ISSN 1392–3730
JOURNAL OF CIVIL ENGINEERING AND MANAGEMENT
http:/www.vtu.lt/english/editions

2004, Vol X, No 2, 151–166

MULTICRITERIA VALUATION OF COMMERCIAL CONSTRUCTION PROJECTS FOR INVESTMENT PURPOSES

Edmundas Kazimieras Zavadskas, Leonas Ustinovichius, Andrius Stasiulionis

Dept of Civil Engineering, Vilnius Gediminas Technical University (VGTU), Saulėtekio al. 11, LT-10223 Vilnius-40, Lithuania. E-mail: edmundas.zavadskas@adm.vtu.lt; leonasu@st.vtu.lt; Andrius.Stasiulionis@ober-haus.lt

Received 17 March 2004; accepted 30 Apr 2004

Abstract. The article provides the analysis of market development of commercial property constructions, trends, regularities, optimal site locations, characteristics of constructive selection of combinations, of the main financial investment indices after the change of political, economical and social relationships in the East Europe. The overview of the main modern investment requirements important for construction of commercial objects in order to get the maximum profit for exploitation thereof is provided. The models of choosing such indices as market research, site location, constructive combinations, financing of commercial objects are provided. It is emphasised that multiple criteria decision methods are most suitable, and particularly ELECTRE III for research and valuation of investment project alternatives of commercial objects is singled out.

Keywords: commercial property, market research, siting, combinations of structures, financial aspects, ELECTRE III.

1. Introduction

The increasing process of globalisation and the changing market are the main factors determining the importance of effective development, management and purchasing of commercial property as well as investment activities associated with these objects.

Development and implementation of the new commercial property as commodity and services meeting the current needs, development of new implementation and usage forms, appearance of the new support kind are only a few spheres impossible to manage without a thorough investment analysis of commercial property [1].

Commercial objects such as real estate are not only business activity related to sales or rent thereof but also an inseparable part of any other business. The projects of such a business are planned and implemented therein. It is necessary not only for each business entity but also for development of executed business activity of each entity [2].

Commercial objects of the real estate differ from other kinds of goods by many characteristics such as objective and correct investment valuation of the property, the need for large sources of financing, the necessity of large single-time investments, big inertia – as merchandise, difficult acquisition of accurate market data [3–5]. Because no business entity can carry out its activities without commercial property it is very important to develop the model of increasing the profitability of investment into real estate.

Since the Republic of Lithuania is going to become a member of the European Union in 2004, commercial property acquires more perspectives not only as a business object but also as the source of attraction of direct foreign investment. The principle of durability of investment into commercial property places more emphasis on the importance of this business object from the point of view of not only the market but also the whole state [2].

It is very important when investing into the real estate and especially into commercial buildings to choose a suitable site and economical constructions. The site and constructions must be chosen so as the future commercial building meets all the requirements to the best usage of the object [6, 7]. When investing into commercial property, the system of major criteria indices, and an optimal site should be chosen. It is also necessary to collect detailed information on the locality of interest to us and new constructions for our market as well as service characteristics [8, 9]. With this point in view, it is necessary for the investor to analyse information systems related to geographical location and maximum optimal possibilities of management of the building and constituent parts thereof [8]. Each specific location and structural combinations are described by different criteria characterising this place whey have to be defined by both quantitative and qualitative characteristics that would be economically attractive. For practical purposes, it is very difficult to describe the site as ideal, as the combination of constructions of a building may be optimal only for

today, and in the course of 10–20 years economical optimum may change several times [10].

Political and economical realities in Lithuania of the last decade also change the priorities of business sphere, the ways to achieve objectives. Market research and marketing of a commercial object at the moment is one of the most important tools for increasing the competitiveness of commercial objects [1].

Integration into the business world dictated by the Western culture implies new requirements for real estate as business object as well as for investment marketing tools with the help of which this business object is put into practice (rented or sold) [1]. This important change is the reason why the majority of the owners are no longer satisfied with the traditional business ensuring measures. Only the formation of clear investment models of constituent parts of commercial real estate, choosing the optimal variants on the basis of multiple criteria and novelty thereof can guarantee the success in the competitive fight of investment of commercial objects.

2. Concept of investment into commercial property

Investments are resources allocated for development, acquisition or modernisation of long-term tangible property and for acquisition of intangible assets in order to receive profit or social result [11].

The forms of investments may be monetary units or their equivalents, land, buildings, constructions, production capacity, liquid equipment, property rights rated at monetary equivalents [12]. Real estate is singled out as an individual part of the structure of investment market [13].

Before making investments an objective should be formulated and certain restrictions defined. The following objectives are most frequent in the economy [11]:

- Development of new goods or services or those of higher quality
- Development and implementation of new technologies
- Expansion of production capacities, assimilation of a bigger part of the market, etc.

The objectives should be achieved considering national economical situation [12]. The results to be achieved are always valuated in accordance with the following criteria [11]: duration, price, quality.

Investment life cycle is calculated considering [12]:

- Periods of development, service and (in case of need) liquidation
- Average normative life cycle of technological equipment
- Achievement of the set profitability values
- Requirements of the investor

Every investment includes the following features [2]:

- Investments most often indicate big financial expenditure
- Return from investment may be received within a period of time in future
- Elements, such as risk and uncertainty, are necessarily present in forecasting results
- Investments most often mean a possibility for a company to seek its strategic and activity (tactical) objectives.

Much attention should be also paid to the risk of investment. Risk is an uncertainty related to the rise of unfavorable states or results in the course of implementation of the object [11]. While others state that risk is insufficient quantity or indeterminacy of information about implementation of investment project, including the related results and conclusions [13]. The following types of risk are pointed out most often [11]:

- Risk related to the instability of laws and economic situation
- Political risk related to an indefinite political situation and social changes
- Risk related to fluctuations of market prices and market conjuncture, currency exchange rates, indefinite climatic conditions, possibility of natural disasters
- Production – technological risk.

Other authors add to the risk above such factors as lack and inaccuracy of information, failure to understand or combine the objectives, interests of investment participants [12]. In order to reduce investment risk the level of risk itself may be reduced or risk is redistributed among the participants [12].

In summary it can be stated that management of investment risk consists of [13]:

- Estimation and implementation of long-term investment strategy
- Tactical actions carried out within the limits of turnover of financial capacities and strategic solutions
- Operative management of investment activity within the limits of investment portfolio of the company.

In our case the object of investment is commercial real estate, therefore it is very important to analyse specific characteristics of commercial property as an object. Different characteristics of exclusiveness of commercial property as a specific commodity are noted as well. Some authors see five characteristic features [14]:

- Commercial property is not of a single type, it is different in size, site location, year of construction and the purpose
- It is concurrent to the land – it cannot be removed from one place to another
- This property is long-term as compared to other goods
- Commercial property is a commodity requiring a lot of investments
- Usage of this commodity constantly requires additional expenditure.

Other authors single out the following market characteristics of real estate [15]:

- The limits of the market of commercial real estate– district, city, region

- Unavailable interchange ability of specific property by the equivalent of another property
- No standardisation of the merchandise
- Very low number of purchasers and sellers of the property
- The proportion between the number of sellers and purchasers ranges between balancing of „the seller's market" and „the purchaser's market"
- All the transactions are private
- Complicated hard access to reliable information
- Exchange of information and decision making processes are very slow
- The level of privity of purchasers as well as of sellers is very fluctuating
- Strong legal regulation of transactions
- Fluctuations of prices may occur often and be considerable
- Transportation of goods is impossible
- Location is one of the most important factors in the process of pricing
- Due to a long construction investment process a sharp increase of offer in the market is hardly possible.

Other authors single out heterogeneity, big size of necessary investment and low liquidity, also they note private character of transactions, stability of cash flows, small number of sellers and purchasers stressing that the market of real estate is not perfect [16].

Considering the durability of the property the following features are noticed [14]:

- The manager of the property can regulate its state with the help of investments
- Every year the supply is increasing (more is erected than it is demolished)
- The supply is not elastic.

The cause of difficulties in applying marketing tools of optimal investments to commercial property constructions is cohesion of this object with the land. The problems of pricing policy are related to big price of the object itself (which forces to make strategic, long-term decisions) [14].

The authors suggest the following streamlined scheme of process of investment into commercial property constructions, the constituent parts of which will be analysed in detail in the proceeding chapters of this article (Fig 1).

3. Investment stages of market analysis of commercial property

General analysis of the market and economical situation. General analysis of the market and economical situation must provide a clear view on conditional attractiveness of the district or specific site location of investment object for the inhabitants and the future users of investment object. First of all it is necessary to clear out general tendencies of the main social-economic characteristics describing the demographic potential of employees and purchasing power of the population as the function of occupation. One must note that the focus of analysis must be chosen depending upon the type of a specific investment object – office, sales, manufacture, etc (Figs 2, 3).

The analysis of economic situation in the region. While analysing social-economic situation in the region an attention first of all should be paid to the main indices of macroeconomics that characterise the development of the economy in this region and that may influence the real estate market. Two types of indices are singled out: economic indices and social indices.

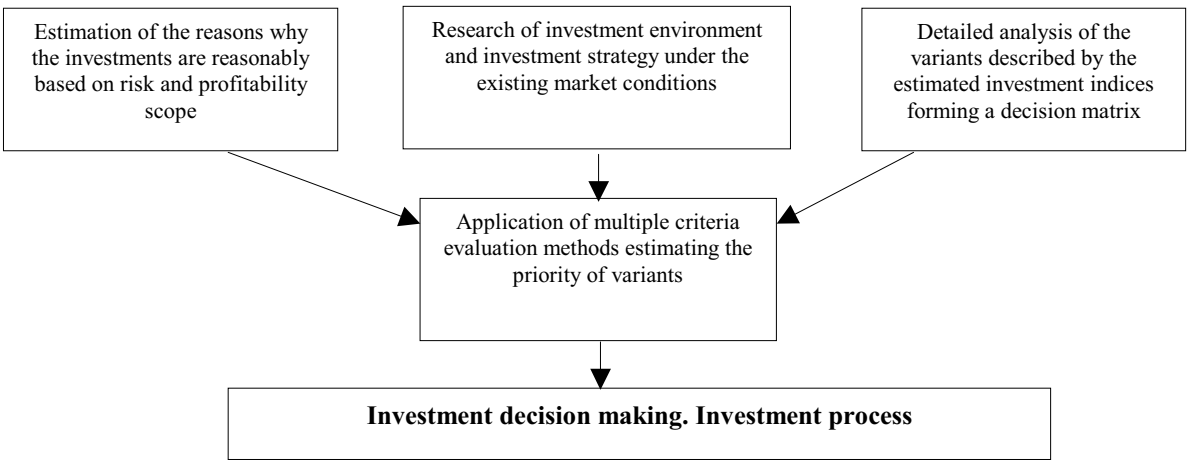

Fig 1. Stages of the take-up of investment solution

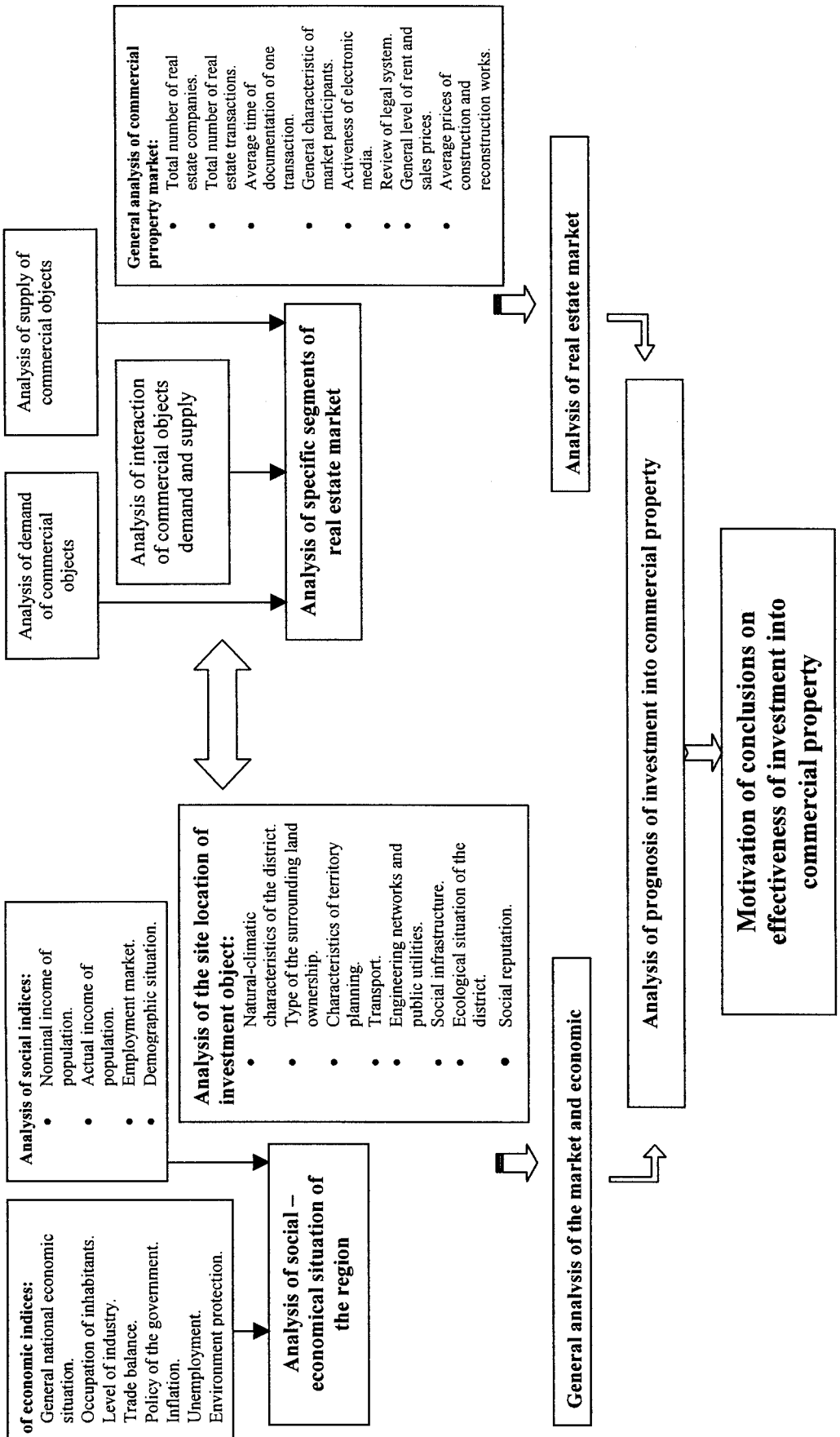

Fig 2. The model of market analysis for the investment into commercial property suggested by the authors

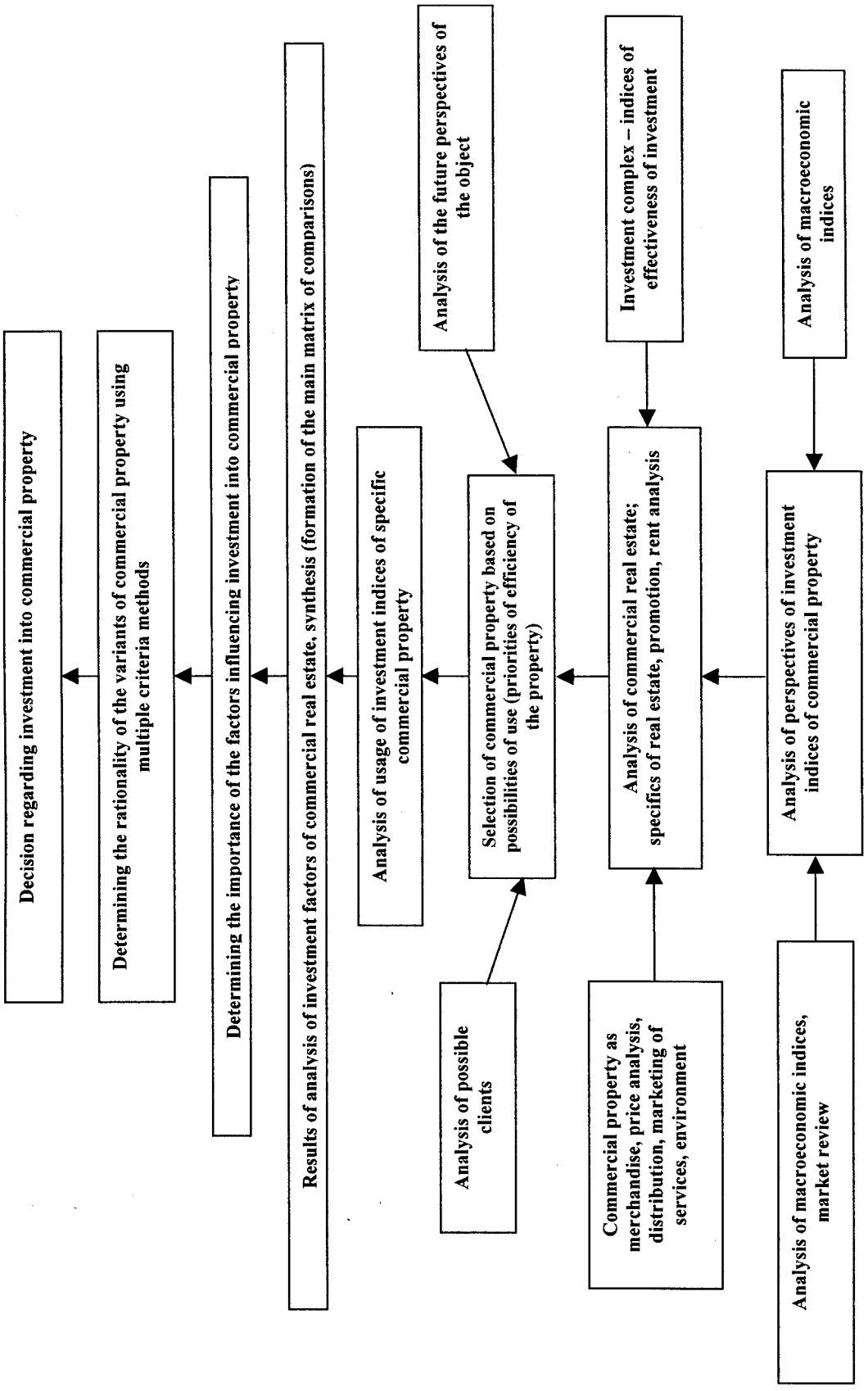

Fig 3. The model of marketing of the investment into commercial property suggested by the authors

Economic indices [17]: scope of industrial products, capital investments received from all the sources of financing, production of consumption goods, scope of contractual works, retail turnover of goods, cargo transportation (dispatch), scope of export.

Social indices [17]: nominal income of the population, nominal average salary of one employee, actual salary of one employee, price index of usage of services and goods, total number of the unemployed and percentage thereof.

In this stage the main background data are formed by analysing possible best and most effective usage of the object under analysis, also standard purchaser of the real estate analysed is determined as well as his investment motivation [17].

Analysis of the region location. In the analysis stage positive and negative indices of the investment object site location that can determine the price of the real estate are analysed. The following are attributed to these indices [17]: natural – climatic characteristics of the district, type of the surrounding land-ownership, transport, engineering networks and public utilities, social infrastructure, economic site location, ecologic situation of the district, social and criminal situation.

General analysis of the market of national real estate. This stage ensures general understanding of the actual state of the market and general activeness of the real estate market. For this purpose qualitative and quantitative characteristics of the real estate must be reviewed.

Analysis of the real estate market of the region. Analysis of the real estate of the region must provide understanding of long-term prognosis of demand and supply ratio of the investment object [18].

It is stated that the main objective of the analysis of real estate market is determining these factors from the point of view of demand and supply that have influence upon the value of a specific options of using land specific investment project [19]. „Target market“ must be determined, ie potential users who can buy or rent the property.

Analysis of specific segments of the real estate market. Research of demand of commercial property. Demand of construction production depends upon the following factors [20]: price, interest rate, price of other products/services, income, population, interests, policy of the government, perspectives.

In evaluating the demand of the rented commercial property market it is necessary to consider [17]: the structure and level of consumption of food and industrial products during the current period and future prognosis of change of structure of the demand of purchasers and their actual income, demographic situation, life style, solvent demand and consumption, perspectives of change of trade and commerce legislative environment, the condition and perspectives of national export – import policy, tariffs of transport services.

Characteristics of prognosis of demand of commercial property. General demand for commercial property is described by the number of potential buyers falling into the zone of attraction of commercial centre, also by the structure of the buyers according to age, income, family structure, socials groups.

Considering also the fact that the basis of demand for commercial property is purchasing power of inhabitants, the future perspectives of commercial centre will be mainly determined by the condition of the local economy. Therefore, first of all it is necessary to make prognosis of the future perspectives of the inhabitants occupation level and possible changes.

The result of demand analysis is a conclusion on a current and perspective demand level of the investigated segment of real estate market [17].

Characteristics of prediction of demand of commercial property. In carrying out market analysis competitive objects are determined and described; their provided conveniences and other characteristics are estimated. Competitive objects increase supply and may overtake a part of demand, that otherwise may be satisfied by means of investment object analysed, although not fully meeting the demands of the buyer. Also, it is especially important to forecast the number of competitive objects that are to be built in the future.

Research of interaction of demand and supply of commercial property. On the basis of the acquired tendencies of demand and supply the proportion thereof for the whole planned period of investment project is justified. The demand and supply ratio shows the type of marketing situation. This may be: „the market of the buyer”, „the market of the seller”, „balanced market”. Depending upon them marketing strategy is formed in the investment plan as well as possibilities to change price policy [18].

4. Indices important for the commercial object site location

Indices that should be considered when estimating the site location of the future commercial object [1]:

- R1 – possibilities of parking (index showing possible number of cars for parking and convenience in a certain location). The higher possible number of parking lots, the more attractive is this place. This index is estimated by number of parking lots in a certain territory.
- R2 – presence of equal competitors (presence of similar commercial objects in the residential district has a certain influence upon the possibilities of business activity). Sometimes the presence of competitor even improves possibilities of business activity. This index is rated at points from 1 to 7. They describe the influence upon the object from low to very high.
- R3 – population residing within the range of 1 km (it is worth while building commercial object in the location where population density is low). Sometimes this index is offset by such indices as good

flow of public transport. This index is described by the number of population (in thousands) within the range of 1 km.

- R4 – price of the land lot (market value of the chosen location is similar compared to the asked price). This index is expressed in thousands LTL for an are of a land lot.
- R5 – flow of public transport (important index when attracting clients without their own vehicles). This index is rated by points from 1 to 7. They rate transportation flow from low to very high.
- R6 – visibility from the main streets (index allowing the client to easily find the commercial object). This index is rated at points from 1 to 7. They describe visibility from very poor to very good.
- R7 – infrastructure of communications (possibility to connect the commercial object by means of minimum expenditure to the existing urban or local communications). This index is rated by points from 1 to 7. They describe the level of communications infrastructure in the locality from low to very high.
- R8 – changes of environment in the future (this index is rated at points from 1 to 7. 1 point means low, and 7 points mean high influence of environment change).

The values of these indices are estimated by applying the data of survey of the experts processed by the method of pairwise comparison and using software (KVADR – estimation of the values of indices by the method of the least squares) (Fig 4).

5. Valuation of commercial land lot considering commercial benefit of this lot

The following main aspects of evaluation of urban commercial land lot can be singled out [17, 18]: 1) expenditure related to macroeconomic analysis of development of land as a profitable real estate. Engineering, public transport and other constituent parts of infrastructure are stressed, also costs of investment to the planned object in the existing land lot. It is very important to distribute the budget of the city to the economic development and assimilation of the new territories considering also the future benefit for the city from the investment into the existing territory. 2) Market analysis of the city land rent. Whether the resources invested into the development of the land infrastructure will really payoff and will give profit from the usage of it and investment into it in the near future.

Considering the factors mentioned, the authors suggest to evaluate commercial land lots taking into consideration the maximum utilisation of the lot, calculating the value of the lot by means of the income value from usage.

Utilisation of the income value from usage method (capitalisation of income or cash flow discount) when the property is estimated not as the sum of various property, but rather as business object accumulating profit. This method is applied when it is anticipated that usage value of the property under estimation will show at the most objective scale the market value of the property. The method of income value from usage is based on the assumption that there is a determined relation between the net (activity) income and the income received from the object and the market value of this object.

When calculating the value of commercial land lot by applying the method of income value from usage it is suggested to use cash flow discount type (formula 1). The essence of cash flow discount is a consumption that the market value of the valuated property equals to the sum of present values of cash flows plus present value of reversion.

This method differs from income capitalisation methodology as in this case analysis of income and capital indices is made for the whole period of investment.

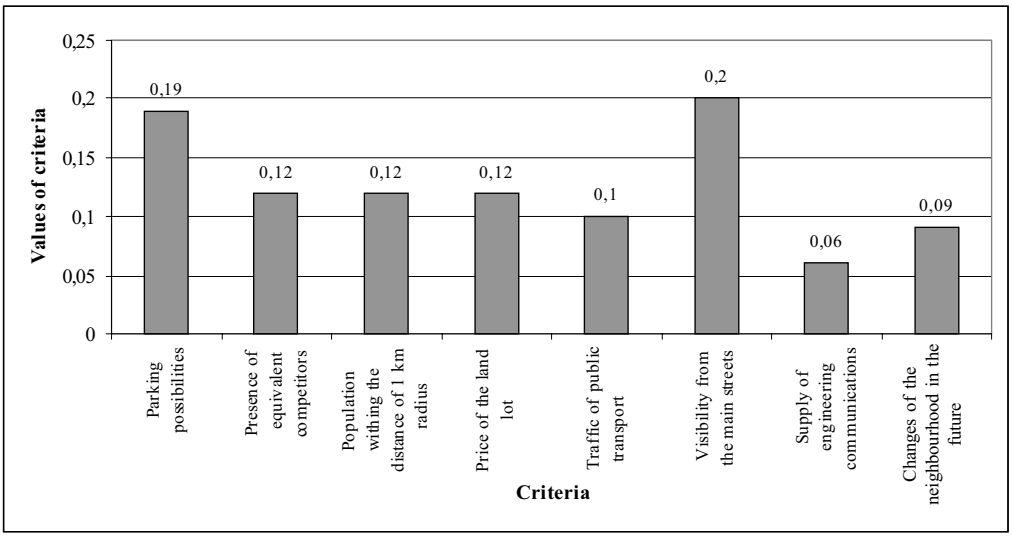

Fig 4. Values of criteria for selection of the site location for commercial property construction

$$\check{Z}V = \sum_{i=1}^{n} \frac{IP - IK}{(1+PI)^n}, \quad (1)$$

$\check{Z}V$ – value of commercial land lot;
IK – estimated investment costs of the project;
n – estimated period, during which the investment project will be developed;
IP – estimated investment income of the project;
PI – estimated annual profitability index of the project.

The essence of this method is a correct prognosis of investment costs and investment income (Fig 5).

6. Constructional solutions of the commercial object

Success of commercial object is determined not only by properly chosen commercial activity or a place for the implementation thereof. The factors that are equally important for the value of commercial object are its exterior and interior – in short, its marketable outlook. Specifics of commercial object is unique because the object has not only sell the good, but also to sell itself, its outlook must be impressive and attractive not only to the subject buying or renting premises there, but also to the potential client – the buyer [21, 22].

At the moment in Lithuania the following main types of commercial object may be singled out [10]:

1) modern buildings of glass and metal,
2) bright hangar-type commercial objects,
3) new and renovated big stone buildings,
4) impressive small trade objects,
5) renovated commercial objects.

Just as the exterior of the building must inform about its content, the planning of the building interior must focus the subject on the designated purpose of the object at the maximum scale. The solutions of the interior are determined by the purpose of the building and limitations of technical implementation as well as financial capabilities. The interior of small commercial objects must be impressive, and that of big ones – informative. The main requirements are floor covering that is easily maintained, not slippery and resistant to intensive movement, good enlightening and conditioning system. In big supermarkets the issue of consistent, systematic and informative outlay of goods is relevant. With the help of references the buyer must easily find the way in the sales outlets.

After carrying out the analysis of commercial attractiveness and competitiveness the conclusion is made that the site location of the object must be attractive from the commercial point of view, constructive elements must be easily disposed according to individual demands of the client, appropriate sanitary conditions are desirable, conditioning system, quantity of enlightening sources, catering facility, issues of parking (very important), security and telecommunications.

Architecture of the buildings of the same designation is deferent. Constructional structure of the building of the same architecture can also be various. Seeking for the most optimal solution, most often it is referred to the analysis of the results of projection of various variants and multiple criteria evaluation. Depending upon the situation, demands of the client and the estimated type of commercial activity architectural and functional solution thereof is different, but it is possible to distinguish the features characteristic to all commercial buildings [23]. Ever increasing speed of life stimulates rapid progress of different technologies that ensures the variety of products and freedom of choice. Clients demand better and better quality of goods and services. Now the priority is given to the modern trade centre providing the most possible variety of services that is able to offer a wide assortment of goods, comfortable environment, attentive servicing (Fig 6). Indices that must be considered when valuating constructional elements of the future commercial object are as follows (Fig 7) [22]:

- R9 – facade (index showing modernity of constructions, possibility to combine direct function of constructions with attractive aesthetic outlook, the main faēade of the building facing the main street). The more the building is visible (illuminated, with advertisement spaces), the more attractive it is.
- R10 – used constructions (index indicating material and durability of constructions).
- R11 – useful area (mainly all the commercial objects are planned considering the main principles, the main components do not change, they are exposition (sales) area, administration – office part, technical and warehousing premises.
- R12 – possibility to enter (index indicating convenience of entrance and exit the building).
- R13 – ergonomic solutions (index indicating amplitude of premises, internal enlightening – natural and artificial light, air conditioning, ventilation.
- R14 – internal condition (index indicating the quality of decoration of premises and possibilities of durability thereof).
- R15 – infrastructure of communications (specifics and possibilities as well as convenience of maintenance of engineering networks and communications in each constructional solution are rated by points from 1 to 7).
- R16 – possibilities of movement in the premises (staircases and escalators are projected in order to make the client pass the whole exposition before entering the next level.

7. Traditional indices of efficiency evaluation of the commercial property investment projects

Investment value of commercial object is a specific value for a specific investor that depends upon individual investment requirements for commercial object. Investment value is directly influenced by the objectives of a specific investor and correspondence of advantages and disadvantages of the commercial property analysed to

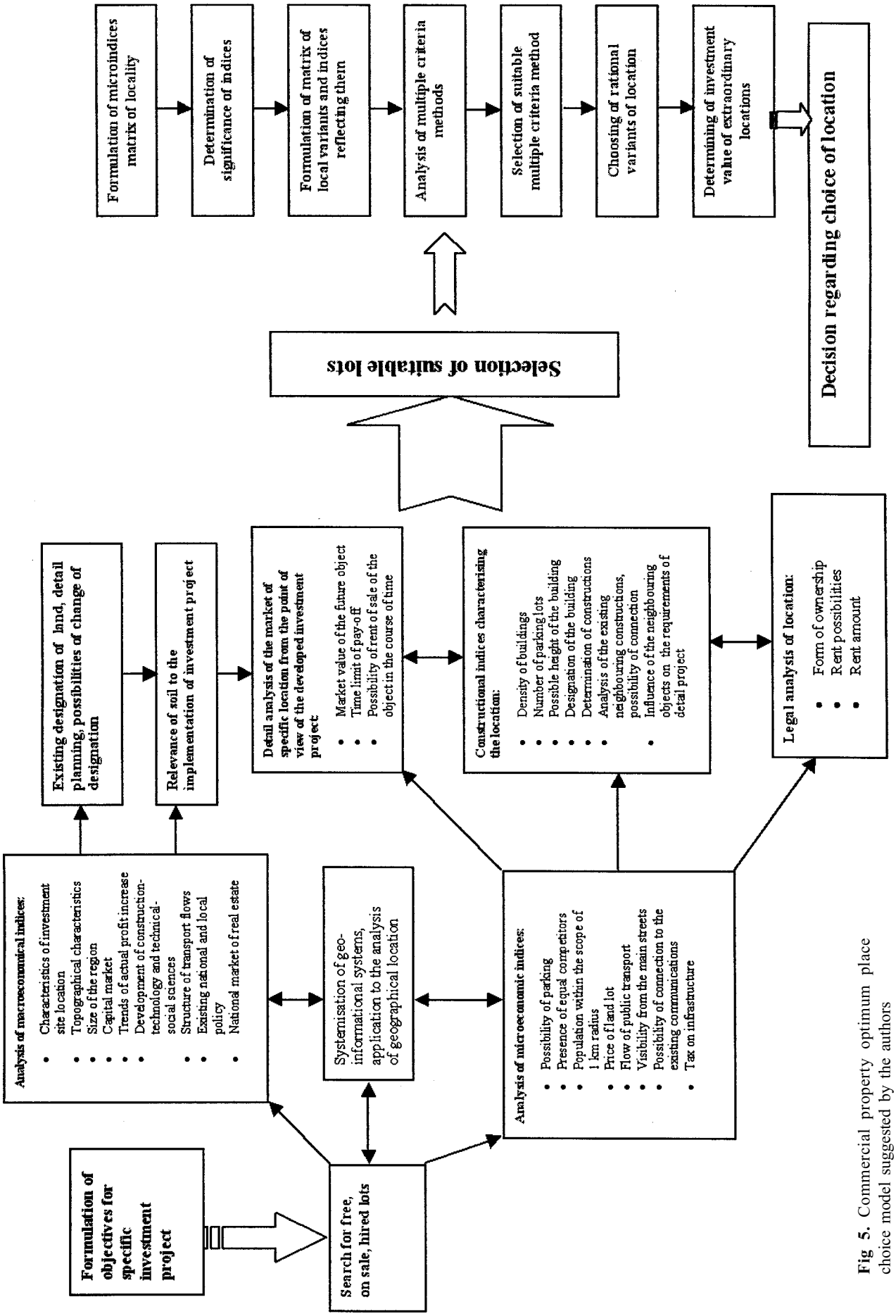

Fig 5. Commercial property optimum place choice model suggested by the authors

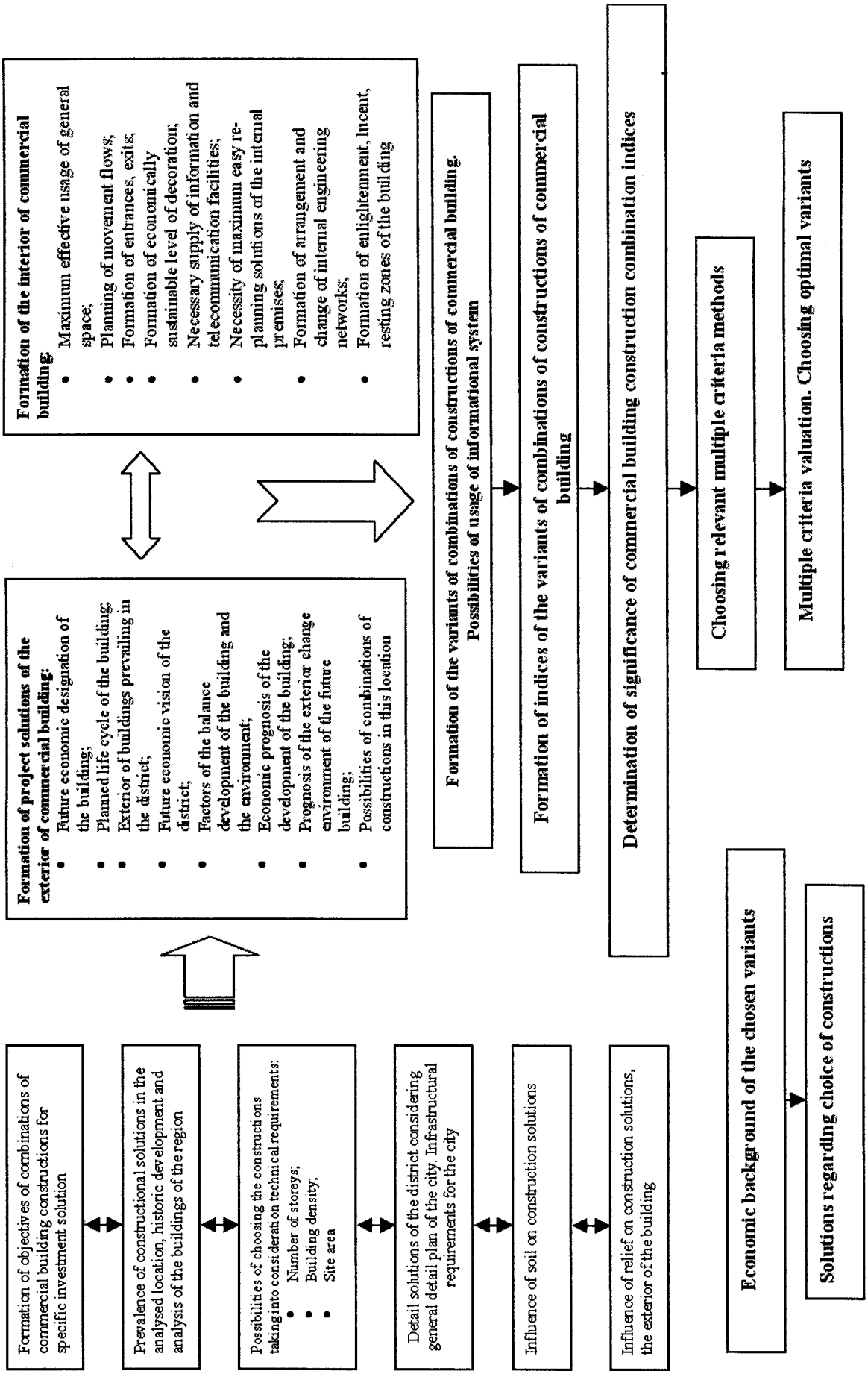

Fig 6. Model of commercial property optimal constructional solution choice suggested by the authors

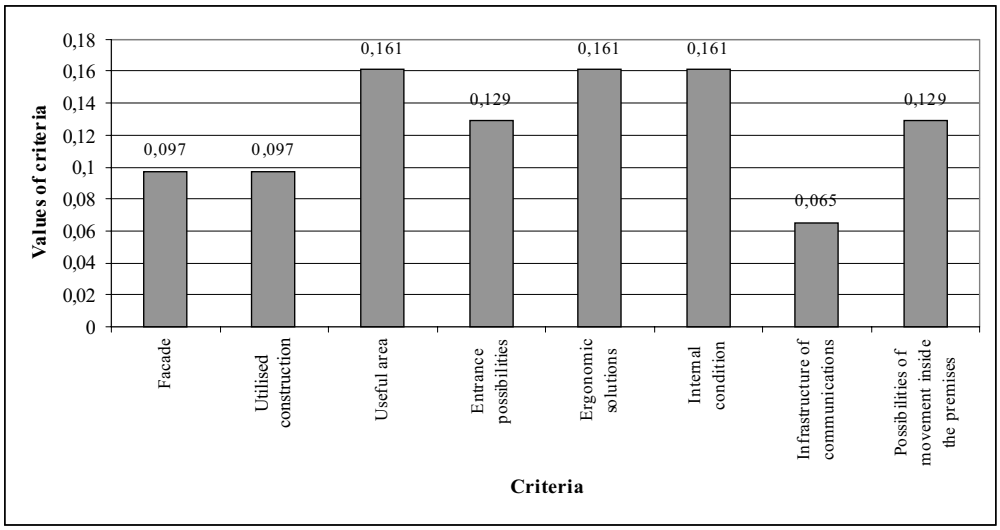

Fig 7. Values of criteria for selection of constructional variants of a commercial object

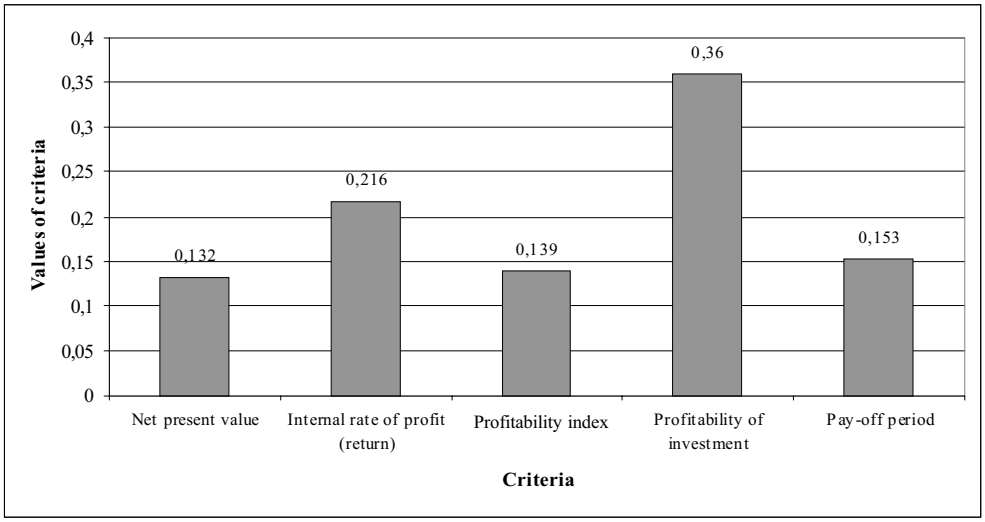

Fig 8. Values of investment economic indices of commercial objects

these objectives. When making investment solutions it is necessary to evaluate the investment value of the ownership in each specific case [24, 25]. Modern indices of valuation of efficiency of commercial objects investment projects are based on monetary value in the course of time that is calculated by means of discount rate. Discount rate (r_D) equals the capital price for investor if several conditions are met: risk level of the project is acceptable to the investor, calculations are made using constant or calculated prices [24, 25]. When financing structure is changed by planning intervals discount rate also changes. If implementation risk of the analysed project differs from the risk of the typical projects of the investor, it is necessary to estimate the value of the discount rate that is valuated as a bonus for taken risk.

$$r_D = r_{baz} + P_R, \tag{2}$$

r_D – discount rate after evaluating the risk
r_{baz} – basic discount rate
P_R – bonus for risk taken.

Estimated discount rate (using estimated prices) is calculated according to the formula:

$$r_{PR} = r_D + I + r_D \times I, \tag{3}$$

r_{PR} – estimated discount rate
I – scope of inflation during the period of estimation.

Efficiency of investment projects of commercial objects is determined by comparing the income and expenditure related to implementation of the project. Efficiency is estimated by using efficiency valuation indices (Fig 8) [26]:

- Net present value
- Internal rate of profit (return)
- Profitability index
- Profitability of investment
- Pay-off period.

Net present value, when valuating investment projects, the main task is to estimate the value of the future benefit that may be obtained during the period of

management. Hereby, the future value of the benefit (Future Value) is turned into the present value by means of the discount. When discounting cash flows and choosing the project as the main index there is a difference between the future value of discounted cash flows of the amount and the initial investment that is called net present value [27].

$$NPV = -C_0 + \sum_{t=1}^{n} \frac{C_t}{(1+r_t)^t}, \quad (4)$$

NPV – net present value;
C_0 – amount of initial investment;
C_t – t cash flows of the period;
r_t – discount rate.

Positive NPV means the fact that cash income of the project exceeds implementation expenditure thereof [27]. The project is effective if NPV is positive. The higher is the value of NPV, the more effective the project is. NPV is the main index when evaluating effectiveness of the project because it [26]:

- Shows effectiveness of the project, ie allows to maximise the investment effectiveness;
- Is the only index with the feature of additives.

The present value of the project is estimated by the method of discount, and discount rate is estimated on the basis of alternative capital value, ie the value that would be received by the investor investing money into the project with the same risk factor. But in reality the project may generate cash flows, which will determine higher net return of alternative capital value and will ensure additional profit to the owner.

Internal rate of return – is the discount rate that makes net present value equal to zero. In other words, when discounting by this rate the present capital return value equals the initial investment.

When calculating the internal rate of return the task of analysis of discounted cash flows is solved in the reverse order – all the positive and negative cash flows of the project are analysed in order to estimate discount rates, at which their present value equals the initial investment. In practice, this rate is calculated by method of iteration, that means choosing the right discount rate for the present cash flows [27]:

$$NPV = -C_0 + \sum_{t=1}^{n} \frac{C_t}{(1+IRR)^t} = 0. \quad (5)$$

IRR – Internal rate of return.

Profitability index – or benefit-cost ratio is the ration of the present value of the future benefit and initial investment [27]:

$$PI = \frac{PV}{C_0}. \quad (6)$$

Other value of index is the ration of the present value of all the positive cash flows of the project and the present value of all investments. The value of profitability index must be over one, and then investment can be made. In its essence, this index corresponds to NPV [27].

Profitability index is closely related to NPV and IRR [26, 27]:

- If PI>1, then NPV>0 and IRR> r;
- If PI=0, then NPV=0 and IRR= r;
- If PI<0, then NPV<0 and IRR< r.
- If PI>1, then the implementation of the project may be discussed. Otherwise, the project is loss-making.

Profitability of investment – in some cases it is also necessary to calculate profitability of investment (r_I), which shows how many net monetary units (estimating discount) will be earned by one monetary unit invested into the project [26]:

$$r_I = \frac{NPV}{K}, \quad (7)$$

r_I – profitability of investment,
K – amount of discount of capital investment.

$$K = \sum_{t=0}^{T} \frac{K_t}{(1+r)^t}, \quad (8)$$

K_t – capital investment at the time of t interval.

Pay-off period is a minimal period of time (from the start of implementation of the project), after which integral effect becomes positive and remains such later on. In other words, this is a period, starting from which the primary investment and other expenditure related to the investment project are covered by the income from the project. It is recommended to calculate the pay-off period estimating the discounting [26, 27].

Very often for estimation of effectiveness of investment the index is used that determines the time. This index is necessary when the amount of cash flows of the project is equal to the amount of initial investment.

Pay-off period may be calculated on the basis of taxes based on cash flows or before paying them, which must be indicated in the report.

This investment index is used by the investors in order to know when full pay-off of the invested capital occurs. The period of pay-off of own capital for investors is a value that is inversely proportional to capitalisation coefficient of own capital:

$$PB = \frac{1}{R_E}, \quad (9)$$

PB – pay-off period,
R_E – capitalisation coefficient of own capital.

8. Characteristics of decision making methods in multiple criteria tasks

In decision making process the task of ordering or rank attribution in accordance with their priority is analysed. Such a task rises when forming stock portfolio [28], valuating commercial and business activity of constructional companies [29] or buying several goods [30].

Most often it is impossible to describe the characteristics of the object of choice in the form of one index, several indices must be taken, which often are very different. Also, the tasks of selection of the most suitable object is every popular, valuation in accordance with a lot of indices of efficiency.

There is a lot of methods indicating the rules of SPA activities. New methods are constantly suggested. Lately such scientific works appeared that are based on comparison of different methodological and separate methods [31]. An important question arises: what kind of criteria should be compared?

Ratios of alternatives are introduced: R – ratio of not strict priority, P – ratio of strict priority, I – ratio of indifference. Despite of numerous methods and important differences among them, three main methodological requirements must be formulated by the results of application of methods [32]:

1. Particularity of ratios of multiple criteria alternatives (A_iRA_j or A_jRA_i). According to the provided assumptions rationality of alternatives differs.
2. Non-cyclic character of lot of alternatives (if $A_1PA_2PA_k$, then A_kPA_s, where s<k, impossible). In case of appearance of cycle non-transitivity of ratios of strict priority may appear.
3. Low sensitivity to DM error. In accordance with each decision making method SPA information is applied for valuation and comparison of alternatives. SPA is a non-ideal measurement unit; it may make errors. Therefore, decision making method must be not so sensitive to possible errors in the process of choosing SPA priorities.

The present article includes analysis and evaluation of commercial objects. Taking into consideration the global evaluation practice, the most suitable methodology of evaluation of such objects is comparative preference methods reflecting the essence of pairwise comparison. When analysing commercial objects, we meet with lots of different indices and various groups of these indices [33]. In our case we can compare only the methods of the same group and type. In general, model of choosing variants of investment project, valuation of different groups of indices the valuation of values of which in the general context is very complex, imply a large possibility of error. Therefore, in case of our analysed task professional opinion of an expert is very important, the limits of change of values set by him meeting the expectations of the investment project. Method ELECTRE III [34] compared to other comparative preference methods is the most suitable for solving the task of commercial object investment as well as for describing indices of the raised problem. Values of indices may be analysed in more detail, as well as the opinion of an expert, the values of group of indices evaluated in the general context.

Comparative preference methods. The group consists of ELECTRE I; ELECTRE IS; ELECTRE II; ELECTRE III; ELECTRE IV; ELECTRE III; PROMETHEE I and II; MELCHIOR; TRICHOTOMIC SEGMENTATION; QUALIFLEX; ORESTE; UTA; PRAGMA; CARTESIA and other methods.

The basis of the methods [35] is pairwise comparison of alternatives based on specified indices of concordance or discordance. The hypothesis of the particular alternative being more preferable than the other is checked. A concordance index is found by indicating coefficients of values of SPA indices. A discordance index is obtained evaluating the criteria of alternatives. Both concordance and discordance indices are not related, being used separately. Each stage of analysis has its lowest value of concordance index and the highest value of discordance index is obtained according to which the preference of one alternative with respect to another is determined.

Just as in the methods of analytical hierarchy only the established alternatives are valuated and compared. The distinction of this group of methods is the ratio of incomparability of alternatives in case of certain values of indices.

Indices of comparison used in the methods ELECTRE III, IV, etc allow to valuate inaccuracies of the initial data and measurements of experts [35].

The methods above are not so sensitive to the DM mistakes in measurement. **First**, for some cases, the preference of one alternative over another one remains if the alternative estimations vary within a wide range. **Second**, the criteria weights can vary without any changes in concordance index if the total sum of weights used to calculate the index remains constant [35].

The most typical method of this group is ELECTRE methods (Elimination Et Choix Traduisant la Realité – elimination and choosing reflecting the reality) [35]. Although ELECTRE methods first of all were suggested as heuristic there are quite a lot of works that serve as the ground of their axiomatic character [36]. ELECTRE methods are implemented in the form of the systems of decision making [36]. These systems are attractive to the users.

9. Description of ELECTRE III method. Essence of the method

ELECTRE (*Elimination et Choice Translating Reality*) method was developed by Benayoun and his colleagues [35]. Later Roy, Nijkamp, van Delft [35] developed the method until its present state. ELECTRE uses the principle of "the predominant ratio". Methods of selection of the set of non-predominant variants (ELECTRE) were developed by a group of scientists from France lead by Prof B. Roy. The most effective non-predominant variant is selected in the course of several stages (Fig 9) [31]:

In ELECTRE III method the same indices of two variants are compared, determining the level of index j of variant a being better than index j of variant b expressing this value through the index of conjunction, also

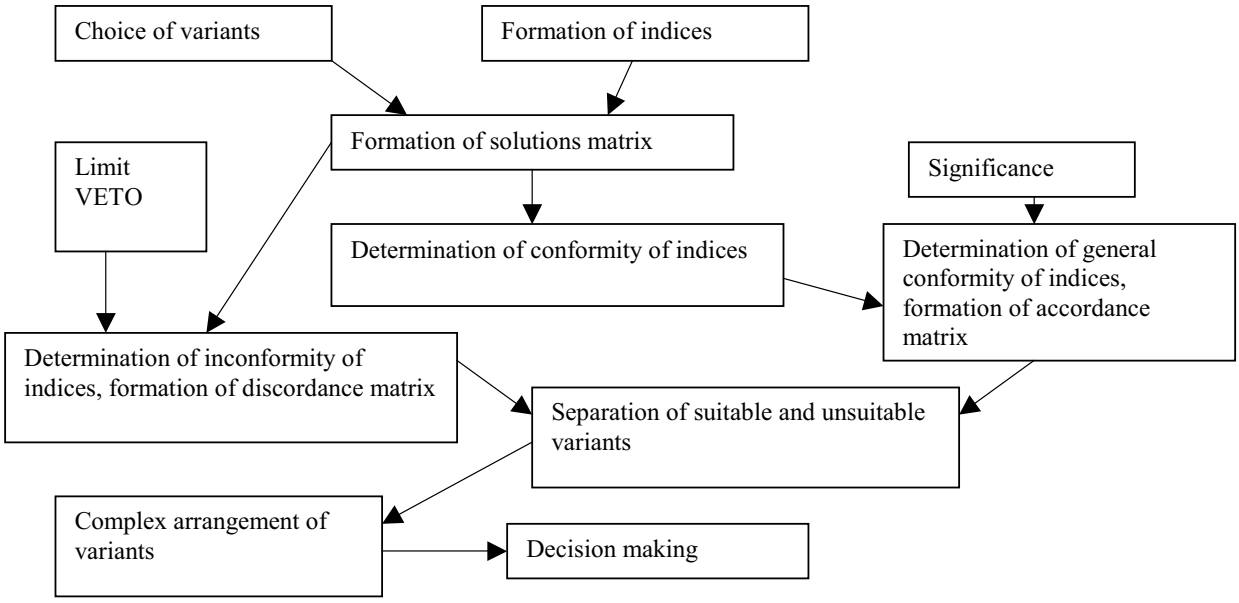

Fig 9. Model ELECTRE III

the level of discordance of index *j* of variant *a* with the index *j* of variant *b* expressing this value through the index of discordance [36].

10. Conclusions

1. Investment into the commercial property is the sphere of activity requiring strategic (long-term) solutions. Therefore, it is very important to carry out detail research and to analyse the future and past tendencies of existence of commercial property objects.

2. The market of commercial property is unique, limited, trade transactions are made privately, the majority of sales data are documented in closed-type institutions; this fact determines that this data is not available to the analysts of commercial property market – these are only several reasons making the research of commercial property more difficult.

3. In order to make research of the objects of investment in commercial property environment, the main environments of research should include: macro-economic situation of the region, micro-economic environment of the locality, potential participants of commercial object, modern requirements to the real estate object, and management tools of this object.

4. The price of commercial property – the main index of competitiveness – is mainly influenced by the following factors: place, exterior, interior, areas, ergonomic solutions, leading simplicity. However, it is important to match all these elements.

5. Commercial property is object, the situated locality of which cannot be changed not changing its designated purpose of use, where commercial activity is executed – trade and presentation of the activity of the subject, or the object is used in order to get commercial benefit.

6. The process of investment development of commercial property is a process of development and support of the value of real estate object determined by constructional solutions that are defined by the demand of the participants of commercial objects.

7. The model of investment into commercial real estate, increase of efficiency by means of marketing and market research was developed that is based on systemic interaction of the constituent part of the model.

8. The location of commercial object is factors defining unique site location of the object determining its attractiveness in a competitive market from the point of view of other site locations.

9. Promotion of commercial property is provision of information about the present commercial property in the environment of flow of analogues information providing the clients with the possibility to evaluate the advantages of the object compared to the flows of equivalent information.

10 The system of indices for selection of location of commercial object is developed and the values of indices are determined that allow to precisely describe the location in accordance with important characteristics of selection of location of commercial object.

11. The model is developed for selection of commercial object location allowing detailed determination of the main priorities of the location, ways of selection thereof, GIS (Geo-informational systems) usage allows to analyse information more effectively about the location of interest, effectively determine the values of indices for specific geographic location.

12. The carried out analysis of the commercial objects development revealed that the changes of location and value of commercial object are closely related to the national economic level, the prevailing attitude of the society to commercial relations and social environment.

13. After carrying out analysis of the impact of the location on the commercial object, not only the main indices determining profitability are established, but also the influence of the site location on construction of the building. When choosing constructional solution of the future commercial object it is necessary to consider the soil characteristic to specific location, as well as number of storeys and style of the neighbouring buildings.

14. The main solutions of exterior of commercial objects at the moment prevailing in Lithuania: modern glass and metal constructions, bright hangar-type commercial objects, new and renovated big concrete buildings, impressive small trade objects and renovated commercial objects.

15. For selection of combinations of commercial object constructions the model was developed allowing to describe the main priorities of constructions combinations of commercial object, ways of selection thereof.

16. After analysing multiple criteria valuation methods it was determined that the method of selection of the set of non-predominant variants ELECTRE III is suitable for valuation of investment efficiency of constructional projects of commercial objects, as they are based on pairwise comparison of the variants determining if indices do not contradict to the prevalence of the variant.

References

1. Stasiulionis, A.; Ustinovičius, L. System and analysis of commercial objects for investment purposes. *Technologic and Economic Development of economy* (Ūkio technologinis ir ekonominis vystymas), Vol IX, No 3. Vilnius: Technika, 2003, p. 105–115 (in Lithuanian).
2. Stasiulionis, A.; Ustinovičius, L.; Zavadskas, E. K. Development of the market of commercial objects in the Baltic States. *Bridges* (Tiltai), No 4 (21). Klaipėda: Klaipėda university publishing outfit, 2002, p. 31–39 (in Lithuanian).
3. Hansz, Andrew J. Diaz III J. Valuation Bias in Commercial Appraisal: A Transaction Price Feedback Experiment. *Real Estate Economics*, Vol 29, No 4, 2001, p. 553–565.
4. Clayton, J.; Geltner, D.; Hamilton, S. W. Smoothing in commercial property valuations: Evidence from individual appraisals. *Real Estate Economics*, Vol 29, No 3, 2001, p. 337–360.
5. Sivitanidou, R.; Siv, Tanides P. Does the Theory of Irreversible Investments Help Explain Movements in Office - Commercial Construction. *Real Estate Economics*, Vol 28, No 4, 2000, p. 623–661.
6. Bond, S. A.; Hwang, S. A Measure of Fundamental Volatility in the Commercial Property Market. *Real Estate Economics*, Vol 31, No 4, 2003, p. 577–600.
7. Riblett, R. C. Tucson‘s commercial property online. *Economic Development Journal*, 2003, p. 31–35.
8. Ustinovičius, L.; Stasiulionis, A. Valuation of choosing location of commercial objects in different aspects. *Civil Engineering* (Statyba), Vol VII, No 6. Vilnius: Technika, 2001, p. 474–480 (in Lithuanian).
9. Ireland, Michael W.; O‘Connor, Patrck M. Location Analysis for Commercial Properties. *Assessment Journal*, Vol 9, Issue 6, Nov/Dec 2002, p. 21–26.
10. Stasiulionis, A. Multicriteria based estimation of selection of commercial property‘s construction project. In: International Conference: Modelling and simulation of business systems. Vilnius, May 13–14, 2003, p. 36–42.
11. Griškevičius, A.; Silickas, J. Management of investment projects (Investicijų projektų valdymas). Vilnius: Institute of Information of Lithuania, 1998. 44 p. (in Lithuanian).
12. Pranskėnienė, D. Features of service quality management thesis of the 3rd plenary meeting of the 2nd Congress of Lithuanian World Businessmen. In: Business management, marketing and studies (Paslaugų kokybės valdymo ypatumai. Antrojo pasaulio lietuvių verslininkų suvažiavimo trečiojo plenarinio posėdžio „Verslo valdymas, marketingas ir studijos“ pranešimų tezės). Vilnius: Institute of Information of Lithuania, 1992. 79 p. (in Lithuanian).
13. Chetirkin, E. M. Financial analysis of industrial investment (Финансовый анализ производственных инвестиций). Moscow: Delo, 1998. 256 p. (in Russian).
14. Economics of real estate (Экономика недвижимости). Moscow: Delo, 1999. 328 p. (in Russian).
15. Bloech, J.; Götze, U.; Huch, B.; Lücke, W.; Rudolph, F. Strategische Planung, Instrumente, Vorgehensweisen und Informationssysteme. Heidelberg, 1994.
16. Greer, Gaylon E. Investment analysis for real estate decision. Dearborn, Real Estate Education, 1997. 503 p.
17. Prorvich, V. A. Principles of evaluation of city land (Основы экономической оценки городских земель). Moscow: Delo, 1998. 254 p. (in Russian).
18. Richard, M. Betts; Silas, J. Ely. Basic Real Estate Appraisal. Prentice – Hall International, 1994. 496 p.
19. Paskus, Ju. V. Economic and finance of real estate (Экономика и финансы недвижимости). Publishing outfit of University St Peterbourg, 1999. 185 p. (in Russian).
20. Environmental Systems Research Institute. ARC/INFO The Professional Geographic Information System. The United States, 2000. 35 p.
21. Zavadskas, E. K; Ustinovichius, L. Methodics of analysis of investment projects of reconstructions of buildings applying methods of multiple selection. *Technological and Economic Development of Economy* (Ūkio technologinis ir ekonominis vystymas), Vol VII, No 1. Vilnius: Technika, 2001, p. 30–39 (in Russian).
22. Stasiulionis, A.; Ustinovičius, L. Multiple criteria analysis and development of commercial objects and constructions and building projects. *Technological and Economic Development of Economy* (Ūkio technologinis ir ekonominis vystymas), Vol IX, No 1, 2003, p. 3–11 (in Lithuanian).
23. Rutkauskas, A. V. Development of real estate, investments and risk (Nekilnojamojo turto plėtotė, investicijos ir rizika). Vilnius: Technika, 2001. 404 p. (in Lithuanian).
24. Lunkevičius, S.; Ustinovičius, L.; Zavadskas, E. K. Basis of the method of financing rural constructions. *Civil Engineering* (Statyba), Vol VII, No 2. Vilnius: Technika, 2001, p. 148–157 (in Lithuanian).

25. Lunkevičius, S.; Ustinovičius, L.; Zavadskas, E. K. Multiple criteria valuation of effectiveness of investment projects of rural constructions. *Civil Engineering* (Statyba), Vol VII, No 3. Vilnius: Technika, 2001, p. 238–246 (in Lithuanian).
26. Friedman, J. P.; Ordway, N. Income Property Appraisal and Analysis. American Society of Appraisals, Prentice Hall, New Jersey, 1992. 467 p.
27. Isaac, D. Property finance. London: MACMILLAN, 1994. 428 p.
28. Ghasemzadeh, F.; Archer, N. P. Project portfolio selection through decision support. *Decision Support Systems*, Vol 29, Issue 1, 2000, p. 73–89.
29. Ginevičius, R.; Podviezko, V. Complex valuation of commercial-economic activity of construction companies. *Civil Engineering* (Statyba), Vol VI, No 4. Vilnius: Technika, 2000, p. 278–288 (in Lithuanian).
30. Jain Subhash C. International Marketing Management, third edition. Boston: BWS-KENT, 1990. 758 p.
31. Zavadskas, E. K.; Kaklauskas, A. Systemic-technical valuation of constructions (Pastatų sistemotechninis įvertinimas). Vilnius: Technika, 1996. 279 p. (in Lithuanian).
32. Larichev, O. Characteristics of the methods of decision making in multiple criteria tasks of personal choice. *Automation and telemechanics* (Автоматика и телемеханика), No 2, 2002, p. 146–158 (in Russian).
33. Joerin, F.; Musy. A. Land management with GIS and multicriteria analysis. *International Transactions in Operational Research*, No 7, 2000, p. 67–68.
34. Roy, B. Electre III: the algorithm of classification based on dim representation of preferences at presence multicriteria (Electre III: un algorithme de classement fondé sur une représentation floue des préférences en présence de critéres multiples). *Cahiers du CERO*, 20, 1978, p. 3–24 (in French).
35. Roy, B. Multicriteria Methodology for Decision Aiding. Kluwer Academic Publishers, Dortrecht, 1996. 293 p.
36. Vallee, D.; Zielniewicz, P. ELECTRE 3–4, version 3x. Guide d'Utilisation, Document LAMSADE N 85, Paris, Universite de Paris Dauphine, 1994. 56 p.