branches such as mathematical modeling and microelectronics sciences, and the link between these two branches led to the emergence of automatic data processing and modeling and the emergence of informatics, which can be defined as the scientific branch that is concerned with methods of collecting information, studying its characteristics, methods of processing, reorganizing, preserving and publishing it. and facilitating the means of using it in various scientific and practical fields, all by relying on computer technology, and programming work with it, and geographic information systems, or what is known as SIG or GIS for short, is one of the most important branches of geomatics that has begun to flourish and expand and touch most scientific and technical fields, and this is due to its ability to represent all spatial phenomena and then analyze and study them, Which helps to make sound decisions related to these phenomena.

2.1. Intellectual and Conceptual Framework for (GIS): The GIS is one of the modern systems that came into existence in the sixties of the last century and began to spread since the eighties of this century. It considered as well as the descended of her ascended classical Information Systems IS; who is developed and spread since the fifties of the last century, and

although GIS are considered modern systems compared to their predecessors IS, they have found a foothold in various fields and fields, and have become linked to all geomatics technologies related to creating digital maps and spatial analysis. Due to the novelty of the concept of GIS, its definitions have varied according to its fields of use, so we will review in the following a group of definitions given to these modern systems.

2.1.1. Definition of GIS: Geographical information systems are a special case of Information Systems (IS), which is known in its large sense as an information system that combines data and tools that process or deal with this data. According to the standard (ISO 5127-1-1983) issued by the International Organization for Standardization): An information system is a communication system that processes and displays information. As for the data used, it can be from its source of a numerical nature, literal or audio-visual, but it is all stored in a binary digital form that is easy to deal with by computers that are originally digital electronic devices Binary, and thus this data stored in its digital form is considered a representation of real phenomena and events (Paegelow, 2004, p. 15).

As some researchers defined it, according to their perception, that it is a computer model of geographical reality in order to obtain the required private information through the creation, sharing and application of information based on digital data and maps (Gomarasca, 2010, p. 143).

2.1.2. Development Stages of GIS: As was previously mentioned, the roots of GIS go back to the sixties of the last century, when information technology entered the field of maps and geography and its task was initially limited to drawing and creating maps in an automated manner, then expanded to occupy a wide range of social, economic and political fields. Concerning geographic information systems in Canada in 1963, through the establishment of the Canadian Geographical Information System or what is known for its acronym (CGIS), which was used to inventory Canadian natural resources and was considered the first geographic information system, and then, in the late sixties of the last century, the Canadian Water Center was considered the first to Produce automated maps from Canadian water resource data (Koehl, 2004, p. 63). Then, starting from the beginning of the seventies of the last century, the interest in these new systems expanded and began to spread, and they touched many fields that were not

so long ago that these systems did not know a way. And computer programs for drawing maps and diagrams appeared (Souris, 2002, p. 13).

With the advent of the mid-nineties of the last century, the use of information systems reached its peak so that its use was circulated to reach the largest number of users, whether specialists or ordinary users, administrators and even politicians and decision-makers (Pornon, 2011, pp. 27-28).

2.2 Areas of GIS Use: We have already noted in the previous paragraph that GIS reached the peak of their use at the end of the last century, as they touched all economic, social and political fields, and it became difficult to find a field that these systems did not reach, and the following is a summary of the various fields of their use:

2.2.1. Management of water resources and sewage networks: The problem of water deficiency and the scarcity of its sources is among the problems that burden most countries and governments, so that the supply of drinking water and its provision to the various people of the same nation has become one of the challenges that haunt all politicians and decision-makers. The coming wars and conflicts will arise in order to control this sensitive and crucial resource, with the spread of the use of GIS, the use of this technology in the management and management of water resources and sewage networks has become among the uses that contribute effectively to formulating policies for analyzing and following up the general situation of drinking water supply networks, as well as networks of wastewater or re-filtering and use in irrigation farmland.

2.2.2. Land use planning and town managing: Among the areas that have become indispensable to GIS is the field of territorial preparation, urban planning and organization. The great demographic explosion witnessed by most countries of the world has led to rapid population and urban expansion accompanied by this increase in population, forcing decision-makers and regional policy-makers to find Scientific and practical methods for organizing and preparing new population regions, so GIS is one of the most important tools to help arrange future urban areas according to their suitability to receive cities and residential communities based on several topographic, environmental and climatic criteria (Lukomba & al, 2021, pp. 88-90).

2.2.3 Follow up and directing government investments: The use of GIS can effectively contribute to managing, planning, political decision-making, and the implementation of economic and social development policies. Thus, it is considered a directing and follow-up tool for all government investments in infrastructure or those that improve the standard of living of the population, and all of this is done through by providing the information system with all the spatial and geographic variations of the different regions of the same country, and then based on the analyzes and treatments that the information system is based on, a set of solutions are proposed, to help follow up and manage government investments and distribute them fairly and equitably to the various regions (Géraud & Sèmiyou, 2013, pp. 1-12) ,in addition to the mentioned uses, GIS is used in several other fields such as engineering construction, construction and public works, using the three-dimensional GIS (3DGIS), which is known as (BIM Building Information Modeling), the GIS is also used in the field of agriculture through the study of land suitability, agricultural crops for a particular crop, and the extent to which the cultivation of certain crops can be developed according to other crops. (Besim & al., 2016, pp. 153-160).

3. Thematic and spatial analysis using GIS:

The desired goal and the ultimate purpose of establishing and using any information system or computer program is essentially to assist in the management of resources, whether human or material, through the management and processing of data related to those resources. According to the directives of the beneficiary of this system, then it performs all the necessary analyzes and treatments to produce a set of outputs in an automatic and logical manner in the form of tables, texts or digital files in a short time, they meet the requirements of this concerned party, whether they are economic institutions or government departments. These outputs, most of which are paper outputs, were implemented manually before the establishment of the information system, which requires a lot of time and effort and bears human error, which prompted decision-makers to resort to information systems that shorten time, effort and money. GIS are part of these information systems, but they have a feature that distinguishes them from other systems, which is the management of information with a geographical or spatial dimension, and therefore processors and analyzes are

characterized by their geographical spatial dimension, so we will discuss in the following the stages of creating a GIS, as well as the method of its use in the production of objective and spatial analyzes that help in decision-making.

3.1 GIS designing and creating stages: Creating any project, must go through several stages, starting with the initial study and ending with the final completion stage. GIS projects follows the same proposition, as it requires a preliminary study of the project and then drawing up a plan to implement this study that goes through several stages, starting with From the stage of thinking to the stage of completion, then the stage of experimentation and correcting errors, and ending with handing over the project to its owners with the transfer of knowledge and training and assistance in its exploitation and ensuring its updating and updating, (Al-Rasheed & El-Gamily, 2013, pp. 76-77). It is worth mentioning that the design and construction of a GIS must pass through highlighting the relationship of the study with the site or place, every project must be linked to its geographical or spatial dimension, and in general, according to some researchers in the field of geographical information, 85% of the information can be geographical or spatial, even if it appears to be non-spatial and has nothing to do with place or geography (Bordin, 2002, p. 13), therefore, we decided to customize this paragraph to highlight the stages of designing and establishing a GIS that enables objective and spatial analysis of this information and supports and contributes to the decision-making process.

3.1.1 Project Study Phase: The goal of creating any GIS is to give all the information related to the elements of the studied geographical area in the form of outputs that are either objective or natural maps or tables. Ambiguity, the study of the project begins with five questions: (Denègre & Salgé, 2004, pp. 8-10).

- Where? Where can the phenomenon be, or where its location is, or in general where all the elements related to this phenomenon are located, and the location or place must take into account the astronomical location, and the geographical location, which is its geographical borders, that is, what surrounds it from the four sides and its regional and political subordination;

• What? What can we find on this site, and this question is posed in the form of questions and spatial analyzes that the system answers after the process of linking the elements of the system to the place;

• How? How is the process of linking the elements of the GIS location, and what are the relationships between them, and based on these relationships, spatial analyzes are carried out, which is one of the most important features of GIS and one of its strengths;

• When? When was the last update, what is the date of the statistics, when was the data obtained, all of which are temporary questions that can be linked to the place and used in temporal analyzes or in following up the temporal development of spatial or geographical phenomena such as population expansion, desertification, pollution, etc.;

• What if? What if this phenomenon continues in this way, what if other elements intervene and affect the phenomenon, how much is the phenomenon affected by its location and what are the changes or fluctuations that may occur in the future in the light of a group of accidents, and this is a question that the system answers to foreseeing and studying possible possibilities of occurrence to try to solve it after predicting its occurrence.

After this stage, comes the next stage which is the stage of thinking and designing the project.

3.1.2. Thinking and Project Design Phase: This stage comes after the preliminary study of the project in terms of its feasibility and the possibility of its establishment. After the decision is made to establish a GIS, the process of thinking begins on the method that should be followed in order to obtain this system. The design and construction of any GIS is carried out according to two directions:

Either an orientation according to the field of its applications or a regional orientation (Denègre & Salgé, 2004, pp. 88-110). As for the design according to the field of use and application, it chooses the field to which this system belongs, and then designs it away from the region. The system is valid for every place and time, provided that it is provided with the necessary quantitative and spatial data for the project. As for the design according to the regional orientation, it depends on an administrative

division that moves from the whole to the part, with a containment relationship between the whole and the part, and the part's affiliation to the whole, this relationship may go beyond the international, regional or global dimension, as the country belongs to a continent, an alliance or an organization that includes a group of countries.

3.1.3 Execution stage: This stage begins with choosing the hardware and human components on which the implementation of the design depends. As for the human component, it is represented by the technicians and specialists who will program the geographic information system and enter data, update and correct it. As for the hardware components, they are the data entry devices, printing and output devices, computers or processing devices, as well as the necessary software And since data is the beating heart of any information system, it is of great importance and the completion process starts from classifying the data into two main categories: descriptive and quantitative data, and spatial data. They are associated with some type of spatial data. (Boukli & Rabah, 2016, pp. 10-11).

3.2 Creation of thematic maps (thematic analysis): After we have reviewed the stages of designing and creating a GIS, we will move on to how to use this system to create and produce a set of thematic maps according to the data stored in it. Concerning the layers of geographical data, each of the descriptive or quantitative values that represent the layer can be exploited to produce objective analyzes in the form of a colored map according to the topic studied or objective statistics that are integrated with the map, thematic analyzes are widely used in GIS, they are often the tool preferred by non-specialist decision-makers, as they simplify spatial phenomena and give them a comprehensive view of them. thematic analyzes can be divided into (Pornon, 2011, pp. 115-120):

- Total analyzes; specific to each layer as a unified entity, so that this type of analysis targets each geographical data layer and considers it a single and indivisible object, if the layer is one of lines, the lines can represent a network of roads, rivers or electricity networks. The thematic analysis can link the form line, color and width of the phenomenon shown.
- Taxonomic or categorical analyzes; the class or class is the feature that distinguishes a group of elements belonging to a particular class

that share one characteristic. For example, the road network can be divided into three types (national, state and municipal). We can classify this class according to these three classes, each category is given a shape, color and thickness that distinguishes it from the rest of the categories. Thus, once we see an objective map classified according to this classification, we can distinguish all types of roads at first sight without referring to the data table related to the type of road, and this is what gives the objective analyzes all their explanatory and explanatory power.

• Quantitative thematic analyzes; these analyzes depend on quantitative fields in their classification of spatial elements. As its name indicates, it divides elements quantitatively based on quantitative fields, descriptive fields are excluded from this analysis, and it is noticeable in this type of analysis that it gives freedom to its user to choose a number varieties in contrast to the taxonomic analyzes that automatically create varieties according to the value of the fields, if we want to classify a municipality or a region of the country according to its population and create five classes according to specific fields, from the very weak census to the very large census through the weak, medium and large census.

• Comparison analyzes; these analyzes differ from the previous ones as they allow the analysis of several values at the same time, which allows a comparison process between different data, especially those affected by time, for this reason it was called comparative analysis, as it compares the change of values over time, as a census comparison Population in two different periods, or comparison of GDP during different periods.

Although thematic analyzes are among the strongest features of GIS, they do not rise to the strength of spatial analyzes and their high ability in studying geographically referenced phenomena. Geographical reference through multi-criteria analyses, so we have dedicated the following paragraph to try to define these analyzes and how to use them to help in decision-making.

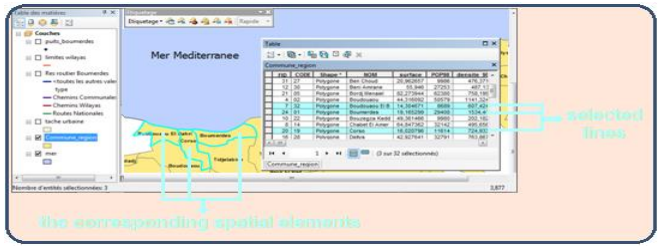
3.3 Spatial analyzes using GIS: We have already noted that spatial analyzes are the striking strength of GIS and it is the most important feature

that distinguishes it from other information systems, as all the questions that are posed to classical information systems using the SQL* language can be put to GIS, and the answers and results are usually multiple maps. Layers, usually multi-criteria SQL queries, pertain to a group of layers and a set of data, no other information system is able to take note of it and answer it. All analyzes that result in spatial or geographic results, such as determination and analysis of the scope of influence or what is known as (buffering) and integration, are included in the circle of spatial analyzes, and these are the points that we will address in the following in some detail and clarification:

3.3.1. Selection : The selection is the first and easiest spatial analysis, as it enables to identify an element or group of spatial elements according to the required conditions, which may be simple and easy, and may sometimes be complex and multiple, it is concerned with identifying geographical elements and assigning them on maps based on the data quantitative descriptive spatial, analyzes have two main ones:

• Attribute selection; so that the lines from the data table are selected and then observed on the layer corresponding to this table, and since each table of the database corresponds to a layer consisting of spatial elements related to the elements constituting the table, and thus each line of the table It corresponds to a geographical element from the layer of geographical elements, and when selecting a group of lines, a group of spatial elements will be selected on the map in an automatic way, which is illustrated in the following figure:

Figure 1: The process of selecting elements from the data table



Source: by the study researchers based on ArcGis 10.2.2 result analyses

The selection process is done using SQL language through simple queries and concerns a single or multiple fields.

• Location selection; which is considered one of the frequently used spatial analyzes, as it depends on the geometrical shape of the

elements, what is known as topology, which uses spatial relationships such as neighborhood, alignment, intersection, containment, ...etc, it can also result from a group of elements that do not necessarily belong to one layer. For example, in a GIS that can contain all the municipalities of the country, which are placed in its own layer, just as the sea is placed in its own layer. Thus, the process of intersection of these two layers produces coastal municipalities, which are overlooks the sea, as another example, we can identify all the municipalities through which the east-west motorway passes through the process of intersection.

4. A survey of the opinions of foreign investors in Algeria about the expected role of using the SIG and spatial analyzes in attracting the FDI:

To review the effects of the use of spatial analyzes issue from GIS in stimulating the attraction of foreign investors to Algeria, we used the survey as a tool for collecting primary data related to the subject of the study, and for the purpose of achieving this, we decided to proceed as:

4.1 Structure and assumptions of the survey: This survey is oriented to survey the opinions of foreign investors in Algeria, represented by Chief Executive Officer and Member of the Board of Directors; who know all possible investment fields and their location, and their impact on investment decision-making, in order to achieve this, we divided this survey into the tow following axes:

The first axis: Includes general information and consists of three paragraphs.

The second axis: Deals with a review of the role of spatial analyzes of GIS in providing stimulating information to attract and attract foreign direct investors to Algeria, and it consists of seven paragraphs.

Thus, the number of paragraphs of this survey reached ten, the three paragraphs included in the first axis were answered by choosing one of the following two statements: yes or no, but the answers of the paragraphs included in the second axis was done by choosing one of the following five options: Fully agree, Agree , Neutral, Disagree, Completely Disagree. Therefore, we chose the closed form to restrict the possible answers to the

paragraphs of this axis of the questionnaire, and this is to facilitate the process of answering the questionnaire and limiting it to a limited field.

Based on our previous division of this survey, we tested the research hypothesis based on the answers of the sample members, in order to determine the extent to which our point of view, which we expressed through this hypothesis, matches the views of the sample members.

The sample of the study representing this community, consisting of 111[1] persons, were chosen randomly without weighing one category over another, and without distinguishing its members on the basis of nationality, years of experience or occupation.

4.2 Presentation of the scale used and the results of experimental tests to determine the final form of the survey: In order to enable us to statistically analyze the results of the seven items included in the second axis of the questionnaire, we used the five-level Likert scale[2], for the possible answers, as shown in the following table:

Table 1: Distribution of the five-level Likert scale scores on the proposed answers

Rating	Fully agree	Agree	Neutral	Disagree	Completely Disagree
Grade	5	4	3	2	1

Source: (Nemoto & Beglar, 2013, p. 5)

It should be noted that before publishing this survey on the study sample, it underwent an arbitration process by a group of arbitrators, which included (08) university lecturer from the Faculty of Economics, Commercial, and Management Sciences of the University of Algiers 3, and two university lecturer from the Faculty of Earth Sciences, Geography and Territory Development at the University of Algiers Houari Boumediene for Science and Technology (USTHB), they were assigned the task of revising and correcting the survey, both objectively and formally. They were also assigned the task of ensuring the integrity of the survey's planning and building its various paragraphs so as to achieve the following characteristics (Nemoto & Beglar, 2013, pp. 6-7):

[1] This number was chosen on the basis of the table drawn up by the competent statistical bodies, which fixed the individuals in the samples according to the size of the population and the probability of agreement of the results.

[2] The scale is named after its inventor, psychologist Rensis Likert , Likert distinguished between a scale proper, which emerges from collective responses to a set of items (usually five or more), and the format in which responses are scored along a range.

- Clarity and accuracy of the questions, so that they include one concept in each paragraph, and are as far away as possible from ambiguity and complexity;
- A good choice of the field of answers, to suit the subject of the study, and to ensure accurate and effective statistical treatment of these answers; stay away as much as possible from double-negative paragraphs that contain the negation of the negation, and paragraphs with open answers;
- Testing the sincerity and seriousness of the answers of the members of the sample, by including some empirical questions for confirming that.

Based on the observations, directions and suggestions of the arbitrators, we have made the necessary amendments according to the following rules:

- Paragraphs approved by more than 8 arbitrators are accepted and fixed;
- Paragraphs approved by 6 to 8 arbitrators are accepted and amended;
- As for, the paragraphs approved by less than 6 arbitrators, are rejected and deleted completely.

The survey was also subjected to a preliminary testing process related to:

A- The validity of the survey's paragraphs: The test of the validity of the survey's paragraphs aims to ensure that these paragraphs can fulfill the purpose required of them, which is to measure the subject that was designed to be measured accurately and without ambiguity, which results in either confirming or denying the hypothesis. This test was verified, based on an experimental sample of 30 persons, and we calculated the correlation coefficient according to Pearson's method, for all items of the second axis of the survey, as shown in the following:

Testing the validity of the items of the second axis of the survey: Table 2 shows the correlation coefficients for all items of the second axis of the questionnaire.

Table 2: Correlation coefficients for all items of the second axis, from the survey

Paragraph N°	Correlation coef.	Paragraph N°	Correlation coef.

A1	0.898	**A4**	0.881
A2	0.921	**A5**	0.892
A3	0.866	**A6**	0.935
A7	0.860		

Source: by the study researchers based on the results of the pilot survey and spss26.0 result analyses

It is noticed from the above table that the correlation coefficients were all positive and close to one, so that they exceeded or equal 0.860, which is considered a positive and strong correlation coefficient that was found acceptable, and this means that there is a direct and strong linear relationship between the degree of the answer and the number of its repetition, and this is explained as follows: The closer value of the degree of the answer according to the Five-level Likert Scale to its highest value of 5, corresponding to strong approval, was matched by a high number of repetitions, and this indicates that most members of the pilot survey tend to agree strongly with the survey items.

B - The stability of the answer of the survey paragraphs: The test of the stability of the answer to the survey paragraphs aims to measure the stability of the internal consistency, which is to obtain the same results when the survey paragraphs are applied again after a certain period, which is what is known as the stability and consistency of the survey paragraphs, and to measure the stability of internal consistency, several methods were developed, including: the test-retest method, the split-halves method, and the Cronbach's alpha coefficient method. (Midy, 1996, pp. 11-20).

We chose the Cronbach's Alpha method, to measure the stability of the internal consistency of the paragraphs constituting the second axis of the survey, on the same previous pilot sample, as shown in the following table:

Table 3: Stability coefficients according to Cronbach's Alpha method for the second axis of the survey

Axis	Number of paragraphs	Cronbach's alpha oefficient
Second	7	0.755

Source: by the study researchers based on the results of the pilot survey and spss26.0 result analyses

Through what is presented in the above table, it is clear that the reliability coefficient is high for the second axis of the survey, and therefore the paragraphs expressing this axis lead to consistent results

(homogeneous), which indicates that these paragraphs were formulated in a consistent manner and that the level of its stability is considered good, that the survey is built in a correct manner, has good reliability and is subject to submission, and that its paragraphs lead to consistent, homogeneous and reliable results.

Finally, and in light of the results obtained through conducting preliminary tests for the validity and reliability of the paragraphs of the two parts of the survey, and based on the recommendations and observations we received from the arbitrators, we reviewed and corrected some of the paragraphs of this survey to match those observations and recommendations, and this survey was formulated to appear in its final image.

4.3 Review the limits of the study: The limits of the study were represented in four areas, as follows:

A- Geographical field: With regard to surveying the opinions of foreign investors, the study singled out the entire national territory, by communicating with all active investors on the national territory, on an electronic basis, due to the epidemiological conditions that the world is going through, and by virtue of the vastness of the area of Algeria.

B- Thematic area: The focus of this study is on topics and axes related to the use of GIS spatial analyzes and their role in increasing Algeria's ability to attract and attract more foreign direct investment.

C- The human field: The study was limited to Chief Executive Officer and members of the board of directors of investment companies active in Algeria, because they are the most knowledgeable people of the obstacles and incentives to investment in each country.

D- Time domain: This study was completed during the period between May and December of the year 2021.

4.4 Processing and analyzing the results of the survey:

We processed the results of the answers to the paragraphs of this survey statistically and analyzed them by addressing the following points:

4.4.1. Processing and analyzing the results related to general information (first axis): Through this paragraph, we will process and analyze the answers according to job title and years of experience as follows:

A- Characteristics of the study sample whose answers are subject to processing and analysis according to the job title:

Since the selection of this sample was made without prior knowledge of the job of its members and in a random and spontaneous manner, and without prejudice to one group at the expense of the other, after the process of retrieval of the questionnaire forms and the exclusion of six forms by virtue of the fact that their owners answered that they are not familiar with the components of the investment climate, and therefore they do not have sufficient knowledge with all the incentives and obstacles to investment, thus, their answers will be random, unrealistic, and lack objectivity, and the composition of the sample members, which became composed of 105 persons, as shown in the following table, which shows that the Chief Executive Officer category represents the largest category within the study sample, which amounted to 72.38%, followed by the category of members of the board of directors with a percentage of 27.62%.

Table 4: Characteristics of the study sample by occupation for the forms that will be subject to statistical treatment and analysis

job	repetition	Percentage %
Chief Executive Officer	76	72.38
members of the board of directors	29	27.62
Total	105	100

Source: by the study researchers based on the results of the survey and spss26.0

B- Characteristics of the study sample whose answer is subject to treatment and analysis according to years of experience: Due to our division of years of experience into four levels, the study sample, whose answer is subject to statistical treatment and analysis, was distributed as shown in the following table:

Table 5: Characteristics of the study sample by years of experience and occupation

Years of Experience	Frequency	Percentage %	Chief Executive Officer	members of the board of directors
Less than 5 years	4	3.81	0	4
From 5 to 10 years	34	32.38	19	15
From 11 to 15 years	33	31.43	23	10
More than 15 years	34	32.38	34	0
Total	**105**	**100**	**76**	**29**

Source: by the study researchers based on the results of the survey and spss26.0

It is noted from the previous table, that the overwhelming majority of the respondents had more than 5 years of experience (the second, third and fourth levels) with an estimated rate of 96.19%, so that the total number of persons at this level reached 101, distributed among 76 Chief Executive Officer and 25 members of the board of directors, and this is due to the significant experience required as a General Manager for any investment.

4.4.2. Processing and analyzing the results related to the second axis: In our analysis of the results related to the paragraphs of the second axis of the survey, we based on the value of the arithmetic mean, as it is the most important measure of central tendency. The arithmetic mean, we used its relative weight[3], so that the relative weight gives us the ratio of the arithmetic mean to the highest degree in the used scale corresponding to "fully agree".

Since the value of the arithmetic mean will not necessarily be natural numbers between 1 and 5, we have determined the fields of this ladder in a continuous way instead of the discontinuous method, so this method enables us to link the value of the arithmetic mean to the corresponding field, thus facilitating the process of reading, interpretation and statistical analysis of the values of this mean arithmetic, and in order to calculate the minimum and maximum limits for each field of the scale used, we have calculated the range that is equal to: the upper value of the scale - the lower value divided by the number of scale categories, which in our case is calculated as follows: M=(5-1)/5= 4/5 = 0.8, then gradually add this value to the values of the scale to ensure its continuity, so that it becomes composed of fields instead of fixed values as shown in the following figure:

Table 6: The field to which the answers of the second axis of the survey

the answer	The field of the answer
Completely Disagree	from 1 to 1.8
Disagree	from 1.81 to 2.6
Neutral	from 2.61 to 3.4
agree	from 3.41 to 4.2
Fully agree	from 4.21 to 5

Source: by the study researchers

[3] Relative weight = arithmetic mean / highest score (weight) on the scale * 100 (highest likert scale score = 5)

To analyze the results of the second axes of the survey, we addressed these results by testing the validity of the hypotheses put forward for each axis, by testing the value of the arithmetic mean and the corresponding relative weight, according to the following:

Hypothesis test analysis: The spatial analyzes issued from a GIS are a catalyst for attracting foreign direct investment to Algeria.

We have tested this hypothesis through the data of the following table:

Table 7: Results of the paragraphs of the second axis (a review of the role of the spatial analyzes issued from a GIS to increase the attracting foreign direct investment to Algeria

Ei	Paragraphs	Fully agree	Okay	Neutral	Disagree	Completely Disagree	arithmetic mean	relative weight
E1	The appropriate investment environment in the host country is considered to be the most important requirement, which the foreign direct investor needs, to direct their investments to that country.	71	22	8	3	1	**4.51**	**90.29**
E2	Security and political stability are seen as the most important necessities of an appropriate investment environment.	65	31	6	3	0	**4.50**	**90.10**
E3	The appropriate investment environment must be designed through the modernization and digitization of administrative services linked to investments	64	33	8	0	0	**4.53**	**90.67**
E4	The appropriate investment environment must be designed by reducing the legal and administrative procedures linked to the exercise of the investment activity, and by simplifying the creation and liquidation procedures.	64	29	10	2	0	**4.48**	**89.52**
E5	The appropriate investment environment must be designed through a definitive break with old bureaucratic practices, and the adoption of the principles of e-governance based on transparency and equality between the different investors.	30	61	11	0	3	**4.10**	**81.90**
E6	The appropriate investment environment must be designed, through the generalization of electronic administrative transactions, which will replace obsolete and outdated administrative transactions.	73	22	9	1	0	**4.59**	**91.81**
E7	The appropriate investment environment must be designed, through the use of geographic information systems (GIS), and other space technologies, which help to support investors and direct them to areas suitable for their investments.	73	20	9	3	0	**4.55**	**91.05**
All paragraphs of the axis							**4.43**	**88.57**

Source: by the study researchers based on the results of the survey result and spss26.0

Through the results included in the previous table, it becomes clear to us that the arithmetic mean values for most of the paragraphs of this axis came within the field [5, 4.21], that is, they are attracted to the value 5, which is the opposite of strong approval, except for paragraph A5, which recorded a value less than 4.21 except It came within the field [4.2, 3.41], meaning that it is attracted to about 4, which means that most of the study sample members chose to agree strongly with all paragraphs except for paragraph A5, while the majority of the study sample chose to agree to paragraph A5, which is confirmed by the relative weight For this paragraph, it took a value in the range of 82%, while its values for the rest of the paragraphs ranged between 89% and 92%. It is also clear to us through what was included in the previous table that the total arithmetic mean is between the values 4.21 and 5, and that the weight overall ratio is also limited to between 88% and 90%, which means that the hypothesis is accepted, that is, the spatial analyzes issued by GIS are a catalyst for attracting foreign direct investments to Algeria.

In order to find out which category of the study sample had a significant impact in the direction of the general answer for paragraph A5, towards approval, and the rest of the paragraphs towards strong approval, we decided to include this analysis in the following table:

Table 8: Distribution of answers under the most frequent answer according to years of experience

Paragraph	Paragraph most answer	Percentage % of the most frequent answer out of the total number of answers	Distribution of Chief Executive Officers's answers under the most frequent answer by years of experience				Distribution of board members' answers under the most frequent answer by years of experience			
			Years of Experience≤5	5<Years of Experience≤10	10<Years of Experience≤15	15<Years of Experience	Years of Experience≤5	5<Years of Experience≤10	10<Years of Experience≤15	15<Years of Experience
A1	strongly approval	%67.62	-	12	18	23	1	7	10	-
A2	strongly approval	%61.90	-	9	11	26	4	15	10	-
A3	strongly approval	% 60.95	-	5	15	25	2	10	7	-
A4	strongly approval	%60.95	-	8	18	19	3	10	6	-
A5	approval	% 58.10	-	11	11	23	2	9	5	-

A6	strongly approval	% 69.52	-	13	17	25	2	9	7	-
A7	strongly approval	% 69.52	-	13	18	24	4	6	8	-

Source: by the study researchers based on the results of the survey result and spss26.0

It is noted from the above table that the category of Chief Executive Officers with more than 15 years of experience had an impact on the answer by strongly agreeing to paragraphs A1, A2, A3, A4, A6, and A7 of the survey, and agreeing to paragraph A5.

5. Conclusion:

We have concluded through this study that the use of GIS spatial analyzes would increase Algeria's ability to attract more foreign investors. The production of thematic maps resulting from spatial analyzes of the various economic sectors in Algeria, highlighting all possible fields of investment as well as the potential locations of these investments, will help these investors or other potential investors to make sound decisions about the possibility of investing in Algeria, which contributing to improving Algeria's ability to attract and attract foreign direct investment.

In final we present the most important results obtained through this study, in addition to some suggested recommendations for the actual embodiment of the findings.

5.1 Results: What can be concluded from this study is:

- The use of GIS spatial analyzes will play an important role in helping and accompanying foreign investors to continue and expand their investments, as well as attract other potential investors, through:

A. Providing credible and accurate geographical information related to possible investment fields and the extent of infrastructure development;

B. Increasing the foreign investor's confidence in the accuracy and credibility of the accounting, financial and spatial information available within the geographic information system, which makes this investor more willing to invest and more assured of his investments.

- There is a consensus among the respondents on the positive role that GIS will play in promoting investment by persuading foreign investors who are apprehensive about entering Algeria, and this is by giving them a comprehensive view of all the possibilities that Algeria possesses.

• The Chief Executive Officers members of the study sample with more than 15 years of experience, their answers were characterized by strong approval of most of the paragraphs of the questionnaire, and this is due to their extensive experience gained through investing in various places and various investment environments, about the role that geographic information systems can play In contributing and helping to attract more foreign investors to Algeria.

5.2 Recommendations: In order to achieve the expected role of using GIS spatial analyzes in increasing Algeria's ability to attract more foreign direct investment, it is necessary to:

• Expand the use of geographic information systems to touch various government departments, and put them at the service of foreign investors active in Algeria, or potential investors who want to invest in Algeria.

• Providing foreign investors with all the spatial and financial information for all existing investments, which would increase their confidence in the management, which enhances the chances of success of their investments, and increases the chances of attracting other investors.

6. Bibliography List :

- **Books :**

1. Bordin, P. (2002), SIG, concepts, outils et données. Paris: Hermès Science Publications, France.

2. Pornon, H., (2011), La dimension géographique du système d'information. DUNOD, Paris, France.

3. Midy, M. F., (1996), Validité et fiabilité des questionnaires d'évaluation de la qualité de vie: une étude appliquée aux accidents vasculaires cérébraux (AVC). Laboratoire d'analyse et de techniques économiques (LATEC), Bourgogne, France.

4. Paegelow, M., (2004), Géomatique et géographie de l'environnement, de l'analyse spatiale à la modélisation prospective, Habilitation à Diriger des Recherches. Université Toulouse le Miraill - Toulouse II, Toulouse, France.

5. Denègre, J., & Salgé, F., (2004), Les systèmes d'information géographique, Presses Universitaires de France, France.

6. Nemoto, T., & Beglar, D., (2013), Developing Likert-Scale Questionnaires. N. Sonda & A. Krause (Eds.), Temple University, Tokyo, Japan.

7. Besim, A., Fisnik, L., & Béla, M., (2016), From surveying to geomatics, Landscape & Environment. Sopron, University of West Hungary, Hungary.
8. Boukli, H. C., & Rabah, F. A., (2016), Système d'Information Géographique, cours et travaux pratiques. Université Aboubakr Belkaïd, Faculté de Technologie, Département d'Hydraulique, Algérie

- **Journal article:**

1. Al-Rasheed, K., & El-Gamily, H. I., (2013), GIS as an Efficient Tool to Manage Educational Services and Infrastructure in Kuwait. Journal of Geographic Information System , Kuwait.
2. Lukomba, K. E., & al, (2021), The G.I.S.: Effective tool for land management in the service of the cadastre. International Journal of Innovation and Applied Studies.
3. Gomarasca, M., (2010), Basics of geomatics. National Research Council of Italy, Milan, Italy.

- **Seminar article:**

1. Géraud, A. P., & Sèmiyou, A. A., (2013), Contribution d'un Système d'Information Géographique (SIG) à une meilleure gestion des investissements publics au Bénin. International Conference on ICT for Africa, February 20-23 2013, Harare, Zimbabwe .