ONLINE MAPPING APPLICATIONS

INTERACTIVE BUSINESS GEOLOCALIZATION

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Abstract

Geolocalization of an enterprise or in other words the choice of location is different for every type of business, besides it is also experiencing changes due to the time dimension, which means increase in the level of use of information and communication technologies. Thus also number of the potential territories for the location of the enterprises is increasing, as in their identification the new location criteria and impacts have to be taken into consideration. This process is fostering competition between the regions not only on the local, but also on the global scale. Under the circumstances of global localization the decision on location of the enterprise as any other effective decision has to be based on the results of a complex global and local system analysis.

Aim of the research is to elaborate methodology for definition of the mutual correlations of business geolocalization indicators for Riga and its vicinity and to elaborate a web-based system prototype for the given territory.

The research area is Riga and its vicinity where the potential business opportunities are being assessed based on the development planning documents, evaluation of the existing situation, analysis of the retrospective data, elaboration of prognosis and scenarios. There are data bases created with a wide range of attributes, which are located on the map thus defining the scope

of the spatial analysis, e.g. evaluation of new locations or measuring the impact of a new store or competitor. Data bases include the following attributes: number of inhabitants, age and gender structure per territorial unit, crime situation layer, infrastructure layers, and environment indicators.

The enterprise data base used is related to the concrete spheres of activity, also analysis on its interrelation with the connected spheres is made, as well as its link to the specific infrastructure, demographic, environmental and other data layers. Analysis is based on the interrelations used in the global experience and their adoption to the situation in the given territory. It results in the possibility to assess the impact of changes in different GIS layers on the businesses in the research territory and vice versa - impact of business development on the other GIS layers.

Riga and its vicinity business spatial information structure is based on the geomatic platform. Databases are integrated into GIS in order to ensure quick and quality spatial analysis. System prototype is web based and accessible on the internet.

Introduction

21st century is characterized by rapid development of Information Technologies (IT) which is also promoting constant changes in the society, economy, environment, as well as having its impact on the business. Thus day by day business has to adapt to the new circumstances which are growing more and more dynamic in the time dimension. One of the most important business success factors is information which has to be precise and quickly accessible because it gives the opportunity to react to the changes and to take effective decisions, besides; nowadays time is money.

For many enterprises one of the most important business elements is the right choice of location, which is essential for the profit. Before decision making on the location of the business, it is necessary to analyze different social-economic and environmental indicators and to assess their impact on the territory. To foster this process the advantages of the IT can be

used, i.e. data processing, visualization and speed of information flow, quality, etc. – thus information from different disciplines can be combined to contribute to the business development.

The aim of the research is to create an interactive business web-based system prototype based on GIS using the theoretical aspects and accessible data and to adapt this model for the given territory.

Importance of geolocalization in business

Before starting a business every businessman tries to find the best location for company, warehouse etc. Founder of McDonalds Ray Kroc once outlined the three most important factors for the business – place, place and place. Also the well-known marketing specialist Philip Kotler stresses in his works the dependence of successful business from its location, especially for the retailers.

Place is also one of the elements in the widely spread "Marketing Mix", which is the aggregation of actions performed by entrepreneurs to achieve the marketing goals in the target market. Marketing mix consists of 4, 5 or 7 variables. Four most known are Product, Price, Place and Promotion, the so-called "4 Ps", which can be adapted to the changing market demands and to the dynamic marketing environment. In this context "Place" means that the product/ service is available on the right spot, at the right time and in the necessary quantity. Besides, it includes not only the location of the enterprise, but also the delivery of the product/ service from the producer/ service provider to the user, i.e. logistics, distribution channels, warehouses, communication (internet, mobile), etc. (E.Jerome McCarthy).

Geolocalization of the enterprise means linking its administration, production facilities, warehouses or other premises to the certain location depending on the sector in which the enterprise operates; as well as its characteristics, aims, etc. Business geolocalization is one of the most difficult and complex decisions to be taken when starting a business or changing its location. Its complexity is based on the following conditions: there cannot be the situation of having only one possible location for the business and the economic space is not homogeneous from the business's point of view (H.Diedrich), besides, the choice of location can be the reason for both, successful and unsuccessful entrepreneurship. As the aim of any business is profit, but its location is generating costs, it is necessary to find the optimal solution when the

profit is maximal compared to the costs. H.Diedrich stresses that when choosing the location, business has to take into consideration its mutual relations with the market, i.e. being both, the demander of the means of production and labor as well as the supplier of services or goods in the market.

Nowadays due to the rapid development of e-services many transactions can be managed in the web, and it changes priorities when choosing the business location. Also characteristic of each enterprise defines the importance of business geographical location on profit. However, in general the attractiveness of a location from the point of view of a business is characterized by the accessibility of the land/ premises and their price, taxes and other regulations, accessibility of the labor in terms of quantity and quality, availability of suppliers and clients, market demand, status of the location, quality of living environment and easy access to the quality services.

Each business has its own conditions for the choice of location; however, there are main criteria, which define this decision. The research carried out by the European Cities Monitor 2006 is based on the interviews with 501 managers of the enterprises who evaluate the leading business cities in Europe; and based on these the experts point out the following factors which are prevailing when taking the decision on the business location:

		Year 2005	Year 2006
1.	Easy access to markets, customers or clients	63%	60%
2.	Availability of qualified staff	57%	59%
3.	Transport links with other cities and internationally	52%	55%
4.	The quality of telecommunications	50%	50%
5.	Cost of staff	35%	36%
6.	The climate governments create for business through tax and the availability of financial incentives	31%	32%
7.	Availability of office space	27%	30%
8.	Value for money of office space	31%	29%
9.	Languages spoken	24%	27%
10.	Ease of traveling around within the city	24%	26%
11.	The quality of life for employees	245	26%
12.	Freedom from pollution	13%	15%

Geolocalization and Information Technologies in business

In order to find the best location the managers of companies are making researches, elaborating business plans etc., which allow to analyze the existing situation and to make forecasts. Usually decision making process takes a lot of time and money and consists of several steps: analyses of many indicators, elements and their correlation.

In the 21st century one of the eight main tendencies characterizing our life is that 'each second matters'. It means that the rapid development requires productive use of the time, it cannot be wasted (Prof. P.Jordan). Thus there is the necessity to find solutions which allow saving time, and by this maximizing the profit. It is the reason for rapid growth in the use and importance of IT, as it is increasing the speed and accessibility of the information flow, which, in its turn, is one of the basic preconditions for the profitability. This function is fulfilled best by the internet, which allows quick sending and receipt of information.

To find the potential business location in an easiest and quickest way, the group of authors has created a model, which performs strategic spatial analysis according to the selected criteria in the city of Riga. This model is interactive and freely accessible on the Internet thus being available to a wide range of users.

Description of the prototype

This model operates with data available on territorial dimension in the city. Each user has a possibility to choose between the different criteria and to classify them according to their significance for the particular sector, characteristics of the business, form of entrepreneurship, etc. (the total weight being 100%) and to define the criteria to describe the potential locations for the business.

This model gives a possibility for fast and convenient display of the territorial analyses. However, in order to take the final decision on the business location, also additional criteria have to be taken into account, like subjective desires of the businessman (if users likes the particular area, etc.). This is why it is useful to evaluate on the spot the alternatives suggested by the model before taking the decision.

Besides, it is necessary to take into account the aspect outlined by H.Diedrich, the uncertainty, which is connected with the character of the decision on the business location. Such decision can be defined as a strategic one, as it has long-term effect. Thus when making the decision on the location, the future projects of the business have to be taken into account, which of course involve the uncertainty factor.

Factors influencing the business location, i.e. material resources, energy resources, labor, consumers as well as the traffic and transportation have to be analyzed in their complexity, besides; there are other factors which cannot be ignored, like suppliers, financial

organizations, competitors, investors, etc. Business location criteria depend on the scale, on which this location is searched – either it is international, national, regional or local. If it is the international scale, it is important to pay attention to the interest rates for the loans, currency exchange rate, unemployment level and other social, economic, political and legal factors, which influence the external environment of enterpreneurship (M.Rurāne).

The given model has been elaborated for definition of the business geolocalization based on the Riga territorial analyses; however, it is flexible and can be used also for the international analyses by adding additional fields on other sectors, like taxes, legal restrictions, etc. The current model includes only some of them, as the indicators describing the international analyses are similar for the whole research area.

Potential users of the model:

- Businessmen/ investors:
    - To take decisions on the business location when starting a new business;
    - To take decisions on the change of the business location, if the circumstances influencing the entrepreneurship have changed either in the current or in the new location;
    - To evaluate the competition.
- For researchers, students, state and municipal institutions, mass media, individuals – to make the territorial analyses, etc.

The model offers also an opportunity to create the personal profiles, where the previously generated reports could be saved (in the form of maps, tables, charts, text), besides, there is an additional option - automatic update using the newest data (and saving the previous one). The model allows adding new individual data layers and carrying out the spatial analyses, and it can be also linked with the existing data layers.

Data geolocalization and digital cartography is developed in the Internet environment, and it is the most suitable and unique communication channel, which supports textual information. For creation of these data basis the geomatic platform and infrastructure of spatial data is needed.

GIS technologies are continuously evolving, improving their accuracy, variety, capacity and speed; in the developed countries GIS technologies are widely used in different fields for analyses and interpretation on the infrastructure development, land survey and population management, for planning, monitoring and modeling of the new development tendencies (Jain, 2000).

Map is the best tool for representing the spatial process. In the perception and representation of the space we use the visual, verbal, mathematic, digital methods, as well as the individual approach of each particular person. In ideal case it should be possible to join all these elements into one analytic system.

Spatial analyses is an analytic method, which results in analyses of the spatial location and attribute values of a geographic phenomenon, it also gives a possibility to analyze the human interaction in the spatial context, to analyze these processes in different spheres, among others also in the economic and business environment.

Spatial objects include their spatial description, characteristics of their features and the description of the possible functions. Their features are generalization, inclusion, diversity and inheritance. As to the spatial analyses, the methods used include: cartometry, spatial statistics, sampling, creation of layers, etc. Technical means of the spatial analyses include GIS, Global positioning systems (GPS), remote sensing and spatial statistics.

GIS is the system used for acquisition, storage, analyses and visualization of data, which is connected in space and time; and it is more and more widely used in different spheres of life. This is the reason for using it as a tool for the project activities.

The main problem in Latvia at the moment is lack of unified geomatic platform or structure which could serve as a basis for the information geolocalization, thus giving an opportunity for interactive use of information layers and data basis, i.e. making them available on Internet. In the framework of the project the current platform will be adopted in order to create a new product, which could help the businessmen to manage their business in a more effective way.

These branches are both, currently and in the future generators of the added value and contributing to the economy, finances of the local community and municipalities. When choosing the topic, also the condition is taken into account that the sub-project has to be useful not only on the regional level, but also include the interregional cooperation and features.

In the framework of the project the data system adjusted to business needs in georeference will be created based on GIS, and it will be used on the geomatic platform. This system will support the spatial data infrastructure, allow analysis of different spatial data and will be convenient to use on the Internet. The digital maps will be linked with different information, e.g. demographic, environment, socio-economic data, etc.

As an example the portal of the Navarra region in Spain was used, which is based on the geomatic platform and includes all spatial information structure.

In the basic data the different layers are linked, starting from the scale M 1: 200 000 up to M 1: 5 000. Maps of the cities are displayed on the scale M 1: 5 000 up to M 1: 10 000. The vector layers are linked with the images from the LandSat-5, IRS 1c and others, as well as the 3D models and topographic map.

The vector data used includes: topographic map, parcels and street level, plans of the cities, land use, toponymy, tourism information, environmental data, sports opportunities, etc. The Navarra spatial information system (SITNA) http://sitna.cfnavarra.es/ is based on the organized network consisting of the spatial structural elements.

Data is based on the co-ordinates and is updated. System gives for each user an opportunity to find the data according to their needs and possibilities.

The system can integrate data from different users, connect different scales as well as integrate the territorial information.

There are many options for search of geographic elements ordered alphabetically: by the city, postal address, street name, toponymy, tourism resources, environment, UTM co-ordinates, parcels, etc.

Also the browsers provide different opportunities, like 3D navigation, identification, GPS functions, measuring the distance and area, window definition for the browsing function, printing, photo and video, etc. Access to the data is created on the view attribute “zoom in”, “pan” element identification etc.

To ensure the high speed performance of the system and in order not to load it with ‘unnecessary’ calculations (like statistic information independent of additional data layers and

result), it is made available in the raster (JPG). In the system these are the basic maps showing the buildings, infrastructure, communications, topography, etc.

Information to be analyzed is created in form of the additional thematic layers with the attributes, i.e. data basis. Data processing for the business geolocalization is made using the mathematic programming methods. As the system operation is web-based and is operating in the real time, the operation principles for this system have to be based on the user-friendly and easy-to-understand interface, where the number of parameters to be chosen by the user is reduced, however, still allowing to perform the indistinctive analyses, e.g. the correlation between the criminal situation and enterprises of a certain branch. This system allows users to add new data. In this case the data has to be made ready so that it can be easily integrated into the system. This results into the new layers which can be displayed on the basic maps both, as the graphic or in form of a table. Fig.1 shows the interaction between the components within the model, starting with input form, data sorting, algorithms and finally presentation tools such as graphics, maps etc. And fig.2. shows the organization of data information structure.

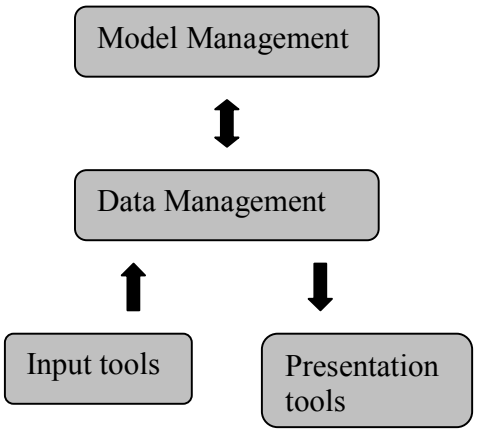

Fig.1. Scheme of model component's

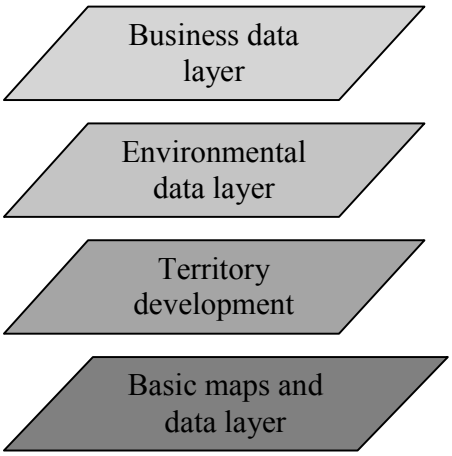

Fig.2. Data information structure

Raw data basis can be:

Point layer, where the different parameters to be analyzed are added as additional attributes. E.g. the Riga City address data base, where based on the data base relation principle each address has enterprise data base information attached, which, in its turn, is using as a

parameter the number of enterprises displayed. In the same way the layer showing public transport stops is using the stops as the attributes, which are enciphered, i.e. divided into several layers based on the number of public transport lines using the particular stop. In addition data on the biggest shopping malls, parking, etc. is used.

Line layer. In the project the street and road layer is used, where the parameter used is the category of the street/ road (see fig.3.).

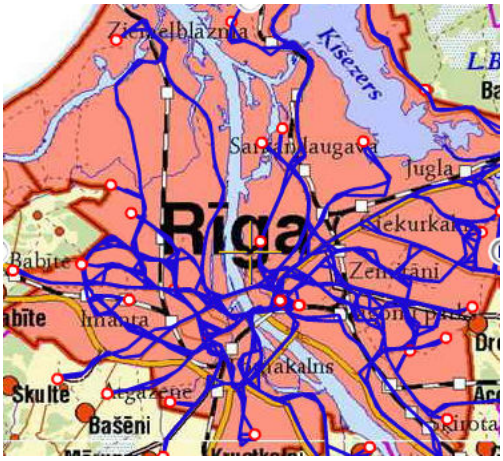

Fig.3. Public transport layer

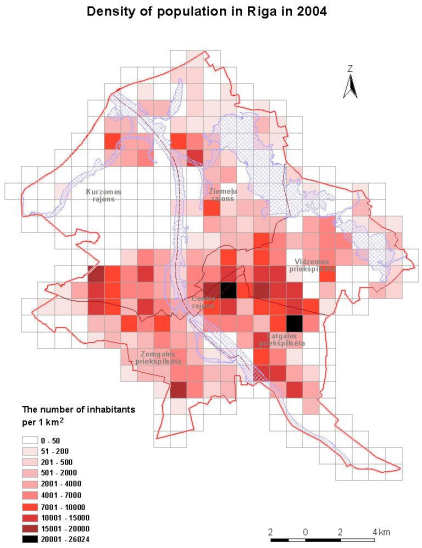

Fig.4. Density of population

Polygon layers are mainly displayed as the rectangle objects, i.e. all the thematic layers for spatial statistics analyses, e.g. demographic data (age, density of population, see. fig.4, employment level, etc.), criminal situation, environment indicators, noise zoning, as well as the urban spatial development plans. Graphic description is made of the rectangles with the parameters attributed to them. When analyzing the particular business sphere, the co-relation between the enterprise data, employment infrastructure layers, public transport, streets/ roads, spatial planning has to be taken into consideration.

Trade representations of many production companies are located in the City of Riga, though the production facilities are located elsewhere. Thus in order to receive credible assessment, analyses of the type of operation has to be foreseen, if this is a producer, which is also attracting employees or it is the retailer, which is rather service provider for other businesses or for the local population.

In the primary processing the raw data is divided into smaller squares adding to them all the raw data base parameters.

In order to make the system generate the result as quickly as possible, all the layers in the system are organized in the way that the analyses of the requests would require as few as possible mathematic operations with the data basis. All the time consuming operations are carried out already during the primary processing, which is taking place when uploading data layers into the system.

Cocnlusion

- The web-based system prototype is created on the geomatic platform and it is combining data layers of different kind and nature.
- By using the GIS systems the prototype allows performing the business geolocalization analyses in the real time.
- The system will be create for different kind of users, as well as businessmen/ investors, researchers, state and municipal institutions, individuals etc.
- This sub-project has to be usefull not only on the regional level, but also include interregional cooperation and features.
- The main problem is availability and quality of databases and integration in the system from different users.

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