

WEB-based social network impact on business geolocalization in Riga city

Marita Cekule

Researcher, Institute of Geodesy and Geoinformation, University of Latvia, maritac@lu.lv

Kaspars Cabs

PhD student, Riga Technical University, kaspars.cabs@gmail.com

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. In this case research area is market stores places localization in different times, accessibility and supply from user perspective in nowadays in Riga city – capital of Latvia. Aim of the research is definition of the mutual correlation of market stores localization factors, user's behaviours for optimal accessibility and more effective decision making for personal budgeting.

Different time scale maps and databases of the market place development in city integration in GIS in order to ensure quick and quality spatial analysis. It is an important backbone for many applications and decision processes in research and businesses.

System is being assessed based on the development planning documents, evaluation of the existing situation and analysis of the retrospective data.

To foster this process the advantages of the social networking technology can be used for choosing optimal purchasing with more effective personal budget planning for user's. For market store localization perspective, systems are being assessed based on the development planning documents, evaluation of the existing situation and analysis of the retrospective data. Analysis also based on the interrelations used in the global experience.

Keywords: social network, business geolocalization, GIS, spatial analyze, WEB, databases, personal budget planning

Introduction

In this paper we examine the role of Geographic information systems (GIS) and web-based data geolocalization for business activities, as well as social network impact on business localization in city. In this case we will study one of the city's business sectors - the location of supermarkets, and developed social network web systems which offers the opportunity to its user of planning their expenditures and impact on purchasing habits.

21st century is marked 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. The analysis of spatial data is an important backbone for many applications and decision processes in research and business. GIS impact on environmental science studies, economics, prediction of urban planning and design, infrastructure development, land and population management, planning of new directions of development, monitoring, modelling, and further research is priceless (Chertov et al. 1996, Lee 1990, Cupas 2003, Cekule et al. 2000, 2007), as are digital cartography (Aronoff 1989, Muehrcke 1986, Berry 1987, Tomlin, 1990) and databases of social and economic processes. Therefore, merging these elements into a single GIS system and deploying it on Internet through a single platform, opens a wide field of opportunities for spatial process analysis and

interpretation, as well as the process of spatial analysis and modelling of real processes and phenomena becomes faster, more accessible and understandable to decision-makers (Fotheringham and Rogerson 1994, Timmermans 1997, Goodchild 2000, Torrens and Sullivan 2001, Batty 2008) because the use of spatial analysis methods can create good quality models of spatial division, social, economic, demographic and other models of processes and phenomena (McGregor 2000, Benenson and Torrens 2004, Berc 2002, Berger 2001, Sun 2001).

Determining the physical location, known as geolocalization (Wong et al. 2003), for many enterprises is one of the most important business elements, which is essential for profit (Cekule et al. 2007), locations conditions can play a significant role in the performance of industrial firms (Gray and Parker 1998, Porter 1998, Malecki 1997).

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. Thus business has to undergo continued adaptation 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 gives the opportunity to respond to the changes and to take effective decisions, besides this information has to be precise and accessible, for time is money (Cekule et al. 2007).

Also, social networks have a large impact on the perception of the urban population and service choices. In a crisis situation, one of the most important tasks for individuals is to reduce their expenses without reducing their quality of life. Consequently much greater role is given to the planning of expenses, including inventories and current cost optimization, as well as their respective planning.

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 (Diedrich 2000), besides, the choice of location can be the reason for both, successful and unsuccessful entrepreneurship (Kotler 2003).

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. (McCarthy and Jerome 1987).

Nowadays due to the rapid development of e-services many transactions can be managed on 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. Authors have made analysis and determined main factors for business location in Riga based on adaptation of the European Cities Monitor (2008). The most essential factors and their importance according to business type are shown in Fig.1



Fig. 1. Essential factors for business location by type of business in Riga

Study area and materials

Research area is Riga city. As in other post-socialist countries, the city of Riga has its own inherent problems - industrial decline, formation of new services for business areas. In recent decades, the experience of developed countries is beginning to emerge in Riga, the areas in which the same type of production protractedly took place, a number of functions are developed, which include not only various types of production, but also the product distribution, retail, offices and other land uses. One of the major functional types, which nowadays are of great importance in the spatial organization of urban environment, is commercial and service space planning and layout.

During the Soviet period (1950-1990) major trading centres were located at micro-region apartment houses built at that time, as defined by the planning politics, causing such type of residential areas to emerge as residential regions with a balanced network of social crew, educational and recreational elements (Otra Rīga 2000).

Nowadays a new trend is appearing – due to the increment of private cars, inhabitants no longer are tied to a particular service provider at their place of residence, but the possibility of more rapid migration within the territory of the city exists (Sobel 2002, Axhausen 2002, Jone 1988). Also the location of supermarket chains is mainly subordinated to the traffic flow directions – in the vicinity of motorways as well as in periphery of the city. Fig. 2 shows that a large part of the district of shopping centres built in Soviet-era still remains, due to the fact that they are located close to residences, but others are subordinated to the traffic flow or are renovated former locations of industrial territories.

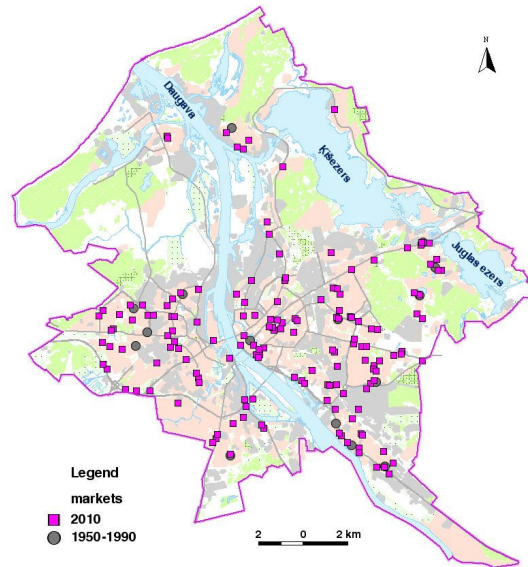


Fig. 2. Location of supermarkets

Due to the development of communication networks, the location of trade centres is nowadays just one of the factors that influence the population choice in terms of shopping site locations.

Web – based data geolocalization and social network system for market place activities

In the 21st century one of the eight main tendencies characterizing our life is that ‘every second counts’. It means that the rapid development requires productive use of the time; it cannot be wasted (Jordan 2006). 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.

The Open Source GIS Software is growing in popularity within geo-information community. Such software plays an important role in breaking down barriers where the cost limits the use of public spatial data and access to GIS tools (Song et al. 2004), the compiled set of the open source software will allow fast and economics deployment of GIS and database applications (Belickas et al. 2005).

Web based business geolocalization system for Riga 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.

The system 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.

Data processing for the business geolocalization is made using the mathematic programming methodes, system architecture are illustrated in Fig. 3.

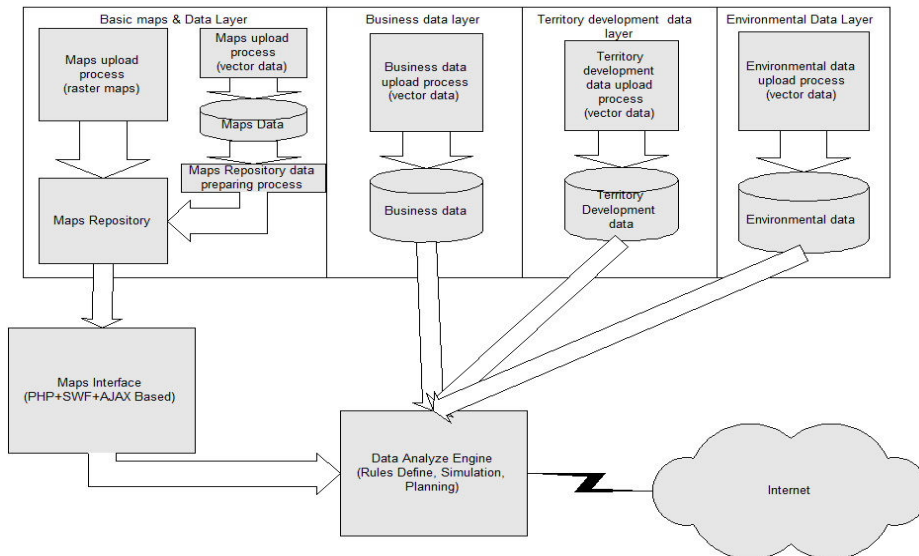


Fig. 3. Business geolocalization system architecture

A social network was developed around the business geolocalisation system for Riga, offering its users the opportunity to plan their expenditures. As an additional benefit to users, management of their expenditures planning, such as registering daily purchases and prices, is an opportunity to evaluate and compare shopping centres offers between one another. That includes assessing price changes through time, Fig. 4.

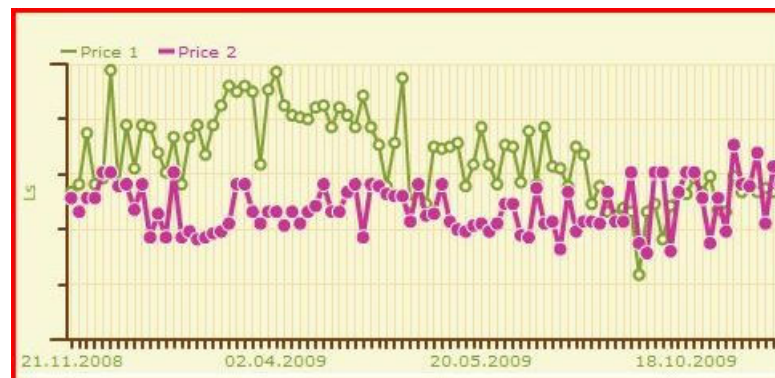


Fig.4. Two different product price changes through time

In this case, the distance to it plays a smaller role than the time it takes to get there (Becker 1976, Zahavi 1979). Analyzing the accumulated statistics for year 2009 we come to conclusion, that the average individual attends independently three to five shopping centers and not always distance from living place is determinative.

The social security system allows to get statistics on individual habits. It also allows the individual to better plan their expenses by choosing the shopping center most appropriate to their planning. For shopping centers it allows for a better assessment of the individuals habits in terms of purchasing as well as choosing one or another shopping center.

Discussion

Within the last year, the economy of Latvia like global economy suffered a recession which negatively influenced almost all business activities. It created a surplus of offices and trade premises in market and it was a cause of essential decrease of rent prices. Entrepreneurs, who proceed to work, now have great opportunity to find new premises in the more attractive areas for considerably lower prices.

Despite the existing recession, it is worth planning and analysing market and looking for economic growth, as well as finding ideal places for new enterprises. The essential factors for business location by type of business in Riga are:

- access to markets, customers or clients,
- availability of qualified staff,
- value for money of office space

Using the Web based business geolocalization system for Riga allows performing the business location analyses in real time. But the quality of results does not just depend on the sophistication of the GIS, only if we can integrate the data we need to represent a problem, and only if we can compose and correlate the data as required, can we generate plausible results. The Internet becomes increasingly important as a source of data. There are manifold services and communities with commercially or collaboratively maintained, reviewed and classified data of high quality. The main problems are availability, regularity of updating, quality of databases and integration in the system of different users.

The system was created for different kind of users, such as businessmen/investors, researchers, state and municipal institutions, individuals etc. The main target groups are SMEs (small and medium sized enterprises) because they are more flexible and choose to change location more often than large companies.

Speaking about social network data analyze, some of the biggest sources of spending are the food and consumer goods purchases.

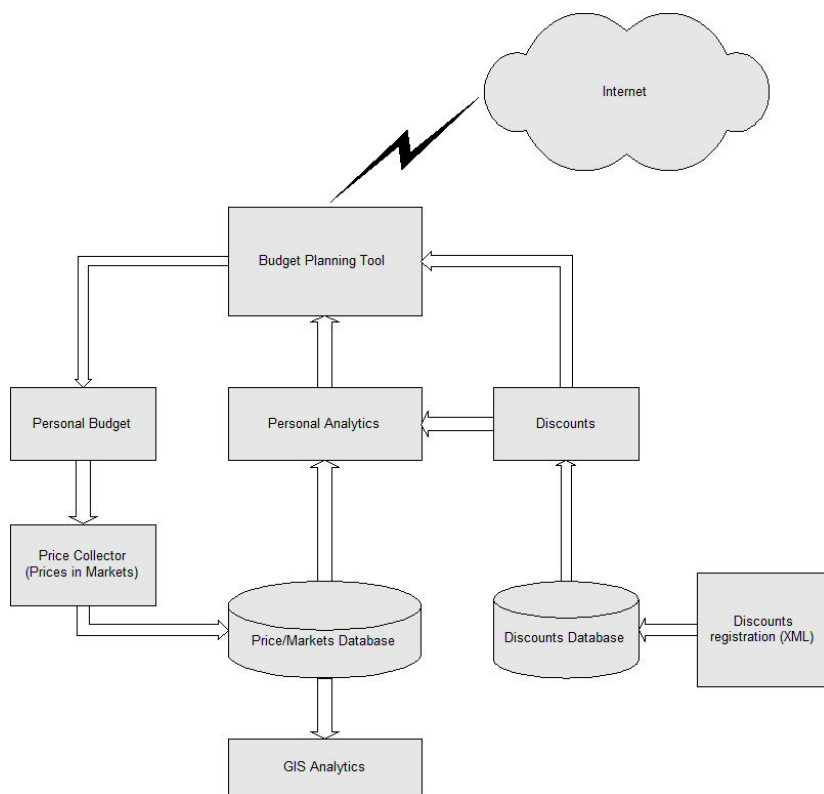
Individual's regular visits to their shopping centers are firstly determined by daily travels, such as the one between home and work, as well as nearby shopping centers. If small purchases are made in street shops situated in the vicinity of their house, larger purchases are usually made by visiting a relatively easy of access shopping centre.

However, budget planning and access to the lowest prices available have recently played a larger role.

References

- Aronoff S (1989) Geographic information systems: A management perspective. W.D.L. Publications. Ottawa, Ontario, Canada.
- Batty M (2008) The size, Scale and Shape of Cities. Science Magazine. Vol.319. no. 5864. pp.769-771.
- Becker GS (1976) The Economic Approach to Human Behavior. University of Chicago Press. Chicago
- Benenson I, Torrens PM (2004) Geosimulation: object-based modeling of urban phenomena. Computers, Environment and Urban Systems. 28. pp.1-8.
- Belickas J, Rapševičius V, Denas Ž, Tchistiakov A (2005) Open-Source Software for Multilingual Geo-Data Distribution via Internet. 11th EC GI & GIS Workshop ESDI. Sardinia.Italy.
- Berec L (2002) Techniques of spatially explicit individual-based models: construction, simulation, and mean-field analysis. Ecological Modelling. 150. pp.55-81
- Berger T (2001) Agent-based spatial models applied to agriculture: a simulation tool for technology diffusion, resource use changes, and policy analysis. Agricultural Economics. 25. pp.245-269.

- Berry JK (1987) Fundamental operations in computer assisted map analysis. Journal of Geographic Information Systems. Vol.1, No.2. pp.119-136.
- Cekule M (2000) Pilsētu ainavu telpiskās struktūras analīzes metodes izmantojot ĢIS. Jauns gadsimts jauna ģeogrāfija. II Latvijas Ģeogrāfijas kongress. Rīga. 90.-91.lpp.
- Cekule M, Zīra M, Čabs K (2007) Interactive business geolocalization. XXIII International Cartographic Conference proceedings. Moscow.
- Chertov O, Kuznetsov V (1996) The Environmental Atlas of St. Petersburg City Area. Russia. Ambio. Vol.25. No.8
- Čupas K (2003) Preparation of 3D digital city model development technology based on geoinformation systems. Geodesy and Cartography. Vol XXIX, No 3. Vilnius: Technica. pp. 90-97. ISSN 1392-1541
- Diedrihs H (2000) Uzņēmuma ekonomika. Zinātne
- European Cities Monitor (2008). CUCHMAN&WAKEFIELD. pp.10-11.
- Gray M, Parker E (1998). Industrial change and regional development: the case of the US biotechnology and pharmaceutical industries. Environment and Planning A 30 pp.1757-1774
- Goodchild M F (2000) The Current Status of GIS and Spatial Analysis. Journal of Geographical Information Systems. Vol.2. pp. 5-10.
- Hampton K, Wellman B (2001) Long distance community in the network society: Contact and support beyond Netvill. American Behavioral Scientist. 45 (3). pp. 477-496
- Jone PM, Clarke MJ (1988) The significance and measurement of variability in travel behaviours: a discussion paper. Transportation. 15 (2) pp. 65-87
- Jordan P (2006) Estonian Annual Innovation Conference INNOESTONIA.
- Kotler P (2003) Marketing Management. Eleventh Edition. Pearson Education International. pp.504., 372.
- Malecki EJ (1997) Entrepreneurs, networks, and economic development: a review of recent research, in Advances in Entrepreneurship, Firm Emergence and Growth. Vol.3 (JAI Press, Stamford, CT) pp. 57-118
- McCarthy, Jerome E (1987) Basic Marketing: A Managerial Approach, (9th ed.). Homewood, IL, Irwin.
- Muehrcke CP (1986) Map use, reading, analysis and interpretation. J.P. Publication. USA 2nd Edn. Madison. Wisconsin.
- Lee YC (1990) Geographic information system for urban applications: problems and solutions. Environment and Planning B: Planning and Design 17. pp. 463-473.
- Porter ME (1998) "Clusters and the new economics of competition" Harvard Business Review 76. pp. 77-90
- Timmermans H (1997) Decision Support Systems in Urban Planning. E&FN SPON.
- Tomlin CD (1990) Geographic Information Systems and Carographic modeling. Engelwood Cliffs. New Jersey. USA
- Rīgas domes Pilsētas attīstības departamenta Pilsētplānošanas pārvalde. Otra Rīga (2004) 95.lpp.
- Song X, Kono Y, Shibayama M (2004) The development of web mapping application using open source GIS solution. International Symposium on GeoInformatics for Spatial Infrastructure Development in Earth and Allied Sciences. Hanoi. Vietnam.
- Sobel J (2002) Can we trust social capital? Journal of Economic literature. 40 (2).pp. 139-154
- Sun R (2001) Individual action and collective function: from sociology to multi-agent learning (Editorial). Journal of Cognitive Systems Research. 2. pp.1-3.
- Wellman B (1996) A personal communities local? A dumptariou reconsideration. Social Networks. 18 (4). pp. 347-354
- Axhausen KW (2002) A dynamic understanding of travel demand: A sketch. <http://www.ivt...>
- Fotheringham, Rogerson (1994) Causal model bulding and analysing. <http://www.citieslab.utsc.Utoronto.ca/papersusingGIS>
- McGregor S (2000) What is Spatial Analysis? <http://www.cpc.unc.edu/services/spatial/spatial.html>
- Wong B, Stoyanov I, Siner EG (2003) Geolocalization on the Internet through Constraint Satisfaction. <http://www.cs.cornell.edu/people/egs/papers/octant-worlds.pdf>



Sociālā tīkla pamatā ir budžeta plānošanas rīks, kas palīdz lietotājam labāk plānot savus izdevumus un veikt analīzi saistībā ar personīgajiem iepirkšanās paradumiem. Katra kāda lietotāja ievadītā informācija ļauj paaugstināt analītiskās daļas ticamību. Tomēr teritoriju plānošanas gadījumā šī informācija ļauj izvērtēt supermāketu izvietojumu

Kā notiek analīze:

A social network was developed around the business geolocalisation system for Riga, offering its users the opportunity to plan their expenditures. As an additional benefit to users, management of their expenditures planning, such as registering daily purchases and prices, is an opportunity to evaluate and compare shopping centres offers between one another. That includes assessing price changes through time, Fig.

From users perspective price analytics goes by price comparison by time and by place. It can be possible compare prices by different marketstores as well as different marketstore networks (To example main marketstore players in RIGA - RIMI, MAXIMA).

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.

mathematic programming methods.

First each layer data are divided to each GIS layer grid position. If data is point type objects, than each points are divided to grids, if data is poligons, than each polygon area size saistībā ar poligona intensitāti, ir pievienots kā grida value. Than layer grid element data values are normalized into an interval [0,100] witch a higher value representing higher importance. Each grid position contain only one value per data layer.

For data layer comparison is used mathematic data correlation methods. In this case we use fuzzy logic decision making structure

Lit:

- 1) Induction of Decision Trees, Machine Learning. 1986, J R Quinlan,
- 2) An introduction to Fuzzy Logic for Practical Applications, 1997.Kazuo Tanaka
- 3) Soft Discretization to Enhance the Continuous Decision Tree Induction. Yonghong Peng 1 Peter A Flach
- 4) Fuzzy decision trees to help flexible querying. Kybernetika, vol. 36. (2000) Crystophe Marsala. <http://dml.cz/dmlcz/135381>
- 5) Learning from Imperfect Data. Cristophe Marsala, Mohammed Ramdani

indicator values are normalized into an interval of $[0,1]$ with a higher value representing a better performance, as presented