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Implementation of construction projects for social infrastructure development in Smart Cities

Alexandr Orlov and Irina Chubarkina

Moscow State University of Civil Engineering, 129337, Yaroslavskoye shosse, 26, Moscow, Russia

E-mail: alor333@gmail.com

Abstract. The article deals with the recent problems of implementation of construction projects for social infrastructure development. Being as basis of comfort life zone formation and important element of Smart Cities, social infrastructure facilities are practically considered by the developers often as project elements impairing effectiveness indicators of their activities. The purpose of the article is the justification of methodological approach to effective implementation of construction projects for social infrastructure development respecting the interests of main participants of investment and construction project: city, citizen, developers. Methodological approach deals with infrastructure facilities within the framework of urban blocks on the base of Smart Cities concept. The article articulates the concept of social infrastructure of urban blocks including condominiums with everyday serviced facilities on the ground floors and yard representing a private territory with landscaping, leisure and recreation grounds and fire lanes and which is accessible predominantly to inhabitants of particular block and which is closed to the public visit. Effective implementation of construction projects for social infrastructure development suggests creation of value innovation (basic element of blue ocean strategy) by means of transformation of so-called strategic canvas for social infrastructure facilities. Multifactor model for projects for social infrastructure development including each element's contribution to creation of additional value to customer was formed on the base of the method of expert assessments. It is presented mechanism of complex effectiveness assessment of decisions on value innovation for social infrastructure facilities respecting the interests of participants of investment and construction process. This mechanism can be used both for projects suggesting exclusively budgetary financing and for commercial projects. It was created an algorithm of practical implementation of stated methodological approach within the frames of Smart City concept. Risks to implementation of methodological way of their reduction were analyzed. Offers stated in the article are aimed to increase the effectiveness of implementation of construction projects within the frames of urban blocks when simultaneous quality improvement of life sphere takes place.

1. Introduction

Housing construction is one of the fastest developing segments of real estate market and it takes a special social load. Provision of housing and availability of housing for population have a direct impact on level of living, tell on fertility and population growth rate and are reflected in its economic culture because house-buying requires significant cash expenditures and usually long accumulation

period is a preliminary to the moment of buying. Mass housing market is necessary both for solution of social problems and for economic development in the whole.

From there exercising of constitutional rights of the citizen for affordable housing is considered as the major sociopolitical and economical problem. Overall scope and pace of housing construction, people's real wealth, their moral and physical well-being, political assessments and motivation of behavior depend largely on the choice of some or other approaches to solution to this problem [1].

Smart Cities – this is not only specialized fitting out of the district. Foremost Smart Cities – this is a complex of measures for improvement of quality of citizen's living, enhancing of its comfort. This is well-considered space that allows for each human to engage in self-realization in urban environment and to do this maximally.

Foremost population's housing demand is defined by demographic and total economic conditions, level of accrual of population's incomes as well as by availability of social infrastructure facilities in chosen micro district. [2].

At this stage of development of construction sector undervaluation of the role of social infrastructure management led to that fact that its elements fail in many respects to meet population's demands in the presence of economic capabilities and instead of becoming a factor that improves on stabile growth, weak formation of social infrastructure elements hampers further development of the cities in particular.

It proves that decisions on social infrastructure performance and development should be taken under the consideration of economic interests of investors and population's real demands, social norms during development of solutions, determination of strategic tasks in social infrastructure management. It is also worth noting that increase in construction scopes and improvement of social effect directly depend on competitiveness in the whole and competitiveness of construction sector companies making development of quarters in the light of different social federal programs [3,4].

Competitiveness is one of the most important characteristics used for analysis of economic situation both of the national economy of Russian Federation in the whole and of separate trade company. As a rule, it is used as effectiveness assessment criterion of economic subjects (1):

$$\text{Effectiveness } = f(\text{Competitiveness}) = f(F_1, F_2, \dots F_n) \quad (1)$$

where F_1, F_2, … F_n – competitive factors.

Effective use of company competitiveness improving methods makes possible to: mobilize sufficient volume of own and borrowed funds needed to achieve strategic purposes of the company development; minimize capital procurement costs; carry out rational budgeting of main areas of the companies' activity; ensure implementation of effective investment projects; manage cash flows of the company rationally [5-7].

Thus the purpose of the article is the justification methodological approach to effective implementation of construction projects for social infrastructure development in Smart Cities, respecting the interests of main participants of investment construction process: city, citizen, developers, and facilitating the competitiveness improvement of the companies.

2. Materials and methods

Methodological base of the study is presented by the methods of scientific analysis and synthesis, grouping, comparison and generalization. Also methods of social research, factor analysis, expert assessments and statistical data processing were used.

Solid foundation for survival of construction sector companies in complex outside environments is to make strategy that is aimed not to existing conditions but to those ones that will have to happen. Strategic approach to management of competitiveness and stable development of construction companies is to provide their stabile competitive advantage.

Main problem of existing strategies is complexity of promotion of long term competitiveness, requirement of choosing between price and quality, problems with forecasting effectiveness

assignments, duplication by competitors and difficulty in strategy implementation. [8]. In this regard it is proposed application of value concept which methodological fundamentals used in «blue ocean» strategy that is aimed to effectiveness improvement of investment activities of construction sector companies by ensuring of long term competitiveness on the real estate market by means of increase in value shown in figure 1.

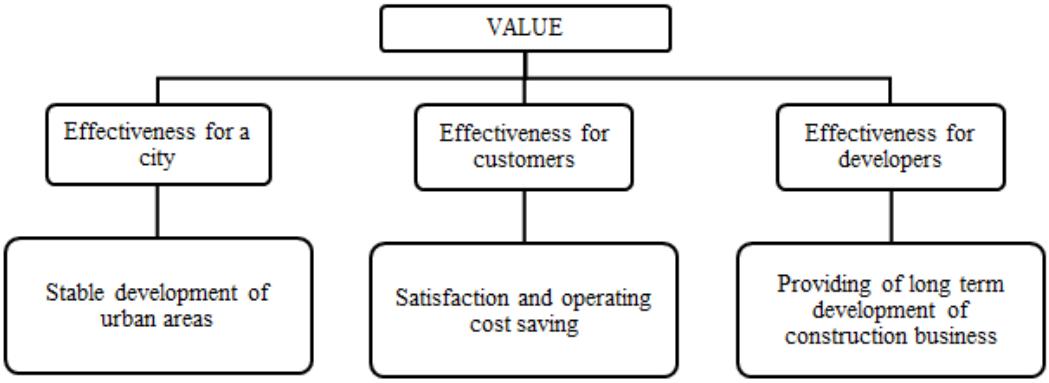

Figure 1. Types of values for real estate market participants in implementation of real estate facilities

Thus, levels of competitiveness can be shown in figure 2, where F_1, F_2, … F_n – social infrastructure factors within the frames of short term competition, and F_1', F_2', … F_n' – social infrastructure factors within the frames of long term competition.

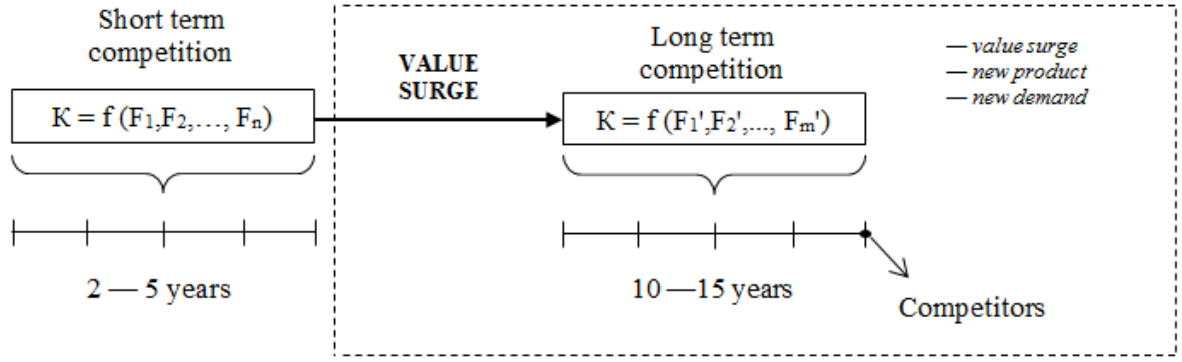

Figure 2. Levels of competitiveness

Therefore, conclusion should be drawn that value surge is required for switching of construction sector company to long term competition considering social infrastructure factors that in turn will facilitate effectiveness improvement of this company.

In order to form a strategic line of actions it is desirable to act as per specific chart, following the logics of effective strategy selection and for that reason algorithm of practical implementation of methodological approach within the frames of Smart City is shown in figure 3.

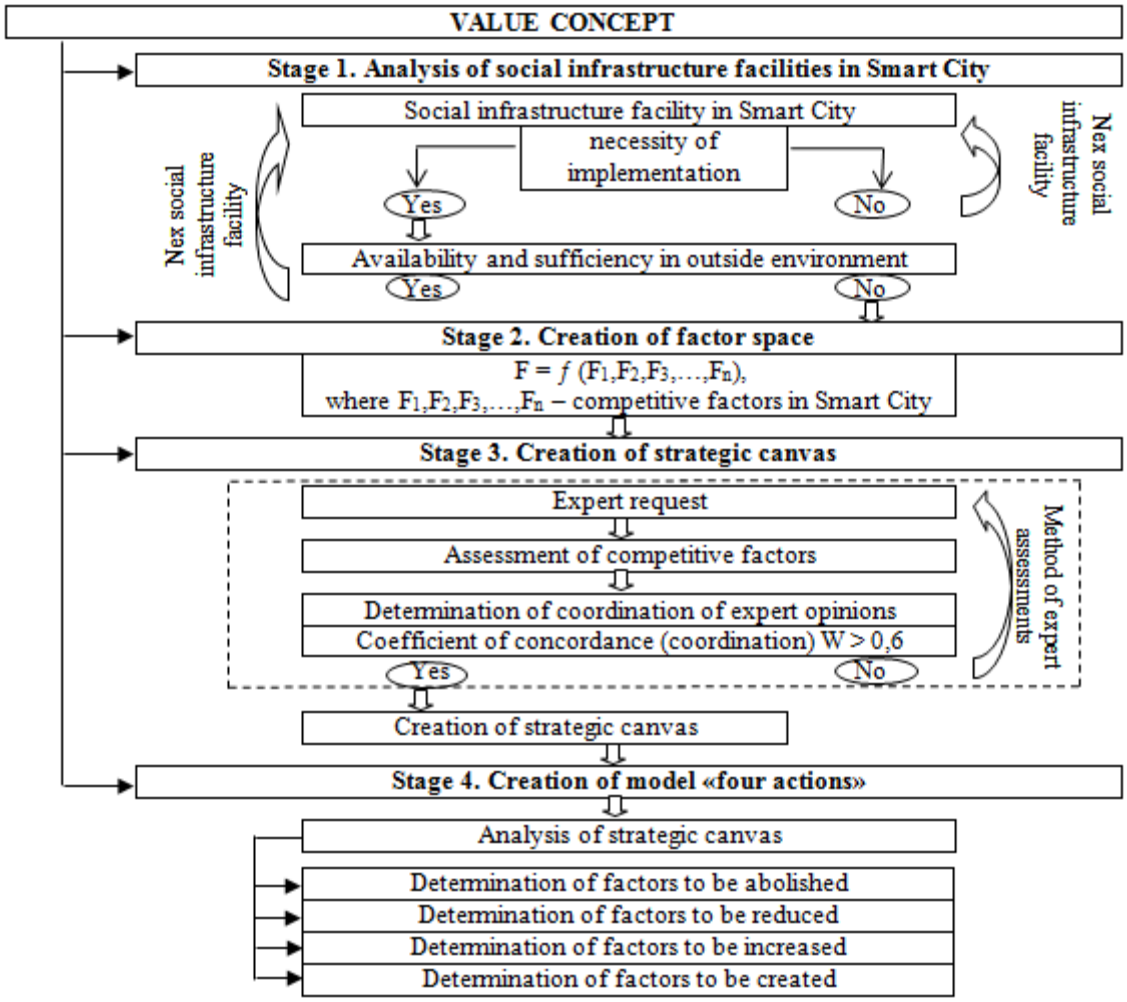

Figure 3. Algorithm of practical implementation of methodological approach within the frames of Smart City

Also methodological approach includes assessment of risks affecting the company's projects. In order to identify risks, it is necessary to carry out quantitative and qualitative risk analysis. Comprehensive list of risks is made while carrying out of qualitative risk analysis. Risks are done through the hierarchy: macro-level – country risk; meso-level – branch risk; company and project risk.

Quantitative analysis is to assign own priority to each risk, determination of each simple risk proportion as well as probability of risk ensue. Then integrated risk indicator is derived. Average risk assessment is done by expert method.

Special attention in methodological approach within the frames of Smart City should be given to assessment of specific investment risks during value concept implementation.

Investment risk is everyday component of any project connected with finance investments [9]. It is impossible to avoid it completely but knowing all specifics it can be minimized and here following risk management chart can be helpful:

- identification of possible risks during deal making or carrying out of real estate activities;
- qualitative and quantitative risk analysis (identification of risks and factors increasing probability of their occurrence, risk zones, i.e. deal stages where risk ensues; determination of possible extent of losses caused by one or another risk);
- evaluation of capabilities to reduce risk and costs needed for its avoidance.

- elaboration and accomplishment of measures permitting to avoid risks, reduce probability of their occurrence or possible volume of losses;
- control over carrying out of necessary measures; introduction of substantive changes in mechanism their implementation.

Also decision on investment program implementation requires performing calculation and analysis of investment effectiveness indicators that are carried out within the frames of project analysis. [10]. Calculation process and comparison between necessary sum of expenses and results of implementation of projects form the basis of effectiveness assessment of implementation of projects. However, effectiveness of investment activity may be expressed not only by economic indicators but social budgetary and ecological ones too.

Thus, if effectiveness indicators are fulfilled so conclusion about implementation of methodological approach should be drawn. If the project is ineffective then revision of value concept elements is in place.

3. Results

As stated previously, the customer is not interested in a simple house-buying; he is interested in buying of housing real estate facility in socially landscaped district. Thus, this articles deals with infrastructure facilities within the frames of urban blocks on the base of Smart City concept. Social infrastructure facilities represent assembly of elements providing conditions for rational human activity in all spheres of public life.

Urban blocks may include condominiums, adjacent territory, built-in and built-on serviced facilities [11], shown in figure 4.

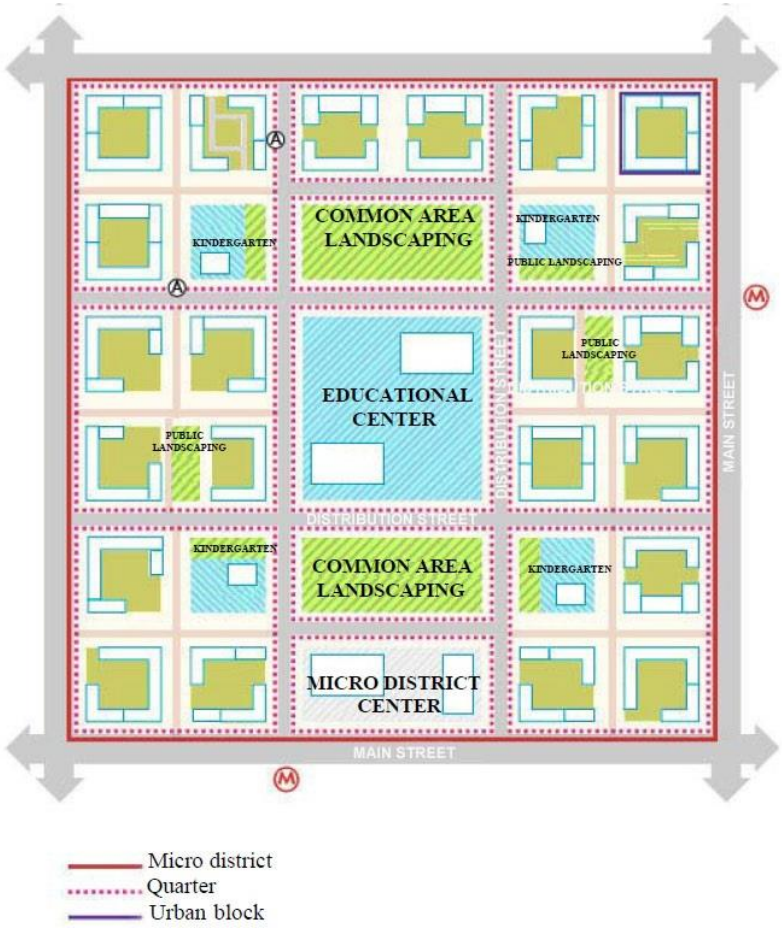

Figure 4. Smart City micro district with use of urban blocks

Urban block territory will be closed to visit by unauthorized personnel. Planning organization of quarters and urban blocks will make possible to construct condominiums with one frontage which is more traditional for the city then non-systematic arranged buildings. According to urban design norms micro district in radius may not be more than 500 m, quarter – over 300 m and urban block – more than 100m. Such norms will provide a guarantee that infrastructure will not move to anywhere from the household. These norms suggest more rational planning of driveways that makes possible to create parking places and to avoid non-systematic parking in the yards. [12-15].

Since this article proposes not simply creation of Smart City but some closed housing system, this format of which will provide majority of basic social functions – urban blocks including social infrastructure facilities so this model will be achieved by more detailed study of internal social infrastructure.

Within the frames of value concept according to aforesaid algorithm of practical implementation of methodological approach within the frames of Smart City so factor space presented by following competitive factors (figure 5) was formed according to the results of first two stages:

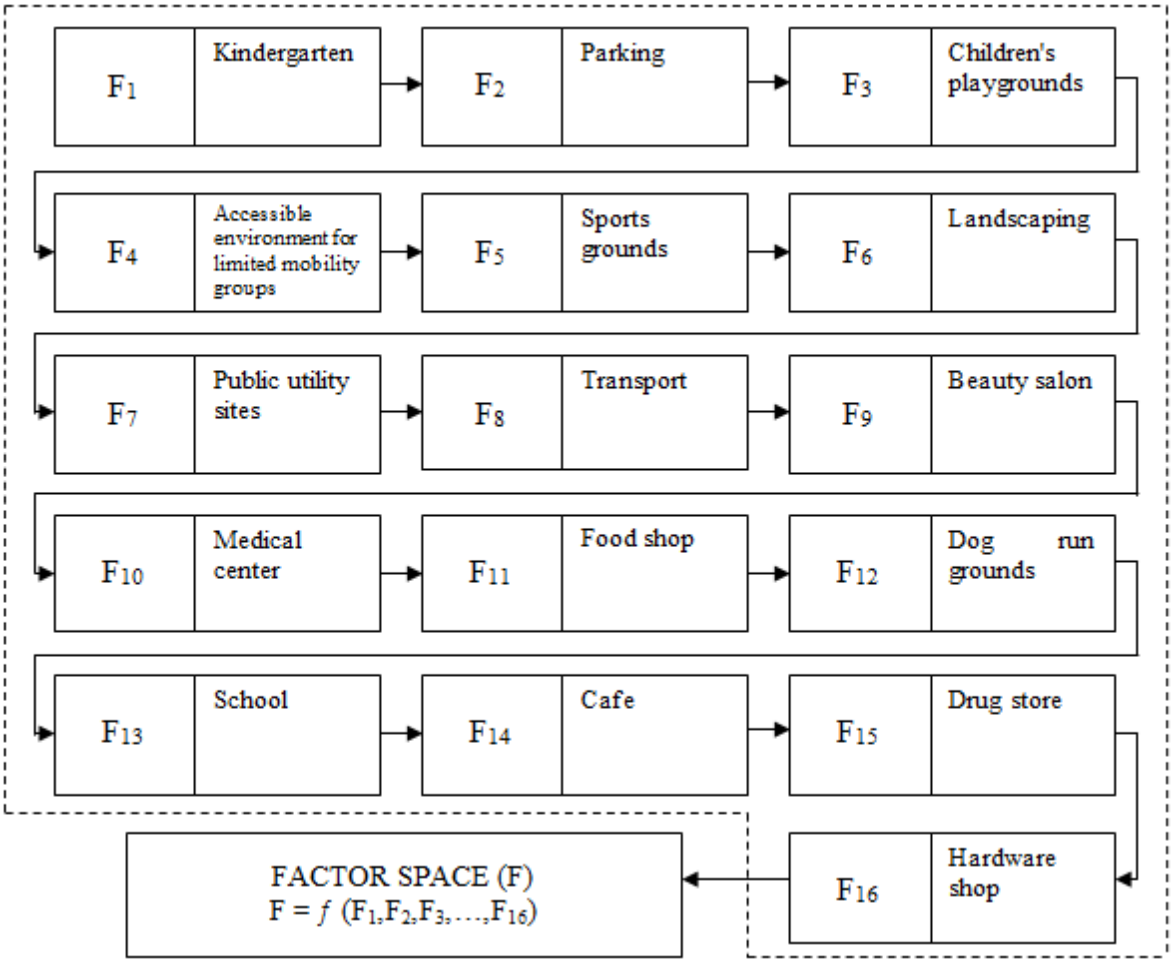

Figure 5. Factor space

In considering of Smart City construction by real estate facilities with in advance indicated social infrastructure facilities we get following strategic canvas shown in figure 6.

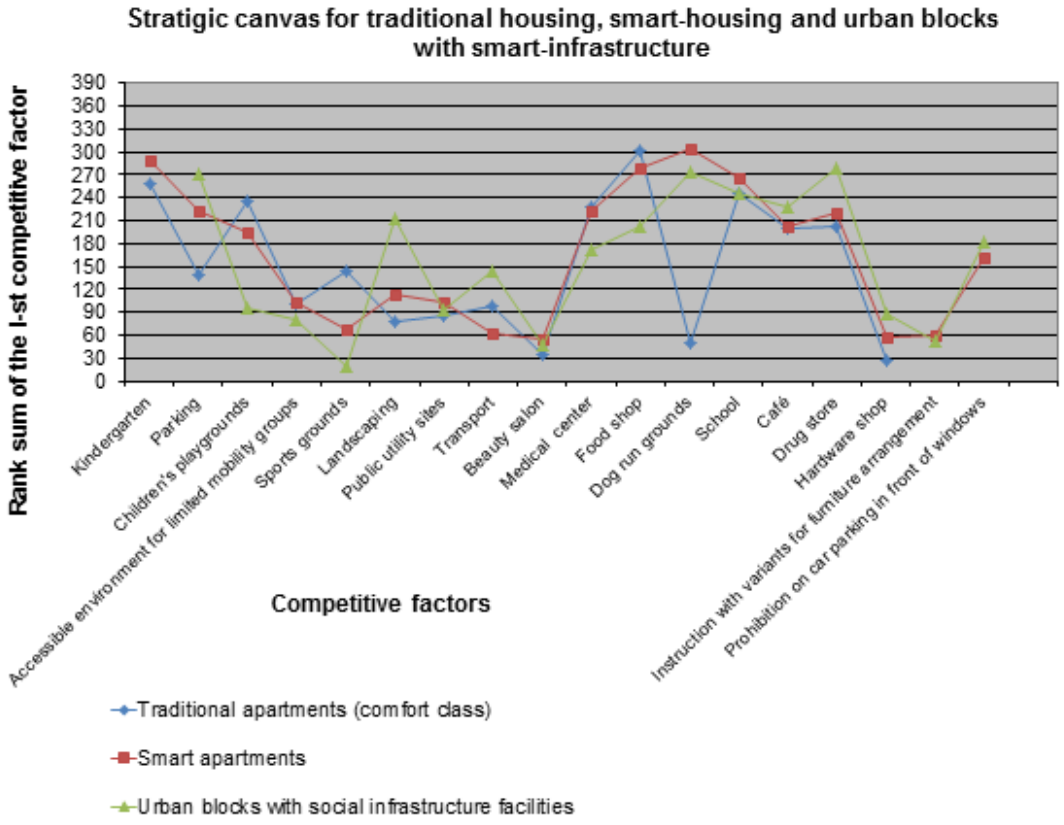

Figure 6. Strategic canvas for traditional housing, smart-housing and Smart City presented by urban blocks with smart-infrastructure

Conclusion should be drawn as per value curve that most optimal one from three proposed variants of real estate facilities according to value of competitive factors is the variant of urban blocks with social infrastructure facilities because of that fact that more than half of competitive factors showed maximum values of valuableness as compared to other housing classes.

After analysis of strategic canvas, it is proposed to consider model of four actions that means that the company needs to make a very careful examination of each competitive factor. Thus, the company should understand which competitive factors should be invested more and which should be invested less, which factors should be denied as well as which factors should be created [16-18].

After creation of this model it is necessary to calculate effectiveness of implementation of construction projects for social infrastructure development that should respect the interests of main participants of investment and construction process: city, citizen and developers. Such investment effectiveness indicators include, for example, ecological, commercial, social and budgetary effectiveness, company charges, as well as quantity of order of company being under consideration.

Let's create an economic and mathematical model for determination of project effectiveness and isolate key entire functions which determine effectiveness from implementation of investment and construction project (2).

$$\mathrm{Ef} = \mathrm{f}(\mathrm{Ec}, \mathrm{E}, \mathrm{B}, \mathrm{C}, \mathrm{S}, \mathrm{Ex}, \mathrm{NO}) = \begin{cases} \mathrm{NPV} \rightarrow \max \\ \mathrm{IRR} \rightarrow \max \\ \mathrm{PI} \geq 1 \\ \mathrm{PP} \rightarrow \min \end{cases} + \begin{cases} \text{Environmental effectiveness (E)} \rightarrow \max \\ \text{Budgetary effectiveness (B)} \rightarrow \max \\ \text{Commercial effectiveness (C)} \rightarrow \max \\ \text{Social effectiveness (S)} \rightarrow \max \\ \text{Company's expenses (Ex)} \rightarrow \min \\ \text{Number of orders (NO)} \rightarrow \max \end{cases} \quad (2)$$

where Ef – effectiveness from implementation of investment and construction project,

Ec – economical effectiveness, provided by set of parameters such as net present value (NPV), internal rate of return (IRR), profitability index (PI), payback period (PP).

Essence of this economic and mathematical model is to highlight which effectiveness indicators will give optimal results with consideration of social and other circumstances and to determine effectiveness from implementation of investment and construction project.

4. Conclusions

Acquiring and maintaining of positions of construction sector companies on the world market in the long-term make necessary to implement definite logics during implementation of Smart Cities projects. Exactly this caused by steady rising interest for creation of new approaches to control over investment and construction projects being as most effective set of instruments forming strategic competitive advantage. It is necessary to consider condition of social infrastructure expressed by social and economic effectiveness determined by consumer attractiveness of real estate facility for the customers. With development of Smart Cities major trends of development of social facilities can be determined on the base of certain norms of urban blocks and planning of measures is carried out in the long-term during creation of social infrastructure facilities.

Thus, providing of effectiveness of investment activities of construction sector companies stipulated by long term competitiveness is possible by means of implementation of value concept in investment construction activity, creation and use of which will provide not only improvement of competitiveness of construction sector companies but will increase investment attractiveness of realized projects as well as will facilitate implementation of social and economic effectiveness.

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