PROGRAMMING AN INTERACTIVE MAP TO ENHANCE CLIENTS' PARTICIPATION IN SITE SELECTION OF E-MARKETING, IN CAIRO AND GIZA GOVERNORATES- EGYPT

***Reda Alkot Mohamed[1] & Sayed Ahmed Sayed [2,3]**

Abstract

Multiple-Criteria Decision Analysis (MCDA) is concerned with structuring and taking decisions involving multiple criteria. Integrated with Geographic Information System (GIS) technology, MCDA can be used to select the best locations for any investment project. However, not all investors/clients have the required skills to use these specialized methods and programs. Also, there may be an incompatibility between the consultant and the end user in the end results. Therefore, this research aims to program a web-based Decision Support Engine (DSE) to facilitate the decision-making process and involve the end user easily. The proposed DSE was applied to an E-marketing applied study in Cairo and Giza governorates. Data were collected by electronic questionnaire (928 Questionnaires) processed by SPSS, to create the geodatabase used by the Django web framework to build the DSE. The end result of DSE is producing an Interactive Map to support clients' decision-making in an easy manner. [Bul. Soc. Géog. d'Égypte, 2022, 95: 1-22].

Keywords: E-marketing, Cairo and Giza, Interactive map, Django framework, DSE.

1) Introduction

Feasibility studies are one of the most important studies that economic investors need on an ongoing basis in order to establish their economic projects because they intensely help them in making their decisions in the field of investment.

1) Lecturer of Human Geography, Geography Department, Faculty of Arts, Cairo University, Giza, Egypt.
2) Department of Computer Sciences, Faculty of Graduate Studies for Statistical Research, Cairo University, Giza, Egypt
3) National Authority for Remote Sensing and Space Sciences, Egypt
*** For Correspondence:** e-mail: reda_alkot@yahoo.com

One of the most important elements of the feasibility studies is to create a suitability map for the best locations to carry out these projects by the integration with GIS technology. GIS produces this map by applying a site selection model to determine the most suitable locations for agriculture, industry, trade, or other economic and life activities.
Also, GIS provides MCDA tools in spatial decision support and creating spatial modeling to support the proper decision in selecting the best location (Eldrandaly and AbdelAziz, 2012). The site selection modeling process is applied for selecting the best locations for stores and shops and selecting the shortest paths. So, Geographic Decision Support (GDS) is a promising field in managing economic resources in general and for decision support efforts in the field of urban planning and Spatial Decision support systems (SDSS) in specific (Chandio and Matori, 2011). Also, the land suitability model is applied through MCDA because the spatial decision-making process is a complex process, as it includes many and varied data (economic, social, environmental, political, and other data). Therefore, the decision-making process is called Multi-Criteria Decision Making (MCDM).
But, end-users/clients are may not have the required knowledge for using these specialized methods and programs such as GIS. So, these experiences can be gained by sharing with Expert Systems (ES) in an automated analysis to design a simple and easy-to-use computer interface. Expert systems are a branch of Artificial Intelligence (AI) (Drake, et al, 2010) that aims to serve automated decision-making by sharing knowledge with experts to define a set of rules and steps for making the best decision (Robinson, and A. Frank, 1978) in an interactive method. This interactive method allows multiple choices in line with the desires of the end users, which makes the decision-maker involved in the decision-making process in an easy and simplified way.
This Interaction is called Goal-Oriented Design which is concerned with meeting the needs and desires of the end-users in an easy way and smooth steps, creating Human-Computer Interaction (HCI), and achieving Cognitive Walkthrough among the various variables affecting site selection project (Roth, 2011), and allowing interaction with the experiences and expertise of the end user (Lee and Shim, 1986).
E-Marketing, our applied study, is defined as the process of marketing different products or services over the Internet. It is also a broad integrated concept that includes advertising, communicating with customers/ clients, and retaining them for as long as possible. That is the use of the Internet and other interactive means to build interaction between the company and specific consumers/ clients. In other words, e-

marketing is also meaning that the company can use the Internet continuously at every step of the sale; before, during, and after the sale. E-marketing has a big importance for companies as it helps them to attract the largest possible number of customers via the Internet, in addition to advertising and promoting their goods and services online (Kolomvatsos, et al, 2014). E-marketing has a wide range of methods, starting with building a company's website on the Internet, passing through electronic advertisements, e-mail marketing, and creating electronic catalogs. Also, E-Commerce companies raise their customers' e-loyalty by appropriately managingtheir electronic word-of-mouth (EWOM) systems (Khan and Hashmi, 2016). On other hand, E-shopping is defined as the process of browsing web pages specialized in selling various goods and services through what is known as electronic shops for electronic purchase by the consumer himself.

Decision support programs for the best site selection for any economic investment, E-marketing for example, are highly specialized programs that are used by specialists and experts, through a set of specialized steps that the project owners may not be familiar with. Also, decision support programs may be costly and needa long time to use efficiently. Also, there may be an incompatibility between the results reached by the consultant and the wishes and experiences of the end user/client.

So, through the proposed DSE, the client will be involved in the decision-making process in an interactive way by making him select the important variables affecting his project.

The main contributions of this work can be summarized as follows:

- Programming a web-based Decision Support Engine (DSE) to facilitate the decision-making process using recent open-source technologies. Some examples of these open-source technologies are; Python Programming Language, Django Web Framework, HTML5, CSS, and JavaScript. These open-source technologies are mainly used in building web applications that rely on Python as a backend to apply some data analysis and statistics and display the results on the web in an efficient manner. Our work will use Django Web Framework.
- Involving the end user in the decision-making process in an interactive manner

The rest of this paper is organized as follows. Section 2 outlines the related work briefly. The proposed methodology is presented in Section 3. Experimental results for the proposed method are introduced in Section 4. Finally, Section 5 concludes the paper.

2) Related Work

The related works could be divided into three groups: -
Group 1 shows the studies of the Decision-Making Process. For example, a geospatial Decision Support system (DSS) was implemented to achieve high quality for drought-related data. These DSS offers a range of data mining techniques with full control to users in the United States (Goddard et al, 2003) & (Harms, et al, 2002).
Also, in (Terribile, et al, 2017), a Geospatial Cyber-infrastructure platform was used to build a novel DSS that facilities collection, management, and processing for both static and dynamic datasets, data visualization, and on-the-fly computer applications in order to perform simulation modeling.
The power of automated analysis and Electronic DSS in decision-making could be used in medicine, to facilitate communication between patients and doctors, in order to reach the best service through applications of information technology (Beilby, et al, 2005).
From a computer sciences view and the programming languages, Shesham (2012) proposed a framework named GeoFilter which derives GIS data andprocesses it with Expert System decision-making capabilities to help in solving spatial decision-making problems.
Ahmed, et al (2015) showed how an information system in Egypt, helps investors to take their investment decisions. This system adopted many different technologies, such as JavaScript, Google Maps API, SQL Server, Liferay Content Management System, and JSP. The system was tested by different platforms such as Microsoft Azure Cloud, VM (Windows 7 based) on Cloud (PaaS Service), and on a private remote server. Also, query time at each platform was measured. The results showed that applying the query on a virtual machine on a private cloud is the best and took the shortest time.
Also, in the field of Business and investment, ArcGIS Business Analyst helps to add a business, demographic, and consumer data to provide tools for market analysis. This Business Analyst helps in designing campaigns that consider demographics and planned launch dates to help in offering insight for designing a strategy for marketing (Connor et al, 2008).
A retail GIS analysis explained how GIS and some methods and new tools could be used in the business of site suitability analysis, customer profiling, exploring the future market potential analysis, and exploring the trends of the retail sector (Kavita and Patil, 2011).

Other studies, show the relationship between Decision-Making Process and planning goals, such as Land Information Systems (LIS) which developed as a tool for urban planning, development, and management on different planning levels. LIS has been integrated with many GIS platforms for effective implementation (Sukeerthi, 2013). Also, ASPENEX for forest management, URBYS for urban planning and analysis, and GEOOEX to assist planners in assessing the suitability of land for land use activities. These applications are produced by cooperating with GIS and Computer Science represented in the field of programming.

Group 2 revealed studies that show how public participation can be used in Decision Making. For example, (Bethany and Joseph, 2011) show that the data from GIS and economic modeling can be integrated in a visual MCDM tool to enhance the National Environmental Policy Act (NEPA) process and public participation. Also, User priority combined with the MCDM tool to provide multiple alignment alternatives for a transportation project participant.

In addition, in (Farnaghi and Mansourian, 2020), public participatory GIS (PPGIS) was introduced, which helps the public in Collaborative Spatial Decision-Making (CSDM) by participating in site selecting process through a Web-based platform using cloud computing infrastructures.

Group 3 discussed the relationships between the interactive maps by using Web GIS and the decision-making process. Web GIS could be considered as a type of programming an interactive method to achieve the decision-making process. Web GIS is used in many fields such as tourism, health, economics, management, ….etc.

For example, ArcGIS Server and Web-GIS are used to create a platform guide for tourists to enable them to find the touristic places and services in historic Cairo in an easy and quick manner. In this study, the digitization of the cultural heritage led to the creation of digital maps for historic Cairo, which lead to easy and accurate identification, analysis, and interpretation of geographical data and touristic places attributes (Mohammed, et al, 2021).

The Zambian Ministry of Health created a web-based GIS architecture with an intuitive and simplified user interface to enable non-specialist users to work on the system without any specialized knowledge. Their architecture was used as a Managing tool for monitoring and evaluating health facilities and as a portal for public interaction with their spatial information (Mushonga, et al, 2017).

(Reed and Bodzin, 2016) utilized Web GIS maps to investigate malaria disease patterns and prevalence related to the environment in the Congo and their relationship with environmental and demographic factors to increase public health literacy through dynamic mapping for timely and accurate decision-making.

Also, a web-based GIS system was built for monitoring and mapping the Sugarcane crop at the farm level in Medak District - Andhra Pradesh, India. This monitoring system led to appropriate decisions to increase production and other activities related to the crop. It also helped non-technical users access information and take appropriate measures to improve crop production (Kumar and Babu, 2016).

In (Ahmed, 2011), a Web-GIS was used to build an information system for tourism marketing in the Aqaba Governorate, which resulted in saving time and effort and reaching accurate results in a very short time.

On the other hand, a Web GIS decision support system for rural land management in Wadi El-Natrun valley (WNDSS), El-Beheria governorate was designed and implemented. This WNDSS was developed following the client/server model and contains many functions, like data extraction, statistical analysis, and visualization by an interactive map (Ahmed, et al, 2020).

Another Web GIS platform was proposed to monitor and investigate soil at a multi-scale in order to raise public awareness. This platform is a combination of Web-GIS with on-the-fly geospatial processing based on GPU computing, specifically designed to allow real-time requests (Langella, et al, 2020).

In (Góralski, 2009) three-dimensional interactive maps were introduced to offer improvements and benefits to their traditional counterparts, by presenting resulted maps in a 3D view.

From the above discussion, it can be noted that Web GIS is considered a first step of programming to aid decision-making by using web platforms. And by using GIS, spatial data could be provided to the planners, because GIS can store, retrieve, analyze, model, and map a large volume of spatial data. And by the integration between these maps and their spatial databases, users can create knowledge used in planning and decision-making.

But, the proposed DSE will have a superior feature over the previous works discussed that is it will increase the client's participation in the decision-making process by programming a simple interface allowing him to select which criteria affect his project and also select the level of this effect in a process called Public Participation GIS (PPGIS). And the

resulting map will be as aiding in the decision-making process to identify a suitable place forE-marketing in the study area.

3) Methodology

In this research, the proposed application was built to help the decision-maker in selecting the best places for E-marketing in the study area. The interactive map was applied to a new object in Economic Geography "E-marketing", and in an important area "Cairo and Giza governorates" which is the capital of Egypt. A detailed description of the proposed methodology and the key technologies used in developing this system are presented in this section. The proposed methodology is shown in Figure 1.

The study area of this work is Cairo and Giza governorates, because Cairo is the Capital of Egypt, and Giza is Twin City for it, and both have 18.7 million persons (CAPMAS, 2021), representing 19 % of Egypt's population, so they form a promising place for E-marketing, or for any other economic projects. A random electronic questionnaire was distributed over the study area to collect the data.

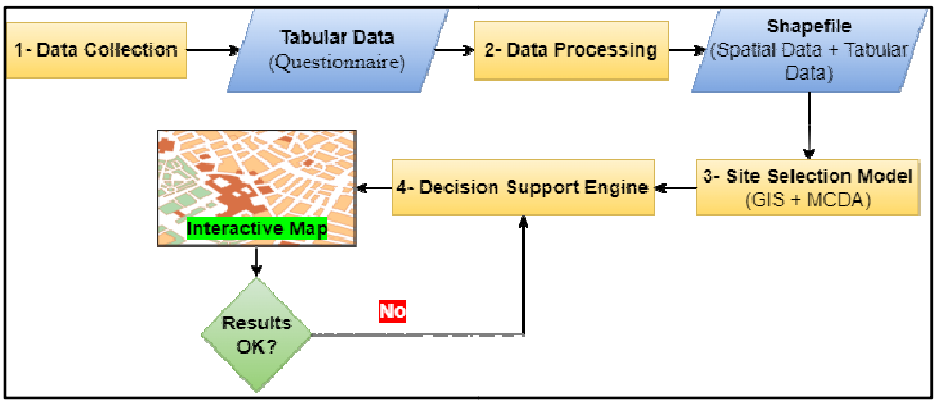

Figure. 1 The proposed methodology

3.1) Data Collection

The first step in the proposed methodology is collecting the data. The data required in this system was gathered by an electronic questionnaire carried out online. This questionnaire (Appendix 1) was designed in Google Forms, and the link of these google forms of the questionnaire was sent to the interviewees by Facebook in a random distribution manner. The aim of this questionnaire is to collect data about the

variables that have an effect on e-marketing. These variables were identified and described in general in Table 1.

Table 1. Selected variables of the Questionnaire

Variable	Description
Age	The younger age is most responsive to E-marketing activity
Educational level	The high educational level most suitable for E-marketing
Job	The job types that most interact with E-marketing
Mother work	The author's hypothesis is that the workwoman is more interactive with E-marketing than the unemployed woman according to personal view
Family income	High family income means more activities on E-marketing according to children within the family
Browsing	Internet browsing rate per day
Searching on the Internet before shopping	Searching for the desired product online from several websites before buying it

The number of questionnaires that were collected was 928 Questionnaires distributed between Cairo 363 Questionnaires (39.1%), and Giza, 565 Questionnaires (60.9%). The outcomes of this questionnaire and the characteristics of the interviewees in classification are shown in Table- 2, which will be the base for creating a geodatabase of the proposed DSE. The classification of every variable into categories is shown in Table 2, for example,the age group (41–60) represents the high percentage (73.1%) from studying the age variables. and the university educational level is the high percentage (49.7%) from studying the Education level variables, and so on.

Table 2. Characteristics of the interviewees

Variables	sub-variables	Size	%
Age	≤40	174	18.8
	41–60	678	73.1
	≥61	76	8.2
Education level	Secondary or less	416	44.8
	University	461	49.7
	Above university	51	5.5
Job	Governmental sector	392	42.2
	Private sector	536	57.8
Mother work	House wife	664	71.6
	Governmental job	174	18.8
	Private sector	90	9.7
Family Income	≤3000	301	32.4
	3001–5000	419	45.2
	≥5001	208	22.4
Daily internet browsing	≤ 2 hour	263	28.3
	2 - 4 hours	240	25.9
	≥ 4 hours	425	45.8
searching on Internet before shopping	Regularly	646	69.6
	Sometimes	282	30.4
Total		928	100.0

3.2) Data Processing

The questionnaires data has been processed by some steps:

- Convert questionnaires data from individual cases (every interviewee represents a case) to spatial cases, by using SPSS software (cross tabs process). and the university educational level is the high percentage (49.7%) from studying the Education level variables, and so on.
- Joining these spatial data with the map in ArcGIS to create the shapefile. This shapefile contains spatial attributes, such as the data geometry, as well as the tabular data of the questionnaires. This shapefile is then being used as the interactive layer with which the end user will interact. Figure 2 shows the questionnaires data after processing.

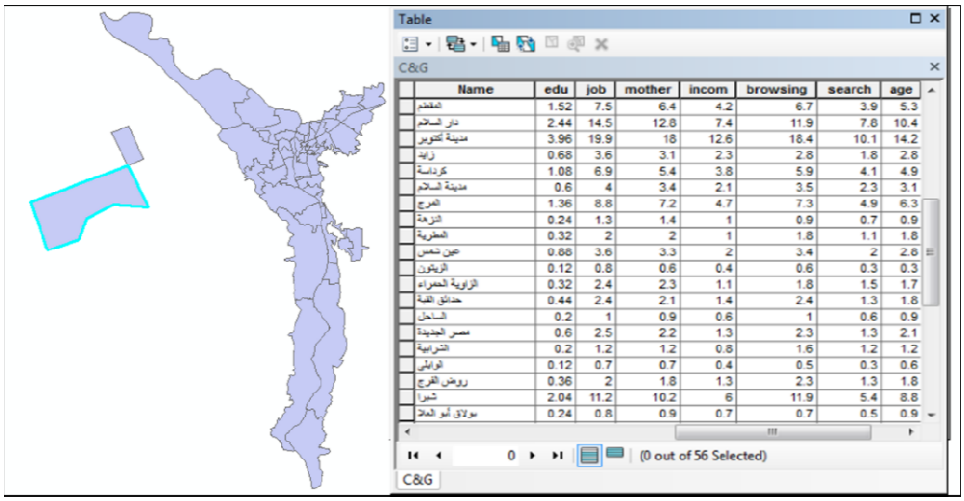

Figure. 2 The questionnaires data in shapefile format

3.3) Data Processing

The site selection model is a common approach to identifying the best place for any project and assisting with decisions for the best suitable alternative for future site location, factoring in multiple variables of varying importance to identify locations that best meet established criteria for a site. ArcGIS provides a set of tools and functions for users to perform site selection modeling. To identify possible locations, suitability analysis ranks and scores sites based on multiple weighted criteria. First, you'll define the problem, identify the criteria for solving it, and generate the input datasets required. Then, the input values will be transformed to a common ratio or preference scale so the criteria can be compared. This scale is created according to the author's subjective view, depending on his experiences with the relative importance of every factor and its effectiveness. Next, weights will be assigned to selected criteria and aggregated them to determine scores for each potential site. Finally, these scores will be used to rank sites from most suitable to least suitable to identify the best possible locations for the desired application (Abramovich, 2012).

The site selection model will be built from the cooperation between the academic view and the experimental view as the following:

- The consultant and the academic will give weights to the sub-variables that influence the e-marketing, depending on his own view as shown in table 3.

Table 3. Weights of sub-variables in the study area

Variables	sub-variables	weights
Age	≤40	0.3
	41–60	0.2
	≥61	0.1
Education level	Secondary or less	0.1
	University	0.2
	Above university	0.3
Job	Governmental sector	0.1
	Private sector	0.2
Mother work	House wife	0.1
	Governmental job	0.2
	Private sector	0.3
Family Income	≤3000	0.1
	3001–5000	0.2
	≥5001	0.3
Daily internet browsing	≤ 2 hour	0.1
	2 - 4 hours	0.2
	≥ 4 hours	0.3
searching on Internet before shopping	Regularly	0.2
	Sometimes	0.1

- The end user will put his experiences by selecting the level of effectiveness for every main variable as shown in Figure. 3. And by this, the Clients/end user will participate in the Decision-Making Process of selecting the best site forE-marketing in the study area.

3.4) Decision Support Engine

The last step in the proposed methodology is to build the Decision Support Engine (DSE) by a programming language, that will be used to identify the best locations for carrying out an E-marketing project. The proposed DSE was built based on a free and open-source web framework called Django.

Django according to (Liawatimena, et al, 2018) is a framework for web development using Python and was created for the quick development of database-driven sites. The Django framework gives a great emphasis on the reuse of models and templates, as well as the DRY (Don't Repeat Yourself) rule (Aziz, 2021). Django is lightweight, efficient, and Python-based. It encapsulates all parts needed to build a web application (Front End and Back End) in one framework, so it simplifies the communications and interaction among the web application components. The front end of the application was built using HTML5, CSS, and JavaScript. It represents the interface with which the end user will interact and is responsible for sending the end user's request to the back end to process. The back end represents the main controller of the web application which will receive the end user's requests from the front end, process them, and deliver the results to the front end to render. The back end of the proposed DSE makes use of Python programming language.

4) Results and Discussion

The main interface of the proposed DSE is shown in Figure 3. In Figure 3, all variables that have an impact on the E-marketing activity appear as well as the degrees of their impact to identify the best place for E-marketing in our study area. The proposed DSE provides an interactive process between the decision maker (end user/ clients) and the available variables, where the end user will do the following, according to his own opinion, due to his experiences:

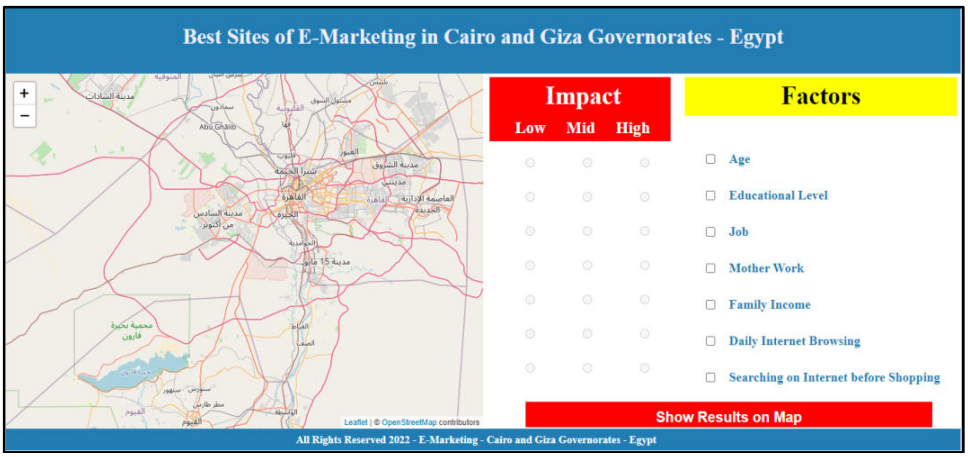

Figure. 3 The main interface of the proposed DSE.

A. Determining the variables that influence the project and leaving the others that do not. These variables were shown in Table 1.
B. Determining the degree of the impact of each variable on e-marketing (strong - medium - weak) because all variables do not have the same degree of impact. Each factor differs in the degree of its impact on E-marketing according to the own opinion of every end user separately.

After selecting the desired variables as well as the degrees of their impact –as a random example- as shown in Figure 4, a site selection model equation will be calculated within the proposed DSE to find the relationship between the selected variables according to the degree of effect of each variable separately, which have subjective reference scale as follows:

- If the degree of effect is chosen "strong", the result of the variable will be multiplied by an effect factor of 1.
- If the degree of effect is chosen as "medium", the result of the variable will be multiplied by the effect factor of 0.6.
- If the degree of effect is chosen as "weak", the result of the variable will be multiplied by the effect factor of 0.3

All these selections are then translated in the proposed DSE to calculate the site selection model equation, Algorithm 1 shows how these variables are translated into the site selection model equation.

Taking in consideration the probability of changing of these arithmetic transactions from place to another, and from time to time, the final result of the proposed DSE is an interactive map which shows the selection of some variable (randomly), and the degree of strength of their impact on e-marketing. It also shows the best e-marketing places in Cairo and Giza. The best locations are shown and ranked in categories based on the suitability color ramp. Figure 4& 5 shows two different scenarios of the resulting interactive map. The results of every scenario differ according to the variables that were selected by the end user. Hence, the end-user has been involved in the decision-making process, because he can select the most important variables, and not select the others, according to his own opinion.

So, the proposed DSE can be thought an integration between the end user's experience and the academic methodology in determining the best locations for e-marketing, because the site selection model will be built from the cooperation between the academic view and the experimental view. The consultant and the academic view will give weight to every sub-variables that have an effect on E-marketing, depending on the author's view. After that, the end user will select the

level of effectiveness for every main variable. And by this, the Clients will participate in the Decision-Making Process of selecting the best site of E-marketing in the study area.

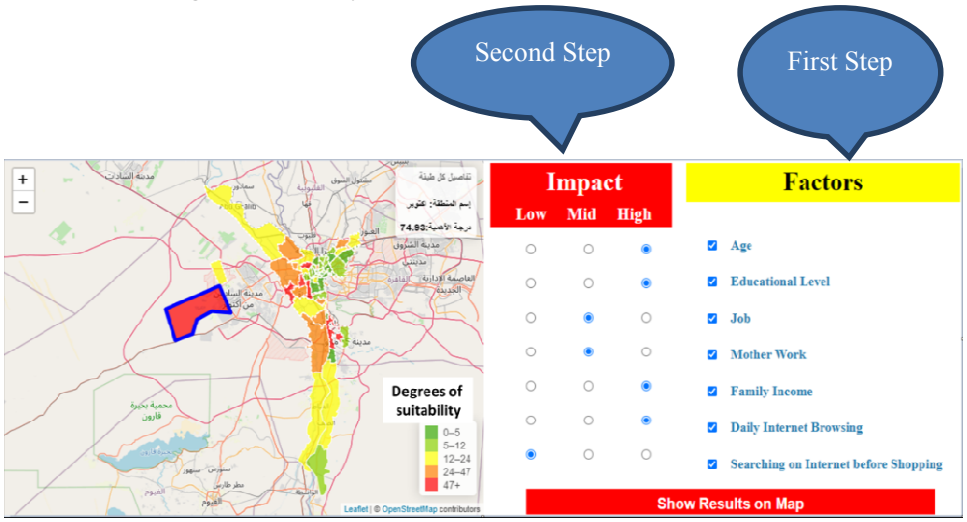

Figure 4.The first scenario of the interactive map of E-marketing in Cairo and Giza Governorates.

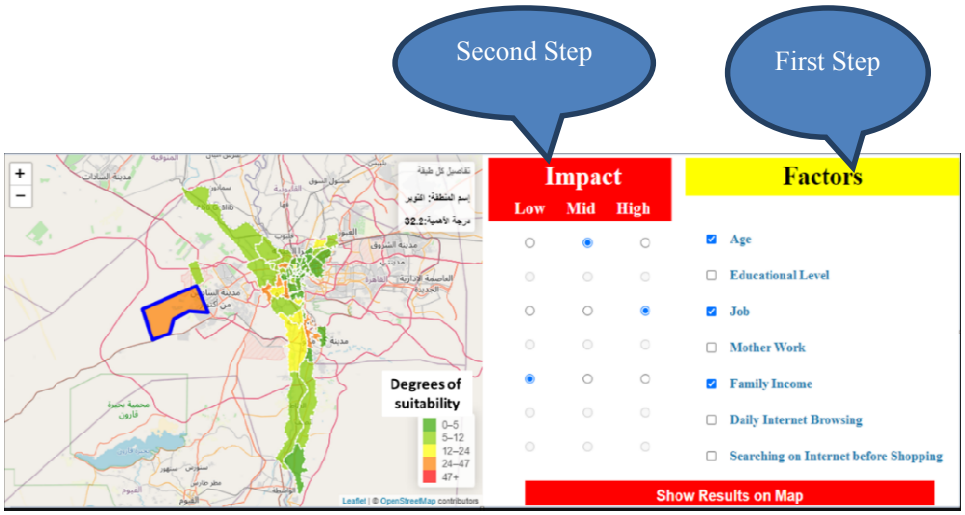

Figure 5. The second scenario of the interactive map of E-marketing in Cairo and Giza Governorates.

This integration must be done because the site selection process varies between the specialist/ consultant who applies academic experience and the client/end-user who has practical experience. Hence, the proposed DSE will allow the end-user to participate or determine the variables that affect e-marketing through cooperation with the academic specialist.

Algorithm1: Site Selection Model Calculation

```
if request.is_ajax and request.method == "POST":
        try:
           age = float(request.POST.get('age'))
        except:
           age = 0.0
        try:
edu = float(request.POST.get('edu'))
        except:
edu = 0.0
        try:
           job = float(request.POST.get('job'))
        except:
           job = 0
        try:
           mother = float(request.POST.get('mother'))
        except:
           mother = 0.0
        try:
           income = float(request.POST.get('income'))
        except:
           income = 0.0
        try:
           internet = float(request.POST.get('internet'))
        except:
           internet = 0.0
        try:
           buy = float(request.POST.get('buy'))
        except:
           buy = 0.0
total_weight = (feature.GetField("age") * age) +
(feature.GetField("edu") * edu) + (
feature.GetField("job") * job) + (feature.GetField("incom") *
income) + (
feature.GetField("browsing") * internet) +
(feature.GetField("mother") * mother) + (
feature.GetField("search") * buy)
```

As a result of this integration, the end-user will participate in the decision-making process in a no-cost, easy, and fast manner, which will increase the utilization of new technologies that facilitate communication between academics and end-users to save time and the effort of discussion between them. And, the user experience (UX) is not necessary, because the interface of the application is very simple and easy to use. So, these processes will make the communication between the academic and practical views more active and dynamic. Thus, the proposed DSE will be a modern technological tool that the economic community can benefit from, to develop their projects and facilitate the communication process between the investors and the academics, to exchange experiences with each other, thus supporting the final decision-making.

As time means money, a practical benefit of the proposed DSE is the fast economical proper decision-making to find the best location for e-marketing and other economic projects, which means increasing profit compared to competitors.

And over time, the proposed DSE can be a commercial application by being an economical advisory tool available online. Also, it may have advertising revenues if it has many visitors.

The proposed DSE also can be considered as a base for other electronic applications and for more developed and detailed ideas, for various economic projects, by the following:

- Using more advanced tools like advanced mathematical and statistical methods, such as relative weights methods and others, leading to more accurate and comprehensive Decision-making Modelling (Abdul Rashid, 2019) for E-marketing projects or similar projects.
- Providing the application with more detailed data (big data) by using more advanced technologies (Rowe, 2021) about the population, lifestyle, and habits of shoppers and customers for the e-marketing projects or other similar projects, to benefit the investors in determining the best sites of marketing a new product.
- Updating the application's data with time series forms, to make a comprehensive view.

5) Results and Discussion

Decision support programs for the site selection process in E-marketing are specialized programs that are used by specialists and consultants. In this paper, a Decision Support Engine was proposed by a programming language to facilitate the decision-making process and involve the end user in such a process in an interactive manner.

The data was gathered by an online electronic questionnaire to create ArcGIS geodatabase for our platform, Django web framework was used for programming and building this Decision Support Engine. The end result was an Interactive Map to Support Clients' Decision-Making of E-marketing in Cairo and Giza Governorates in an easy manner. In the future, variables inside our application can be updated and developed, to make the resulting decision and maps more accurate, and comprehensive, as well as predict its future by using prediction systems and geographical attitudes, forecasting its potential models and future scenarios.

Using the proposed DSE, the client will be involved in the decision-making process through the selecting variables that have an impact on the site selection process for E-marketing in Cairo and Giza governorates by an interactive method, to produce an interactive map showing the best location of e-marketing through direct participation of the clients/ end users.

In the future, the raw data of the DSE can be updated and developed to make the decisions made more comprehensive. Also, it can be extended by using prediction systems, which allows the DSE to forecast future scenarios from a geographical point of view.

Appendix (1)

Questionnaire for the research of "The interactive Map of E-marketing to Enhance Clients' Participation in Decision-Making Process, in Cairo and Giza Governorates- Egypt."

All replies will be secret

Age: (…. Years)

Education level: Secondary or less( )University( ) Above university( )

Job: Governmental sector( ) Private sector( ) Governmental in the morning and private afternoon( ) Handicraftsman( )

Mother work: Housewife ( ) Governmental job( ) Private sector( )

Family Income: Less than 3000 E.P() 3000 – 5000E.P( ) More than 5000 E.P ( )

Daily browsing: Less than 2 hours() 2-4 hours( ) More than 4 hours( )

Internet shopping: Regularly( ) Sometimes( )

Acknowledgment

The authors were very grateful to the student of the Geography department, Faculty of Arts, Cairo University for their helping in achieving the questionnaires.

References

1. Abdul Rashid, M., (2019) “Capabilities of a GIS-based multi-criteria decision analysis approach in modelling migration”, GeoJournal, VOL. 84, Issue 2, pp. 483–496.
2. Abramovich, A. A., (2012) "Using GIS to Assist Location and Site Selection Decisions" Master thesis, University of Washington, Urban Design and Planning Program.
3. Ahmed, A., (2011) “Building a Marketing Information System for Tourism in Al Aqaba Using ARCGIS 9.3 Software”, Master thesis, Business Management department, Middle East University.
4. Ahmed, S., Kotb, A., Samir, E., Moustafa, M., Farg, E., AbdElhay, A., and Arafat, S., (2020) “A WebGIS Decision Support System for Wadi El Natrun Rural Land Management”, in: proc. of 21st International Arab Conference on Information Technology (ACIT), IEEE, Egypt, pp. 1-7.
5. Ahmed, S., Badawy, M., Zidan, E., and Ibrahim, R. F., (2015) “Implementation of an Investment Information System Based on Google Maps API”, International Journal of Advanced Research in Computer and Communication Engineering, VOL. 4, NO. 9, pp. 383-388.
6. Aziz, E., (2021) "Design architecture of an integrated student activities management system for higher education", Turkish Journal of Computer and Mathematics Education (TURCOMAT), VOL. 12, No. 5, pp. 1676-1683.
7. Beilby, J., Duszynski, A., Wilson, A., and Turnbull, D., (2005) “Electronic decision support systems at point of care: trusting the deus ex machina” MJA, VOL.183, No. 2, pp. 99-100.
8. Bethany, S., and Joseph, H.,(2011) “Using a Multiple Criteria Decision-Making Model to Streamline and Enhance NEPA and Public Participation Processes”, Public Works Management& Policy, VOL.16, No. 1, pp. 59–89.
9. CAPMAS, (2021), “Egypt in figures, population estimation in January 2019”, Central Agency for Public Mobilization and Statistics, 2019, https://www.capmas.gov.eg/Pages/populationClock.aspx, last accessed: January 10 2021.
10. Chandio, I., and Matori, A.,(2011) “GIS-based Multi-criteria Decision Analysis of Land Suitability for Hillside Development”, International Journal of Environmental Science and Development, Vol. 2, No. 6, pp. 469-473.

11. Connor, J., Watson, K., Anders, A., Berry, M., Tsushima, P., and Kaplan, D., (2008), "Using ArcGIS Business Analyst", ESRI, USA.
12. Drake, R., Deegan, P., Woltmann, E., Haslett, W., Drake, T., and Rapp, C., (2010), "Comprehensive Electronic Decision Support Systems", Psychiatric services, ps.psychiatryonline.org, Vol. 61 No. 7, pp. 714-717.
13. Eldrandaly, K. and AbdelAziz, N., (2012) "Enhancing ArcGIS Decision Making Capabilities Using an Intelligent Multicriteria Decision Analysis Toolbox", Journal of Environmental Informatics, Vol. 20, No. 1, pp. 44-57.
14. Farnaghi, M. and Mansourian, A., (2020) "Blockchain, an enabling technology for transparent and accountable decentralized public participatory GIS, Cities, VOL. 105, 102850.
15. Goddard, S., Harms, S. K., Reichenbach, S. E., Tadesse, T., and Waltman, W. J., (2003) "Geospatial decision support for drought risk management", Communications of the ACM, VOL. 46, No.1, pp. 35-37.
16. Góralski, R., (2009) "Three-Dimensional Interactive Maps–Theory and Practice", PhD thesis, University of South Wales, United Kingdom.
17. Harms, S. K., (2002) "Data mining in a geospatial decision support system for drought risk management". In: Proc. of the 1st national conference on digital government, California, USA, pp. 9-16.
18. Kavita, K. M., and Patil, G. (2011) "Geographic Information System (GIS) – for Business Analytics", International Journal of Scientific & Engineering Research, VOL 2, Issue 11.
19. Khan, M. M., and Hashmi, H. A., (2016) "Impact of Interactivity of Electronic Word of Mouth Systems and Website Quality on Customer E-Loyalty", Pakistan Journal of Commerce and Social Sciences, Vol. 10, No.3, pp. 486-504.
20. Kolomvatsos, K., Anagnostopoulos, C., and Hadjiefthymiades, S. (2014). "Sellers in e-marketplaces: A Fuzzy Logic based decision support system", Information Sciences, VOL. 278, pp. 267–284.
21. Kumar, S. K., and Babu, S. D. B.,(2016) "A web GIS based decision support system for agriculture crop monitoring system-A case study from part of Medak District", J. Remote Sensing & GIS, Vol. 5, Issue.4.
22. Langella, G., Basile, A., Giannecchini, S., Moccia, F. D., Mileti, F. A., Munafó, M., and Terribile, F., (2020) "Soil Monitor: an internet platform to challenge soil sealing in Italy", Land Degradation & Development, VOL. 31, No. 18, pp. 2883-2900.

23. Lee, S., and Shim, J.(1986), "Interactive Goal Programming on the Microcomputer to Establish Priorities for Small Business", Journal of the Operational Research Society, VOL. 37, No. 6, pp.571-577.
24. Liawatimena, S., Warnars, S., Trisetyarso, A., Abdurahman, E., Soewito, B., Wibowo, A., and Abbas, B. S., (2018) "Django web framework software metrics measurement using radon and pylint", in: proc. Of Indonesian Association for Pattern Recognition International Conference (INAPR), IEEE, pp. 218-222.
25. Mohammed, R. A., ABD EL GAWAD, Z. Y., and VODA, M., (2021), "Using web GIS for marketing historical destination Cairo, Egypt", GeographiaTechnica, Vol. 16, Issue. 2, pp. 193- 204.
26. Mushonga, H. T., Banda, F., and Mulolwa, A., (2017) "Development of a web based GIS for health facilities mapping, monitoring and reporting: A case study of the Zambian Ministry of health", South African Journal of Geomatics, VOL. 6, No. 3, pp. 321-332.
27. Reed, R. E., and Bodzin, A. M., (2016) "Using Web GIS for Public Health Education", International Journal of Environmental and Science Education, VOL.11, No. 14, pp. 6314-6333.
28. Robinson, V., and Frank, A., (1987) "Expert Systems for Geographic Information Systems", photogrammetric Engineering and Remote Sensing, Vol. 53, No. 10, pp. 1435-1441.
29. Roth, R., (2011) "interacting with maps: the science and practice of cartographic interaction", PhD thesis, The Pennsylvania State University, the Graduate School College of Earth and Mineral Sciences, Department of Geography.
30. Rowe, F., (2021) "Big Data and Human Geography". In: Demeritt, D. and Lees L. (eds) Concise Encyclopedia of Human Geography. Edward Elgar Encyclopedias in the Social Sciences series.
31. Shesham, S., (2012) "Integrating Expert System and Geographic Information System for Spatial Decision Making", Masters Theses, the Faculty of the Department of Computer Science, Western Kentucky University.
32. Sukeerthi, N., (2013) "Land Information System as a tool for Urban Planning: Integrated Land Information System in GIS Platform", LAP LAMBERT Academic Publishing; Illustrated edition.
33. Terribile, F., Bonfante, A., D'Antonio, A., De Mascellis, R., De Michele, C., Langella, G., and Basile, A., (2017) "A geospatial decision support system for supporting quality viticulture at the landscape scale", Computers and electronics in agriculture, VOL. 140, pp. 88-102.

برمجة خريطة تفاعلية لتحسين مشاركة العملاء في اختيار أفضل موقع للتسويق الإلكتروني في محافظتي القاهرة والجيزة – مصر

الملخص

تهتم تحليلات اتخاذ القرار متعددة المعايير (MCDA) بهيكلة واتخاذ القرارات التي تنطوي على معايير متعددة. ومن خلال تكاملها مع تقنية نظم المعلومات الجغرافية (GIS) ، فيمكن استخدام هذه التحليلات لاختيار أفضل المواقع لأي مشروع استثماري. ولكن، لا يمتلك جميع المستثمرين/ العملاء المهارات المطلوبة لاستخدام هذه الأساليب والبرامج المتخصصة. أيضًا، قد يكون هناك عدم توافق بين الاستشاري والمستخدم النهائي حول النتائج النهائية. لذلك يهدف هذا البحث إلى برمجة محرك لدعم اتخاذ القرار (DSE) ويكون متوافرا على شبكة الانترنت، لتسهيل عملية اتخاذ القرار وإشراك المستخدم النهائي بسهولة. ولقد تم تطبيق هذا المقترح على موضوع التسويق الإلكتروني في محافظتي القاهرة والجيزة. حيث تم جمع البيانات من خلال استبيانات إلكترونية (٩٢٨ استبيان) وتمت معالجتها بواسطة برنامج SPSS، لإنشاء قاعدة البيانات الجغرافية المستخدمة في إطار الويب "دجانجوDjango" لبناء هذا التطبيق. وكانت النتيجة النهائية له هي إنتاج خريطة تفاعلية لدعم اتخاذ القرار لدى العملاء بطريقة سهلة.

الكلمات المفتاحية: التسويق الإلكتروني، القاهرة والجيزة، الخريطة التفاعلية، إطارعمل دجانجو Django، دعم اتخاذ القرار.