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Improving Quality and Reducing Work Obstacles by Using Geographic Information Systems (GIS)

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Abstract: *The research aims to identify how to use geographic information systems to improve quality. (23) Projects were selected as a sample for research, which are exploratory projects carried out by the seismic teams of the Iraqi Oil Exploration Company. Research problem is determined by the existence of work obstacles that affect negatively the productivity of work and have a major influence on the progress of production, stoppage of work, slow completion, inaccuracy and loss of effort. This problem was identified practically by applying the Deming Circle to improve the quality and use of quality tools. Work obstacles were classified as natural, technical, security, governmental and social obstacles, and to solve this problem, geographic information systems (GIS) programs has been used. Moreover, building database was used to represent spatial and descriptive data in the form of maps using ArcGIS 10.8 and to study the impact of improvement by spatial analysis of work sites. The researcher discovered several results, the most important outcome was the possibility of using geographic information systems in building database that can be referred to when making decisions and help in solving various problems associated with exploration work.*

Key words*: Quality, Continuous Improvement, Deming Circle, Geographic Information Systems.*

Introduction: It is generally acknowledged that The Iraqi Petroleum Exploration Company has a very important problem, which is the presence of obstacles to work resulting from several reasons. The most prominent is the nature of the work land and technical reasons for the lack of some technical requirements like aerial or satellite images, or the presence of outdated maps. Furthermore, there are other obstacles related with external reasons such as the presence of monuments, residential buildings , agricultural areas, Military areas and mine remnants that affect negatively and significantly the progress of production, in terms of stopping work, slow completion, inaccuracy, loss of effort and waste of time and work requirements. The importance of the research lies behind clarifying how modern technologies are used in geographic information systems and their role in the process of collecting, analyzing and classifying data for a number of years. Another important point is providing a modern satellite picture of the projects implemented by the company through building an integrated geographical database through the practical application of the Deming Circle to improve operations. The research aims to identify the problems and obstacles that occur in projects implemented by seismic teams. In addition

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using geographic information systems (GIS) to continuously improve the quality of work in the stages of applying the Deming Circle in practice, and the importance of quality improvement tools in identifying problems and tackling them.

Methods and tools: The inductive approach was used and graded from the part to whole. It started from data collection and progressed through:

1. Quality tools (Pareto chart and cause-and-effect diagram) to identify the problems occurring in the company and then the reasons for improvement.
2. GIS software through preparing objective maps and building maps models for oil exploration sites and the tracking system program to study and analyze the benefits of using GIS in the work of quality, health, safety and environment management.

The theoretical framework of the research: In this part of the research the researcher has analyses the theoretical framework of the concepts of quality, health, safety, environment management, continuous quality improvement, and geographic information systems.

Quality Management: Quality was defined by the American Society for Quality Control (ASQC) as "all the characteristics and characteristics of a product that have the ability to satisfy certain needs" (Abul-Nasr, 2015: 49). While (Kiran 2017: 3) defined quality as an effective system for integrating quality improvement efforts for different groups of parts of an organization to provide a product or a service with high level of customer satisfaction.

Ecosystem: Also termed as the Eco-system, which is a community of organisms that live and interact with each other and with the inanimate things surrounding them such as water, fire, soil and minerals. These components form a balanced dynamic system, and each of them depends closely on the other and affects each other and the characteristics of the other (Abdel Halim, 2015:192).

Occupational safety and health: This concept usually related with the procedures that lead to providing professional protection for workers and reducing the risk of equipment and machinery on workers and on the organization. These procedures aim to prevent accidents or reduce the possibility of their occurrence and to provide an appropriate and safe work environment. Moreover, to ensure a work environment free from accidents causes or work-related diseases (Mustafa, 4: 2017).

Continuous improvement: Continuous improvement is recognized as the most beneficial aspect to enhance competitiveness, efficiency, quality and performance. It also has a positive and significant impact on maintenance performance, as it is a specific set of procedures that help the organization improve performance(Pambreni&et al,1398: 2019).Continuous improvement strategies focus on reducing waste, namely in time, materials, and the number of injuries to workers. As the idea of this principle based on trying not to wait for the problem to occur, however, it enables departments to use problem-solving tools and make employees an effective component by participating through problem-solving teams. This creates a sense of control over their workplace and tasks (Krajwiski & et al, 2016: 101).

Practical application for the Deming Cycle to improve processes: In order to put the Deming Cycle to process improvement in practice, it must pass through seven basic stages, (Shaban, 100-101: 2009) and (Aishouni, 22-24: 2018):

First Stage - Opportunity Identification: In this stage opportunities are identified and prioritized for improvement. As well as identifying the problems that must be solved to improve the process. A set of quality techniques are used in this stage, especially the seven basic techniques of quality.

Second stage - analyzing current processes: the goal in this stage is to determine the current performance of the process.

Third stage: developing the most appropriate solutions: This stage carried by searching for the best solutions that everyone agrees that it leads to improve the process and raising the quality of its outputs.

Fourth stage - implementing changes: After the best solutions have been selected, the stage of implementing these solutions comes to put them into real practice, and the working group works on improving the process by working on developing a plan for implementing the improvements to the process and starting its implementation.

Fifth stage - study and evaluation of results: The aim of this stage is to evaluate the improvements made to the process by observing the process and the changes that occurred in product characteristics. Data on the process are collected and analyzed in order to assess the development resulting from the improvements in the process.

Sixth stage - standardizing and establishing standard solutions: To ensure that the improvements included in the process lead to the expected results and to improve the quality of the outputs, the researcher records these solutions and makes them as standard solutions.

Seventh stage - planning for the future: This stage aims to determine the permanent and continuous investigation of the highest levels of process performance, regardless the important improvements that were obtained in the previous stages.

Continuous improvement tools: Quality and process improvement tools include the quality improvement process by using and applying quality tools to understand and improve processes as they help the organization collect information, generate ideas, analyze, develop and evaluate processes (Ibrahim, 2013: 637). Basic quality techniques have a prominent role in all stages of the process improvement cycle; the researcher used two tools during her research:

1- **Cause and Effect Analysis Diagram**: It is a document or map of the problem that is required to be studied in the industrial organization and it arises from the ideas of workers, engineers and managers to determine the causes of problems (Ibrahim, 2013: 642). It is also called a fishbone diagram where its drawings take the form of the skeleton of the fish and represents greatness. The main bones are the main causes of the problem, while the secondary bones represent the least contributors to this problem. It is used to study the causes of the differences and discrepancies that we observe in the process and the reasons leading to the emergence of these problems (Aishouni, 94: 2018).

2- **Pareto diagram**: Pareto diagrams are a way to organize errors, problems, or defects to help focus on solving problems. During solving a problem which has many causes, a variety of solutions that require effort and resources will be available. So, should we choose different solutions randomly? , or should we apply all solutions at the same time? This is the question that the Pareto chart answers and it returns to the Pareto Philosophy or Law (80% - 20%), which means that in most cases, 20% of the causes cause 80% of the results (Al-Ali: 2008: 79).

Geographic information systems: The spatial location or geographical location is one of the most important elements of decision-making, policy development and building plans in any society. Therefore, it requires systems that not only monitor and track events, variables and activities, but also determine the locations of these events and human activities. What is more, it is considered as one of the most important systems which are called geographic information systems (GIS). It is a special and distinctive type of information systems (Daoud, 2014: 2).Computer technologies have become a powerful and unique means of solving different types of problems in many areas of human work and knowledge, as they allow reliable, short and versatile exchange of a vast amount of information (Makki: 2012: 12). Al-Shibli (2011:644) has defined information systems as “geography is a group of techniques used for the purpose of achieving specific goals, determined by information related to the geographical features on the surface of the earth. So its features are displayed from the accompanying database”. Al-Mohammadi (2015:650) defined it as the process of collecting, storing, managing, retrieving, transforming, analyzing, modeling and displaying data and the terrestrial and human interrelationships,

knowing their orientation, predicting their reactions and how to deal with them. Particularly in the context of quantitative analysis and systems analysis.

Realistic data representation on maps: Information can be represented at a point or over a specific area by using (X, Y) coordinate values (and sometimes Z for height). These coordinates are spatial data, and the information that is represented is called attribute data. The raster and vector data models store spatial data and attributes. Both data systems are geographically linked, which means that the information is linked with a specific location on the surface of the earth. Using (X, Y) coordinates specified in a standard way with a coordinate system, and one of the coordinate systems is chosen from a variety included in the program. Whenever the coordinate systems are identical, then any set of spatial data could be displayed together with correct spatial relationship to each other (Al-Shafei, 2009: 58-65). Price (2016:10) showed there are three basic vector geometric shapes. (See figure No. (1) below). These shapes called features and they are used as follows:

I. Point features are used to represent data that has no dimensions, such as the location of sampling or the representation of a particular phenomenon. The point consists of one coordinate pair (X, Y).

II. The line features which used to represent objects in one dimension, such as a road. The line contains two or more pairs of coordinates: the endpoints of the line are called the nodes, while each of the intermediate points is called the vertex.

III. Polygon features are used to represent two-dimensional areas, such as a project site. A polygon is a set of vertices that define a closed area.

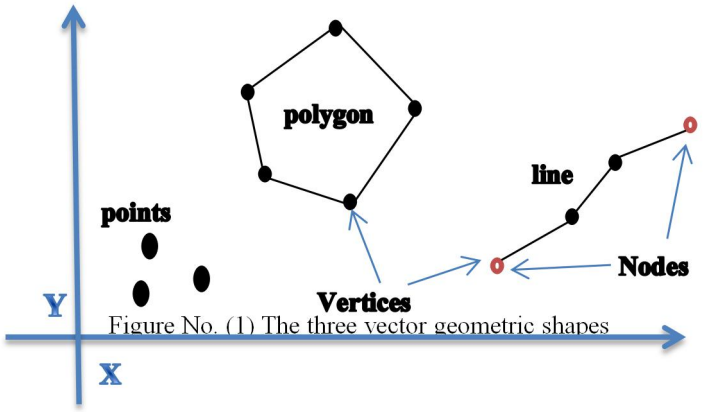


Figure No. (1) The three vector geometric shapes

The applied framework for the research: Projecting the theoretical framework of study subject on the ground requires implementing a number of steps. The first step represented by the provision of a clear methodological framework. That defines the features and basic rules of conducting the research through implementing the Deming Circle and put it into practical practice to improve the quality as follows:

First stage - identifying the opportunity: This stage includes the following:

1) Defining the problem: This problem (work impediments) was identified by studying the research sample projects and collecting the necessary data on the work impediments for each project. This was carried on through identifying project's geographical location and the terrain. Also, it conducted by studying the climate prevailing in project's period of work and the most important obstacles that faced the workers. Table No. (1):

Table No. (1) Classification of work obstacles

Obstacles to work	include
Nature	The nature of the work land, the climate, and the existence of rivers or water resources.

Technical	Mechanisms malfunction, lack of machinery and equipment, unavailability of corrected satellite images, insufficient staff, lack of training of workers.
Security	The presence of mines, thefts, and war projectiles.
Social	Existence of residential areas farms, marshes, and monuments.
Government	The presence of international roads, government properties, military properties, and oil wells.

In order to determine the effect of work impediments on (23) samples of the project, one of the quality tools was used (Pareto chart) to represent the problems graphically. Moreover, arranging the obstacles in descending order from the most influential to the least according to the frequency of their occurrence. This is helps in identifying the most important problems and to find out the most impact on quality and focus on solving them first. Pareto principle that represents 80% of quality problems are the result of 20% of the causes. Therefore, it is better to calculate the occurrences first regarding the type of obstacles. Table No. (2) Illustrates the mechanism of distributing obstacles' type to projects and their recurrence:

Table No. (2) Distribution of the type of work impediments to projects and their frequency

No	Seismic Crew	project name	work obstacles				
			Nature	Technical	Security	Social	Government
1	1	Nasiriyah (3D)	1	1		1	
2	1	Badra (3D)	1	1	1		
3	1	Murjan - West Al Kifl (3D)	1	1		1	
4	1	Dhafra (3D)	1	1		1	
5	1	Wasit - Abu Zarazir (3D)	1	1	1		
6	1	Northeast Nasiriyah 3 D	1	1	1	1	1
7	1	Northeast Nasiriyah 2 D	1	1	1	1	1
8	2	Algarve (3D)	1	1	1	1	
9	2	East - Baghdad S2 (3D)	1	1	1	1	1
10	2	Dujaila (3D)	1	1	1	1	
11	2	East – Baghdad s1 (3D)	1	1	1		1
12	2	East – Baghdad s3 (3D)	1	1		1	
13	2	Abu Amoud (3D)	1	1		1	
14	3	Akas (3D)	1	1		1	
15	3	Mansourieh (3D)	1	1		1	1
16	3	Khasfa - Anah (3D)	1	1		1	
17	3	Samawah - Diwan (3D)	1	1		1	1
18	3	Muthanna-Hadeer	1	1			
19	4	Block-9 (3D)	1	1		1	1
20	4	Block-9 (2D)	1				1
21	4	Subh- Lhais (3D)	1	1	1		1

22	5	Najaf-Karbala (3D)	1	1	1	1	1
23	6	Al Rokaa - 11 (2D)	1	1			
Total			23	22	10	16	10

Based on these results, the obstacles affecting the workflow are arranged according to their importance, frequency, and then both the relative frequency and the cumulative relative frequency of each type. Then, they have been calculated as shown in Table (3):

Table No. (3) The descending order of obstacles according to frequency (Pareto analysis)

work obstacles	Duplicates	Relative frequency%	Cumulative relative frequency%
Nature	23	%28.40	%28.40
Technical	22	%27.16	%55.56
Social	16	%19.75	%75.31
Government	10	%12.35	%87.65
Security	10	%12.35	%100.00
Total	81	%100	

After obtaining these results, a Pareto map was drawn for these data as shown in Chart No. (1):

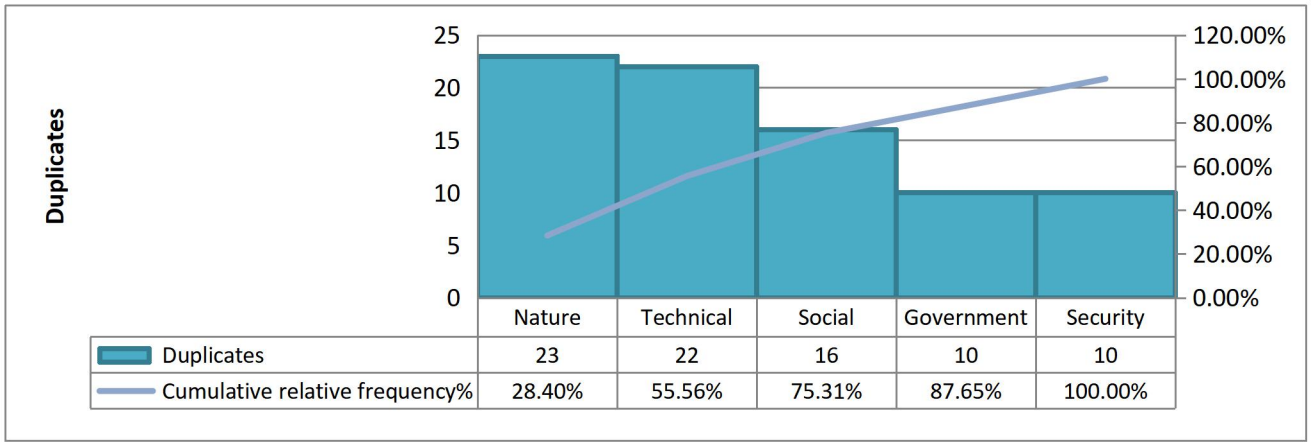


Diagram No. (1) Pareto diagram for work obstacles in the research sample (23) projects

As shown in the Pareto diagram for the previous obstacles, it is obvious that the intersection of the cumulative relative frequency line, which corresponds to 80% of relative frequency rates, is also corresponds to 75.31% of the cumulative relative frequency rate. Consequently, it can be concluded that there are three main problems that cause about 75% of work impediments' problems, which needs to be solved. Work procedures will be improved by 80%, namely: natural obstacles, technical obstacles, social obstacles, and then the remaining disabled people can be studied.

In order to examine the most important reasons that lead to these problems, the researcher used the cause-and-effect diagram (Ishikawa) to find out the main causes. The following four elements were chosen because they have a clear impact on work which was monitored through the reports and data collection. For instance, machinery and equipment, workers, work methods, work surrounding environment. Diagram No. (2) Shows an illustration of the cause and effect diagram (Ishikawa) that demonstrates the four main causes and some of the sub-causes affecting work obstacles

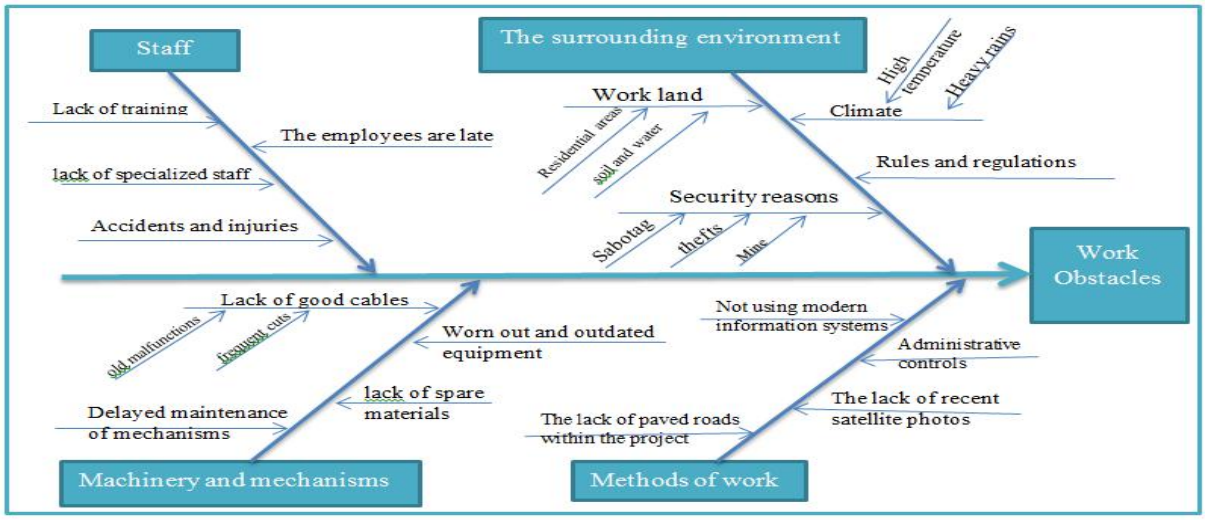


Diagram No. (2) Cause and Effect Diagram (Ishikawa) for work constraints

2) Determining the mechanism for solving the problem: After the problem has been identified, the work team should be ready for solving the problem. The process is started with suggesting a proposal which has been submitted to the company. The company team consists of: (a decision maker from the top management, an official in the quality department, a member of the safety team, information systems specialist).

3) Determine the benefits of solving the problem: The benefit of solving this problem is to conduct analytical studies of potential risks and to find the best methods to confront them and reduce their damages. In addition to provide health care, educational and awareness programs, and train workers on occupational health and safety instructions. This is to avoid the loss of workers' lives or prevent any possible disability. The use of modern work methods makes work faster and improves the accuracy of decision-making.

Second stage - analysis of current operations: In this stage, the processes, activities and mechanisms of quality department are clarified to identify problems and how they take the necessary decisions. These activities are represented by collecting information of a spatial nature that describes geographical features, terrain and climate in work sites and determining natural features. Namely, features such as forests, rivers, desert areas or artificial features like buildings, roads, bridges, and dams. Moreover, determining engineering measurements such as areas, distances, directions, and coordinates of project sites.

Third stage - developing the most appropriate solutions: In this stage, appropriate solutions that can be used to solve problems are identified in the first step and here geographical information systems that will be used for the following reasons:

1- One of the most common uses of GIS in the oil industry is data maps for easy use of digital maps that enable knowing what data are available so it participates in reducing the time that needed to search for information.

2- It provides an ideal environment for fast evaluating data, as it provides an effective way to produce and extract different types of data in order to help decision makers.

3- Development of oil operations, where it is preferable for oil companies to be able to provide the most accurate details of environmental changes. Therefore, geographic information systems are able to integrate and edit data on environmental changes and control them.

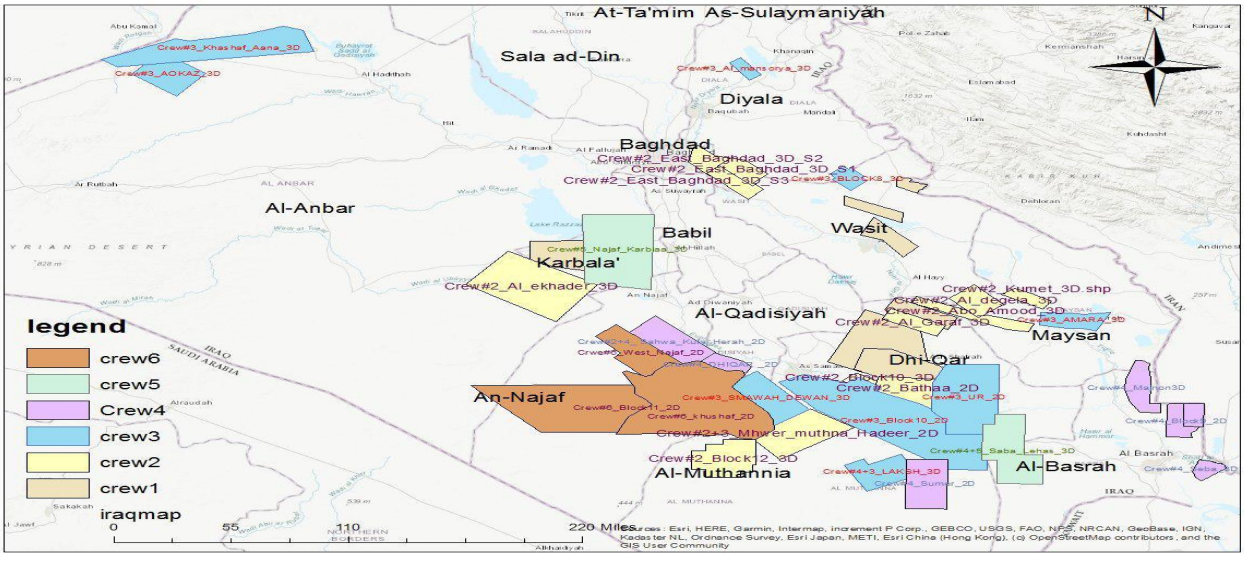
In order to implement these systems, the data that must be available to complete the subsequent steps were determined. In other words, the obtained data which represented by spatial data: (map of Iraq, site coordinates) and metadata: (names of seismic teams, name of the project) have been collected.

Fourth stage - implementing changes: In this stage, solutions are implemented into practice as follows:

1- **Data entry**: The ARCGIS 10.8 program was used, which is an efficient and modern program which is capable of dealing with all data, images and maps. It aligned with international standards in the field of information technology. It is also linked to the information network of the company and requires building a large database that includes spatial and descriptive data. These data concerning business requirements and information services that will be included in the system. Based on that, it can be done by entering the data obtained from the exploratory seismic teams and from their projects that they carried out for several years. The data includes (the name of the seismic band, the name of the project, the number of project points, the number of project points left, implementation ration, work start date, work completion date, the reasons for leaving work), as well as entering the site coordinates for implemented projects.

2- **Conducting the operation**: Through the program, the data was processed and represented geometrically on the map of Iraq, where a satellite image was provided for Iraq for the year (2019). The researcher has presented the data onto the projector (UTM WGS1984, ZONE38N) and the database which was created for the entered data in a shape file, had represented by the use of engineering representation POLYGON to represent the following: (location of projects undertaken by seismic teams, borders of Iraq), and use of POLYLINE engineering representation to represent the main and secondary road layers of Iraq.

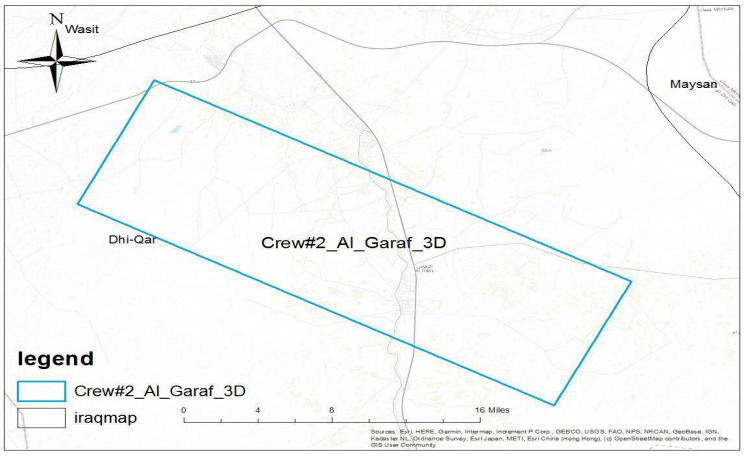
3- **Outputs**: The system management procedures aimed to obtain a map that shows all the projects that the seismic teams have implemented according to data obtained from the Field Work Authority. These data includes approximately 45 projects, including the research sample projects, as it includes all the data related to these teams, and as shown in Map No. (1):



Map No. (1) Shows the most important projects implemented by seismic crews using ARCGIS 10.7

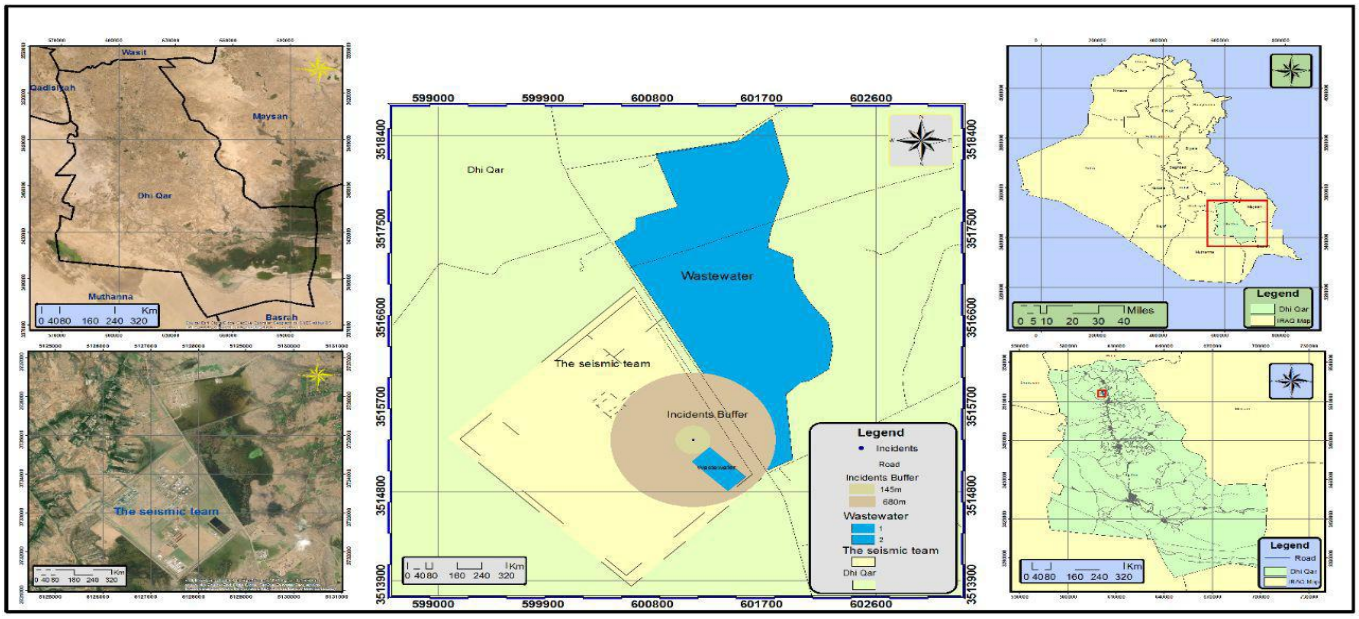
Fifth stage - study and evaluation of results: The researcher revealed that geographic information systems contain a set of important and useful programs. As these programs have the ability of capturing digital satellite images, storing, processing, analyzing and management. They are also working to provide all kinds of data related to geographical information. It allows the integration of spatial and geographical data collected from several sources and their classification in a single place to store, display, analyze. Furthermore, it interprets data in a unique way that reveals relationships and patterns with the ability to see data in the form of maps, reports, tables, and charts as needed to conduct the improvement process. This stage covered the following steps:

First: Creating a database and interactive maps: making the selected projects map as a sample for the research (23 projects) using the ARCGIS program. One of the exploratory projects (the Al-Gharaf project) has been chosen to conduct a spatial analysis for it and study the surrounding area, as the Al-Gharaf field is located in Dhi Qar Governorate, about 5 km northwest of the city of Al-Rifai. On both sides of the Al-Gharraf River, which crosses the project from the far north to the south, in addition to the fact that the Rifai district is all within the survey program with water bodies, and a large water body that represents the sewage swamp for the Rifai district. Three wells are located in the project area, they are (Graf-1) and (Graph-2) and (graph-3), as shown in Map No. (2):



Map No. (2) Shows the location of the Al Gharraf project on the map of Iraq using ARCGIS 10.7

Second: Spatial analysis: A spatial analysis was made for a project that included the presence of a disabled people and the occurrence of a work accident using the BUFFER tool. This tool creates a boundary for the work area at a specific distance. This tool is chosen from the Proximity toolset in the ARC Toolbox program for the purpose of indicating areas with a specific distance to study the perimeter of the obstacles. It could also indicate the accident and the most prominent effects that led to it, as shown in map No. (3):



Map No. (3) Shows Dhi Qar Governorate and the Al Gharaf project in the ARCGIS program

The map shows the following:

1. Raster data. Satellite imagery was adopted from ArcGIS Online, which showed the location of the squad.

2. Vector data included the site representation point of the accident in the project and the Polygon representation which represented the sewage lakes. This were represented in blue (the first lake is outside the seismic band, and the second lake is inside the seismic division), while the second seismic group in Dhi Qar governorate is differentiated by the yellow color In contrast, the Polyline representation represents the methods located within this area, while the Buffer representation represents the ranges surrounding the incident. As it is derived from two ranges, the first 145m and the second 680m, and these ranges cover the area of work obstacles due to the presence of a sewage lake.

Third: Recording of improvement measures: Table No. (4) shows the most prominent activities that were followed in the quality, health, safety and environment section before improvement and the improvement procedures that were followed, Also, it shows the benefit of these measurements and which of the authorities will benefit the most from these measurements the table also examines whether these measurements are located inside or outside the department, see table (4) below:

Table No. (4) Shows Improvement processes

No	operation	Activity followed before improvement	Improving activity by using geographic information systems	The benefit of optimization	the beneficiary
1	Determine the project site	The work site coordinates are mentioned in the project reports after the work is completed	Determine the coordinates of the work site at the Quality Department in one of the interactive geographic information systems programs after determining them by the geological survey and before	Determine the safety and environmental requirements of materials that suit the work with the nature of the earth and the climate at these sites	1- Occupational Safety and Fire Division 2- Environmental Protection and Public Health Division

			starting work		
2	Make decision	The decision is made by top management based on the information	The decision is made by the higher management based on the information obtained from the interactive geographic information systems, to which all departments are linked	1- Helping to make decisions as quickly as possible with accurate, correct and available information 2- Improving the preservation of geographical documents and ending the paper spoilage process	1- Senior management 2- Managing departments and agencies as needed
3	Defining environmental measures	Waste are disposed of by means of sanitary landfill at work sites	Sanitary landfill sites are identified near work sites or modern waste and waste disposal mechanisms are used using one of the interactive geographic information systems programs based on satellite imagery.	Preserving the environment from pollution and maintaining the health and safety of workers at sites	1- Implementation and monitoring unit of health, safety and environment performance, security application and management 2- Environmental Protection and Public Health Division 3- Occupational Safety and Fire Division
4	Define quality measures	The internal audit procedures are carried out according to the specified periodic schedules, and the company is subject to an external audit to maintain the specifications obtained	The procedures implemented on the sites are marked to indicate the sites that have been subjected to auditing from others The auditor can also be provided with the necessary data and information when needed and without delay	It facilitates the beneficiary to control all the operations that he can perform in different places and multiple locations and to avoid errors, omissions and delays	Division of Quality and Performance Assessment
5	Field work databases	The field work data are recorded in the Field Work Authority and it is in control of this	The Quality Department can create a database for it that includes all its work in geographic information systems using field work data	1- Participation in work leads to facilitating procedures, simplifying and speeding up data circulation between departments	Division of Quality and Performance Assessment

		data		2- Improving communication between workers in any project, as maps are an easy language for specialists to understand	

Sixth stage - standardizing and establishing standard solutions: to ensure that the improvements included in the process which shown in the field (improving activity by using geographic information systems) in table No. (4) Have led to the expected results and to the improvement in the level of output quality through achieving the following:

1. Data Maps / Ease of using digital maps that enable the company's staff to know what data are available to them.
2. Spatial analysis / that the use of available information requires data integration on a large scale. Therefore, the geographic information systems provide an ideal environment for a quick data assessment. Moreover, it provides an effective means of decision-making, which gives a strong competitive advantage in obtaining licenses in the investment of oil fields.
3. Oil site management / method for generating production reports and related key investment information.
4. Environmental monitoring / by environmental monitoring the changes will be examined in order to control the variables with high efficiency.

Seventh stage - planning for the future: In this stage, the focus will be on improvement process, where it must be continuous. By proposing proposals to the company, which in turn will follow these improvements, and for this, the focus must be strong on the process of future quality planning through the following points:

1) Establishing an interactive database linked to the field work authority before starting any new project.
2) Establish a geographical database for all previous projects and save it for reference when needed.
3) Determine the necessary mechanisms and equipment for the purposes of preserving the environment.
4) Train workers on safety methods regarding roads and workplaces.
5) Paying attention to quality improvement tools by using Deming's cycle of improvement and geographic information systems to control workplace environment and climate.

In order to determine the reasons for quality improvement that resulted from the use of quality tools and geographic information systems, an Impact and Result Map (Ishikawa) was used as shown in chart No. (3):

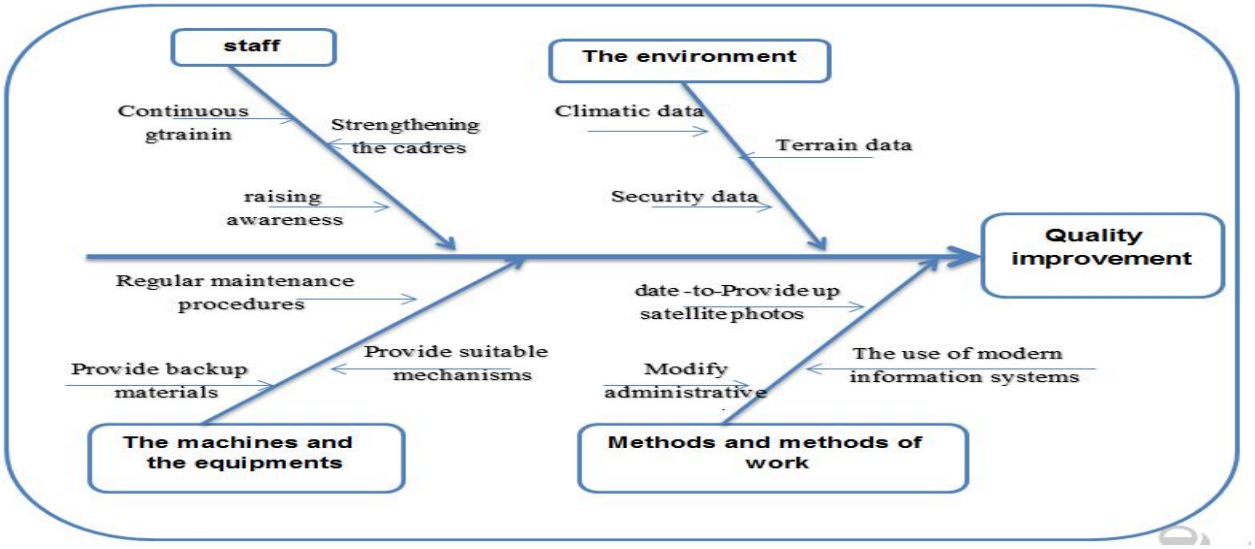


Diagram No. (3) Impact and Outcome Scheme (Ishikawa) to determine the reasons for quality improvement

Conclusions: In conclusion, from this research

1. Geographic information systems help in integrating data on a large scale and providing an ideal environment for data evaluation and analysis with the least possible time and effort. Thus, it offers accurate decision-making by generating reports, building interactive maps, the ability of these systems to improve the process of managing the company's various resources. This is due to their ability to link descriptive and spatial databases to each other and facilitate the process of information exchange and communication process between different departments and between seismic teams.

2. the most prominent sub-reasons that the research participated in and that emerged in the fishbone diagram are the lack of training courses for work procedures. This lies behind the lack of data integration between government sectors. Furthermore, the lack of corrected satellite images for the seismic teams which supposed to help in monitoring the surrounding environmental variables.

3. Pareto diagram helped collect and diagnose data on research problems that led to the emergence of obstacles and causing accidents. Ishikawa diagrams contributed to the analysis and knowledge of the causes of these problems and helped to develop appropriate solutions to address them and try to prevent their repetition. Highlight the most important reasons that led to the improvement.

Recommendations: After a comprehensive discussion throughout this research, a number of recommendations have become very pertinent amongst which are:

1. Adopting the organization and construction of a geographical database for each project before starting its activities. Then, the decision-makers can refer to when planning and to provide the requirements and working times in a problem-free work environment. Also, to examine the nature of the land, climate and other conditions surrounding the project.

2. The use of modern quality improvement tools to improve the quality of work for quality divisions and departments.

3. The necessity of using modern technologies for geographic information systems at quality departments. It improves work quality by reducing waste, time and effort, and improving decision-making by relying on geographically corrected maps based on modern satellite imagery.

4. The necessity integrating geographic information systems with all government agencies by building a unified geographic information base. This will certainly help them to make quick decisions to increase productivity for work for all. Especially in crises and when facing risks, since GIS has proven to be the fastest and most accurate method.

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