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Assessment of the Main Indicators' Relationship of Projects of Information and Communication Services' Development

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ABSTRACT

The relevance of research: The relevance of the problem studied is caused by the acceleration of transition of the Russian economy on an innovative way of development, which depends on the vector of innovative sphere of services and, to a large extent, information and communication services, as well as it is caused by the poor drafting of methodical approaches to the effectiveness's evaluation of the processes of information and communication services' commercialization. Purpose of the study: The purpose of the study is to develop a methodic to assess the relationship of basic indicators of projects of information and communication services' development. Methods of the study: The basic methods of research are methods of stochastic factor analysis, method of pair correlation, multiple correlation analysis, matrix models and mathematical modeling. Results of the study: Based on the analysis of traditional methodic for assessing of the cost-effectiveness of projects of information and communication systems' development the paper offers combined method to estimate the dependencies of financial indicators' basic parameters of projects on long-term development of mobile operators in providing of information and communication services. Practical significance: The paper is intended for researchers, teachers and undergraduates studying the problems to assess the effectiveness of the projects' commercialization in the service sector, particularly, in the development of information and communication services, as well as for specialists - mobile operators, engaged in the problems of development projects' investment and implementation.

KEYWORDS
Economic effectiveness evaluation, information and communication services, long-term development projects, correlation, forecasts of implementation

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Introduction

The democratization process of the national economy becomes the impetus to activate de-monopolization of the communications' sphere and to form the market of information and communication services (Vasil'ev & Kuzovkova, 2005; Vasil'ev & Salyutina, 2005). Innovative projects on the market of information and communication services because of their relatively high capital intensity are available only to large companies, capable of providing the necessary volume of investment flows at all stages of the innovation project's implementation (Vasil'ev, 2006).

Increasing in the result of it the requirements for the quality of information and communication services, while maintaining a competitive price (Razumnikov 2013) leads to the urgent need to intensify innovative development, to implement perspective and long-term innovation projects (Rebrikova 2012).

In this regard, the problems of substantiation of economic feasibility (Vorontsov, 2008), adequate and qualitative assessment of the effectiveness of innovative projects' commercialization stage (Mandel, 2008) in the market of information and communication services on the basis of mathematical modeling techniques (Kudryavtsev, 2004) are of particular importance both for the companies and consumers of these services (Kalachanov, 2006), which manifests itself in maintaining a competitive level of accessibility of these services for the population, the shortest payback periods of innovative project and ensuring of the necessary level of earnings to shareholders on investments (Skripkin, 2002).

Methodological Framework

Research Objectives

Objectives of the study are to justify methodically the assessment of the main indicators' relationship of projects on information and communication services' development of the fourth generation, including:

— data extensive statistical analysis to build an economical - mathematical model to evaluate the main indicators' relationship of projects on information and communication services' development;

— formation of the coefficient matrix of pair correlations of economic indicators of innovative projects' implementation;

— formation of the cluster analysis dendrogram of coefficient matrix of pair correlations of the main financial parameters of the project;

— based on the construction of the economic and mathematical model of main parameters' dependencies of the projects to provide information and communication services to prove the effect of latent factors' influence on parameters of innovation projects on information and communication services' development, which would allow to identify the closest correlations between the project's parameters and predict its successful implementation.

Results

Based on extensive statistical analysis the coefficient matrix of pair correlations of typical financial parameters of innovative projects in the field of information and communication services is formed

The results of calculations shown in the matrix of pairwise correlations reveal closeness of the relationship between the following parameters of the project:

— the value of the net profit (loss) of the project has a close positive correlation with the value of the proceeds (0.98), with the value of the gross profit (loss) (0.99) with the value of the operating profit (loss) (0.99), with the free cash flow (0.91), with discounted cash flow (0.90);

— the value of the net profit (loss) of the project has a close negative correlation with other taxes (- 0.91), operating expenses (- 0.91), with depreciation (- 0.90), with the value of the income tax rate (- 0.93).

The remaining coefficients of pair correlations have little or no value for the project's implementation. It would seem that the picture is clear. However, further studies have shown that it is not so.

Formed dendrogram of cluster analysis of pair correlations' coefficient matrix of the project's main financial parameters

Analysis of mass service's projects, one of which is the project of long-term development of the mobile operator to provide information and communication services (Vasil'ev & Kuzovkova, 2005) shows that the number of objects analyzed can reach many tens and hundreds, and the number of features can also be tens. Obviously, direct (visual) analysis of the data matrix with a large number of objects and features is practically ineffective since we can only identify the individual characteristics of the studied structure and extract illustrative specific examples (Razumnikov 2013). In this connection, there are objectives to integrate, concentrate the original data or to construct generalized characteristics of a plurality of attributes and a set of objects. These tasks' solution can be carried out with the help of modern methods of multivariate statistical analysis (Skripkin, 2002).

Methods focused on the analysis of the structure of the set of features and on the identification of generalized factors are known as the methods of factor analysis, and methods of the structure analysis of a set of objects form a set of methods of multivariate classification. The latter allows to group objects taking into account all the essential structural and typological characteristics and the nature of the distribution of objects in a given system of features. Such classification is performed to accumulate in the same group similar objects, and in such way that the objects of the different groups would be dissimilar by features, and this is the purpose of the cluster analysis (Mandel, 2008).

Thus, a hierarchical cluster analysis method includes the n - 1 similar steps. At the same time, after each step, the number of clusters is reduced by one, and the distance matrix is reduced by one row and one column. At the end of this procedure will be one cluster that combines all n objects. Results of such classifications are often depicted as a dendrogram (hierarchical structure tree) comprising n levels, each of which corresponds to one of the process steps described of clusters sequential enlargement. The dendrogram of the project is presented in Fig. 1.

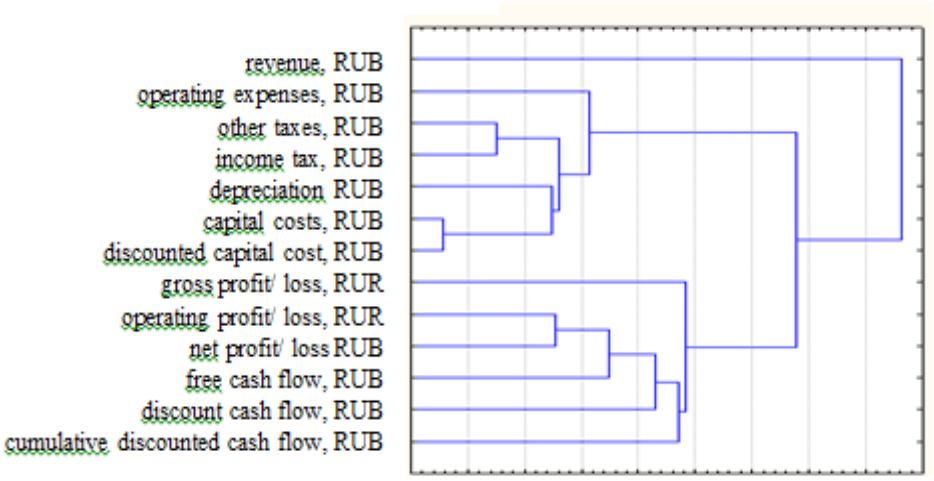

Figure 1. The dendrogram of cluster analysis of coefficients matrix of pair correlations of the project's main financial parameters

Analyzing the scores obtained on several scales of dendrogram, it can be noted that they are similar with each other and have a high correlation coefficient. In this connection, it can be assumed that there is a latent variable, which can be used to explain the observed similarity of the estimates.

Revealed latent variables that significantly affect many parameters of development projects

Analyzing the interference of the main parameters of the financial indicators of the project, we used the methods of stochastic factor analysis, which is a methodic for the study of factors, whose connection with the performance indicators as opposed to functional one is incomplete, probabilistic (correlation). If during the functional (full) dependence with the argument's change there is always a corresponding change in the function, then during the correlation the argument's change can give some function gain values depending on the combination of other factors that determine this indicator (Kalachanov, 2006).

Therefore, when assessing the relationship of basic indicators of projects of information and communication service's development of the fourth-generation such methods of stochastic factor analysis were used as a method of pair correlation, multiple correlation analysis, matrix models and mathematical modeling. In addition, we took into account both static and dynamic parameters of the factor analysis, which involve not only the study of the factors' influence on performance indicators for the relevant date, but the method of study of causality in the dynamics (Kudryavtsev, 2004). Furthermore, there was an attempt of factor analysis in retrospect, which studied the causes of growth of productive indicators for previous periods, as well as in the long term, which explores the predictions of factors' and performance indicators' behavior (Rebrikova 2012).

Table 2. Results of the stochastic factor analysis of basic parameters' dependencies of the financial indicators of the project of information and communication services' development

Variables	Factor № 1	Factor № 2
Revenue, mln. Rubles	-0,855644	-0,507458
Operating expenses, mln. Rubles	0,766228	0,615448
Other taxes, mln. Rubles	0,738185	0,638931
Gross profit, mln. Rubles	-0,873310	-0,477299
Depreciation, mln. Rubles	0,691805	0,699968
Operating profit / loss mln. Rubles	-0,904371	-0,409033
Income tax, mln. Rubles	0,836980	0,508056
Net profit, mln. Rubles	-0,902635	-0,399362
Capital expenditures, mln. Rubles	0,172190	0,975493
Free cash flow, mln. Rubles	-0,853362	-0,432118
Discount cash flow, mln. Rubles	-0,979475	-0,049023
Discounted Cap. costs, mln. rubles	0,178435	0,973153
Accumulative discount. cash flow million. r.	-0,926684	0,035117
The total variance	8,047065	4,436188
The proportion of the total variance	0,619005	0,341245

Stochastic analysis shows the presence of two latent factors, which shows the weight of each parameter in each of the factors. The adequacy of the developed model can be indicated by the parameters of the total variance, the value of which fluctuates within the acceptable framework for each factor, and is 8.047065 and 4.436188, respectively. Thus significant coefficients are marked in red.

The *latent factors' influence on parameters of projects of information and communication services' development is proven*

Conducted factor analysis allowed from the number of factors to make smaller number (from 5 left 2). These factors are latent, that is hidden, and haven't names, but each of them contains the initial weight fraction of original component (Vorontsov, 2008). For example, by red color the significant components inside the factor is allocated, those with a "+" mean that a latent factor's growth is conditioned by their growth, while those with a "-" mean that the latent factor's growth is conditioned by their reduction.

So, №1 factor reflects the significance of the current costly variables of the analyzed project, among which there are the operating expenses (0.766228), income tax (0.836980) and other taxes (0.738185). In its turn, factor №2 reflects the significance of the capital cost variables of the analyzed project. For example, depreciation impact is not significant in any of the factors that can be attributed to the fact that depreciation principally has little effect on the financial performance of the project, i.e. its effect is completely extinguished by other components.

These values of latent factors reveal the relationship between the dynamic changes in the financial indicators in the process of commercialization of the project of information and communication services' development.

The following graph shows the dependence of variables - financial indicators of the project's implementation - in their dynamic state.

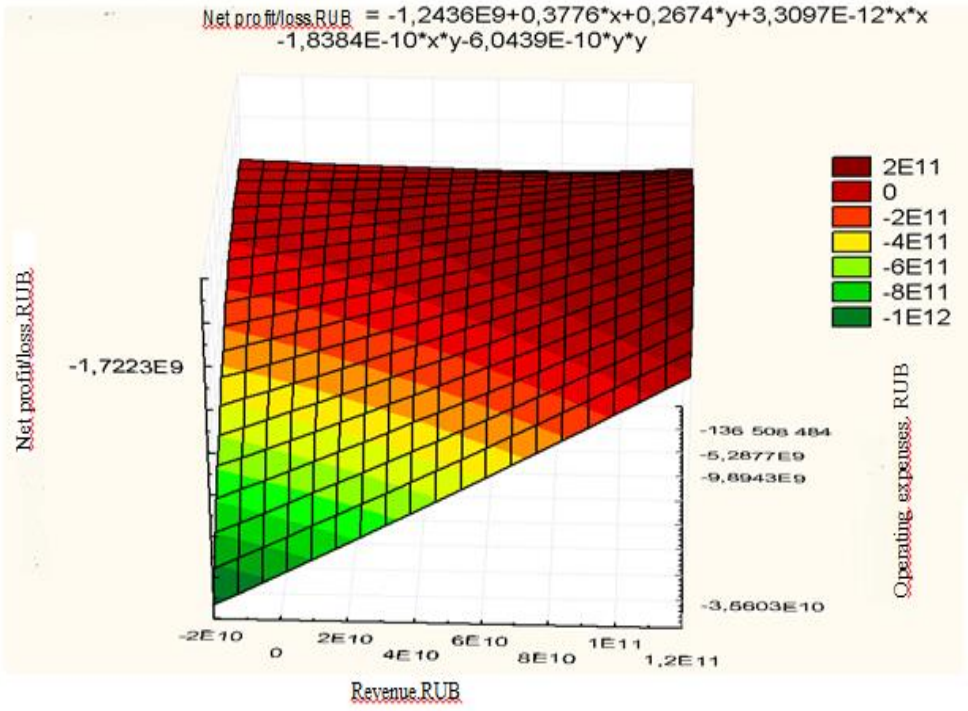

Figure 2. The values' dependence of the indicator "Net profit/loss" on indicators "Revenue" and "Operating expenses"

It should be noted that for each of the dependencies shown in the illustrations, dependencies are obtained by the method of the least squares, and the resulting equations are shown above the corresponding figure, there are indicated the variables "x" and "y". Variables' values are large enough and are estimated in the billions, so the standard mathematical model with a floating-point is used(Vasil'ev & Salyutina, 2005).

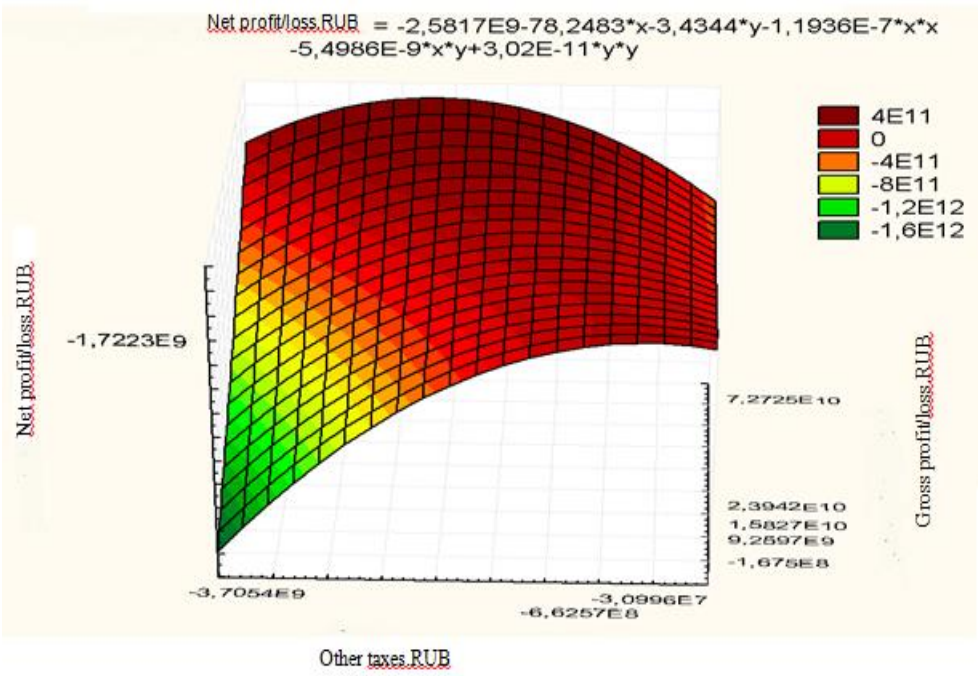

Figure 3. The values' dependencies of the indicator "Net profit/loss" on indicators of "Other taxes" and "Gross profit"

So, the seemingly obvious relationship between the net profit, the revenue and the operating expenses, in the graphical image is not as clear as it is shown in Fig.2 For example, the maximum income or net profit from commercialization of the project, expressed as "2E11", can be obtained only under the condition that the revenue reaches the value "1,2E11", and the parameters of the operating expenses will not exceed "-136508484".

In other words, the dependence of the parameters of the net profit may be expressed as:

$$-1243600000+0,3776*x+0,2674*y$$
$$+3,3097*10-12*x*x-1,838*10-10*x*y$$
$$-6,04*10-10*y*y$$

reflecting all parameters according to its value from two main variables.

As in the previous case, the seemingly obvious relationship between the net profit, the gross profit and other taxes, at the graphical image is not so obvious, as it is shown in Fig. 3. For example, the maximum amount of the net profit from commercialization of the project, expressed as "-1,7223E9", can be obtained only under the condition that the gross profit reaches the value "7,2725E10".

So, it is clear that the higher the level of depreciation and operating profit, the higher the value of the net profits of the commercialization of the project. However, with parameters affecting the variable "other taxes" on the value of the net profit the situation is not so clear. One cannot argue that the maximum or minimum value of other taxes, will lead to adequate growth or decline of net

income from the commercialization of the project. According to the calculations conducted, this value should be between "-3705400000" and "-30996000" approximately equal to "-66257000". The maximum value of the net profit, expressed as "8E10" can be achieved if the magnitude of the depreciation will reach also the maximum value of "-4,1553E9" and the value of the operating profit will be at level "5,0344E10".

The same situations take place and with other seemingly obvious connections. It is not obvious that the maximum value of parameters of the net profit presented as "2,5E11" can be achieved at the minimum values of the capital cost's parameters, represented as "-1,9686E10". However, the dynamics of this interdependence is far from clear.

In other words, their dependence is not linear that allows us to speak about a certain trajectory of this relationship, which should be considered in commercialization of innovative projects in the field of information and communication services and the information economy as a whole (Vasil'ev, 2006).

Discussion

To the problems of formation of methodology and tools for monitoring of the processes of Informatization and development of information economy in the whole the works of V.V. Vasil'ev & T.A. Kuzovkova (2005), V.V. Vasil'ev & T.Y. Salyutina (2005) are devoted.

To the study of the category "product" in the field of information and communication services, to the development of organizational and methodical support directly of the process of "packaging" of information and communication services as the basis and prerequisite for the development of innovative projects the works of N.V. Rebrikova (2012) are dedicated.

Peculiarities of the application of structural-typological features and their classification in different sectors of the economy are investigated in the works of I.D. Mandel (2008), E.M. Kudryavtseva (2004).

Economic efficiency of functioning of the information systems considered in the works of K.G. Skripkin (2002).

To the development of methodical approaches to the study of the effectiveness of information system's projects and to their implementation works of Y.A. Vorontsov (2008), V.D. Kalachanov (2006), S.V. Razumnikov (2013) are dedicated.

However, many questions concerning the assessment of economic efficiency directly in the processes of commercialization of innovations in the market of information and communication services remains poorly understood, as evidenced by the still low pace of introduction of innovative technologies.

Conclusion

The presented methodic of evaluation of the main parameters' dependencies of the financial indicators of the project of ICT services' development reflects a fairly complex system and trajectory of dependence. All this greatly extends the use of methodical approaches to the evaluating of the effectiveness of commercialization of innovations in the market of informational-communication services in the implementation of managerial decisions and

investment policy for the provision of information and communication services. This will allow revealing the real dependence between the parameters of projects and predicting their success.

Recommendations

The obtained results allow expanding of the methodological basis of the service economy, the tools for evaluating of the effectiveness of commercialization of innovations in the market of informational-communication services. In addition, the obtained results can be useful to public administrations in the field of information in making managerial decisions in sphere of investment policy and to specialist of huge operators of communication to assess the projects' effectiveness of innovations' commercialization in the market of information and communication services.

Disclosure statement

No potential conflict of interest was reported by the authors.

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