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Efficiency Analysis and Productivity of Socioeconomic Activities of the Municipal Museums on the Basis of Factorial Communications

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ABSTRACT

The urgency of the problem under investigation due to the fact that in most municipal districts with a deficit of financial and other resources are troubled almost all areas of museum activity. The article focused on the study of factor socioeconomic relations of municipal museums. The leading method to the study of this problem is the correlation and regression analysis, allowing to identify the linkages in the form of statistical regularities. On the basis of the study concluded that the indicators of social efficiency of municipal museums play the most prominent role in shaping the performance of museum activities in the municipalities of the Samara region. Article Submissions may be useful in the development of programs for socio-economic development of regions.

KEYWORDS
Econometric methods, efficiency, socioeconomic activities, the municipal museum, communication factor

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Introduction

The main feature of the XXI century museums is their versatility. Today the museum is the difficult multilevel system solving a number of socially significant problems among which more prominent position takes art leisure, integration of cognitive and moral and patriotic activity.

Museums play an important role in the modern world, not only in meeting the cultural needs of the people and as a place of leisure - and they also act as a driving force of social and economic development of the area, the revitalization of the related industries (tourism, hospitality), which creates a definite multiplier

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effect and increases the investment appeal of the place, which houses one or another museum institution (Throsby, 2013).

In assessing the effectiveness of municipal museums is necessary to apply a multilateral approach to the issue of innovative forms of cooperation between the historical and cultural heritage and socio-economic policy in the region. Methodological aspects of this approach are discussed in a number of papers (Gordin, Lanygin & Horev, 2012; Dorzhieva & Bairova, 2009; Ignatieva, 2007; Esakov, 2007; Ashmarina & Khasaev, 2015 and others.). However, the phenomena and processes of the regional economy and the social sphere are rather known only in the case, along with substantial analysis of their essence manages to quantify their usual objective laws and relationships. Attempts to complex application apparatus of statistical and sociological analysis to the study of the factors that determine the development process cultural sphere, have been made relatively recently (Volkova, 2013; Rubinstein, 2012; Smirnov, 2005). Studies of this kind are few. In our work we focus on the construction of econometric models for assessing the problems and prospects of municipal museums development in the Samara region, and to identify priority areas for improvement of museum institutions on the basis of a survey of students of educational institutions of higher and secondary vocational education of the Samara region - potential and actual visitors to the museum of municipal areas between the ages of 14 to 25 years (the study sample - 1,100) (Huang et al., 2015).

Materials and Methods

Experimental research base

One of the most important aspects of the mathematical and statistical tools application to assess the problems and prospects of municipal museums development in the Samara region - the linkages in the form of statistical regularities.

Features of district museums are such that the relationship between the information and cultural, socioeconomic and patriotic can be studied using the theory of allowing these relationships and communication to identify and quantify. As the object of the museum activities simulation efficiency in the areas of the Samara region we consider complex partial indicators, which in their interaction give a certain impetus to the development of museums:

Y1 – the number of museum visitors (thous. people.);

Y2 – share of excursion visits by persons under the age of 18 years (% of the total number of the museum visitors);

Y3 – income from statutory and business activities based on sq.m of the exhibition space (thous. rub.).

The specifics of the simulation object is determined not only by the composition of dependent variables, but also a set of factors defining them. As a result, the logical considering a wide range of symptoms of factor produced the following composition factors, the arguments most closely associated with the simulated values:

X1 - the population of the service area (thou. pers.);

X2 - the number of exhibitions (units.);

X3 - the number of events the museum (units.);

X4 - the number of educational programs (units.);

X5 - income (thous. rub. / specialist);

X6 - the number of experts (pers.);

X7 - exhibition space (sq.m);

X8 - the average salary of a museum employee (rub. / month.).

Construction methods of multivariate regression models

As part of the methods of construction of multi-factor regression models should allocate two directions.

The algorithm of the first approach is the multi-step analysis, each iteration of the model which includes a new, optional factor argument checked the significance of each regression coefficient by Student t-test and the convergence of the mark for each factor multiple regression equation with the sign of the correlation coefficient pair. Construction of the model begins with a consideration of the factor argument is most closely associated with the dependent variable, and ends, moreover, provided that the resulting model is adequate (the estimated value of F-test is greater than the table).

Another approach consists in a detailed analysis of the pairwise correlation coefficients matrix between the dependent variable and all considered factors, arguments and detection of collinear (interrelated) factors, one of which should be excluded from the factors. The idea of a multi-step analysis is calculated in a number of iterations, during which the consistent inclusion of all the selected models using theoretical analysis of factors and evaluation at each step of the calculation steps significant impacts on the performance of all the factors taken into account and the model of convergence results. The factors were insignificant and do not contribute to improving the convergence between the calculated and actual values of resultant variable omitted and replaced with new (Grabs et al., 2015).

To analyze the relations factor we chose this approach.

Stages of research

The most significant impact on the number of visitors to the museum have indicators related to the social efficiency of municipal museums, as well as their production efficiency: the number of events the museum (X3), the number of educational programs (X4), the number of experts (X6), exhibition space (X7). However, on a productive sign, according to the matrix of pairwise correlation coefficients, primarily affects the number of events held by museums (ry1x3= 0,956683) (Elhorst, Lacombe & Piras, 2012).

Pair regression equation between the main indicator of museum activity and factor variable X3 is given by:

$$Y_1 = 4995{,}762 + 31{,}492\,X_3 \qquad (1)$$

ie, with an increase in the number of events by 1 unit the number of museum visitors increased by 31 people.

The peculiarity of the functioning of modern municipal museums is not only to use the local history museum in the educational and developmental purposes,

but also as a reference base of spiritual, moral and intellectual development of children and youth.

The greatest influence on the share of excursion visits to the municipal museums of Samara Region by persons aged under 18 years has a demographic factor: the population of the service area (ry2x1=0,629317).

Pair regression equation between the main indicator of museum activity and factor variable X1 is given by:

$$Y_2 = 41{,}207 + 0{,}025X_1 \quad (2)$$

This dependence means that with the increase of population per 1 thousand. People, the percentage of visits to museums Samara region youth will increase by 0,025%.

An important characteristic of the efficiency of the municipal museums is an indicator such as income from statutory and business activities. According to the matrix of pairwise correlation coefficients for this indicator primarily affects factorial trait characterizing the income attributable to a specialist (X5) (r_{y3x5}=0,767145).

Interconnection regional levels of income from statutory and business activities based on m ^{2} of exhibition area with the index of income attributable to one expert summarized the regression equation:

$$Y_3 = 21{,}82817 + 0{,}8014X_5 \quad (3)$$

This dependence means that with an increase in revenue per professional per 1 ths. Rub. Museum of income will increase by an average of 801 rubles.

Analysis of paired connections between each individual performance indicators and one of its determinants are not always effective, because the value of the pair correlation coefficient characterizes not only the measure of a causal relationship, but also the degree of concomitant signs of a massive process. In this connection it is necessary to assess the role of the interaction of factors, based on a multi-step regression analysis.

Built multifactor regression model

$$y \approx a_0 + a_1x_1 + a_2x_2 + a_3x_3 + \ldots + a_px_p \quad (4)$$

makes it possible to carry out more in-depth quantitative and qualitative analysis of the relationship of economic indicators examined.

The parameters of the regression equation to show how much the average score varies with increasing signs in the appropriate factor variable X by one of his measurements, provided that the other factor attributes are not changed.

As a result of the multi-step regression analysis, multiple regression equation territorial levels of attendance museums population of the Samara region is characterized by the expression:

$$Y_1 = 4229{,}036 + 28{,}837X_3 + 42{,}078X_4 + 279{,}443X_6 - 5{,}583X_7,$$

options which means that an increase in the number of events on the 1 unit the number of visitors to the museum will increase by an average of 29 people; with an increasing number of educational programs on 1 unit is an increase in the number of visitors to 42 people; increasing the number of specialists for 1 person also increases museum visits on average 279 per year; and finally,

increasing the exhibition area of 1 sq. m. the number of visitors decreases by an average of 6 people.

All regression coefficients are significant by Student's test. Multiple correlation coefficient R was 0.992, the square of this value means that the variation of resultant variable by an average of 98% is explained by the variation factor variables included in the model.

We will find elasticity coefficients:

$$Э_i = a_i \cdot \frac{\overline{x_i}}{\overline{y}}, \qquad (5)$$

where ai – regression coefficients;

$\overline{x_i}$ - average value of a sign Xi.

$$Э_3 = 28{,}837 \cdot \frac{51{,}286}{8457{,}143} = 0{,}174\,,\ Э_4 = 42{,}078 \cdot \frac{4{,}429}{8457{,}143} = 0{,}022$$

$$Э_6 = 279{,}443 \cdot \frac{4{,}286}{8457{,}143} = 0{,}142\,,\ Э_7 = -5{,}583 \cdot \frac{252{,}571}{8457{,}143} = -0{,}167$$

Thus, with an increase of 1% in the number of public events and educational programs conducted by the museums of the Samara region, and number of specialists the number of visitors increased by an average of 0.174% to 0.022% and 0.142%, respectively. Finally, the number of museum visitors will decrease on average 0.167%. with the growth of the exhibition area.

The coefficients of the regression equation in natural scale are not comparable with each other because of differences in the scale measure factors-arguments. They use the original role of standards in the assessment of the effectiveness of the adoption of certain management decisions and are quite acceptable in the development of socio-economic development and in the implementation of short-term and long-term forecasts.

β - coefficients have a single standardized scale, so we form the regression equation in a standardized scale:

$$y \approx \beta_3 x_3 + \beta_4 x_4 + \beta_6 x_6 + \beta_7 x_7;\ \beta_i = a_i \frac{\sigma_{x_i}}{\sigma_y}, \qquad (6)$$

where σ_{x_i} - average quadratic deviation of a sign Xi;

σ_y - average quadratic deviation of a sign Y.

$$\beta_3 = 28{,}83\frac{87}{5433} = 0{,}489;\ \beta_4 = 42{,}078\frac{3{,}44}{5133} = 0{,}028;$$

$$\beta_6 = 279{,}433\frac{1{,}29}{5133} = 0{,}07;\ \beta_7 = -5{,}583\frac{143{,}98}{5133} = -0{,}157$$

$$y_1 \approx 0{,}489x_3 + 0{,}028x_4 + 0{,}07x_6 - 0{,}157x_7$$

Comparing the β - coefficients in absolute value, we conclude that the greatest impact on the number of visitors to the municipal museums of the Samara region has a factor X3 (number of events), then the X7 (exhibition area) and X6 (number of experts), and the least affected by X4 (number of education programs). This coincides with the conclusions of the coefficient of elasticity.

The leading role of museums attendance is determined not only by the fact that attendance has a direct component of the effectiveness of municipal museums, but also by the fact that another of its components - the share of excursion visits by persons under the age of 18 years is one of the strongholds of spiritual and moral development, and patriotic education of children and youth.

The model of visits to museums' excursion by young people has high coefficient of multiple correlation R=0,983.

$$Y_2 = 87{,}744 + 0{,}032X_1 + 0{,}06X_2 + 0{,}02X_4 + 0{,}46X_6, \quad (7)$$

where Y2 – the share of excursion visits to persons under the age of 18 years (% of total number of visitors to the museum);

X1 - the population of the service area (thou. pers.);

X2 - the number of exhibitions (units.);

X4 - the number of educational programs (units.);

X6 - the number of experts (pers.).

The variation of resultant variable to 96,7% is influenced by four factors included in the model.

In contrast to the above model is among the factors, the arguments present demographic factor.

The resulting model parameters indicate that with the increase of population per 1 thousand. people., the number of exhibitions on the 1 unit., the number of educational programs at 1 unit., and number of specialists per 1 person - the percentage of visits to museums Samara region youth will increase by 0,032%, 0,06%, 0,02% and 0,46% respectively.

The third model describes the Income from statutory and entrepreneurship. It includes four factors:

$$Y_3 = -1905{,}45 + 1{,}796X_2 + 1{,}123X_5 + 0{,}172X_7 + 0{,}241X_8. \quad (8)$$

where Y 3 - the income from statutory and business activities based on m 2 of exhibition area (thous..);

X2 - the number of exhibitions (units.);

X5 - income (thous. rub. / specialist);

X7 - exhibition space (sq.m);

X8 - the average salary of a museum employee (rub. / month.).

The analysis showed that income from statutory and entrepreneurship will increase by 1,796 rubles by increasing the number of exhibitions 1 unit; with an increase in revenue per specialist per 1 thousand. rub. museum of income will increase by an average of 1,123 rubles.; by increasing the display area per 1 sq.m. of the museum income will increase by 172 rubles, while increasing the

average wage employees of the museum for 1 thousand. rub. revenue increase by 241 rubles.

Multiple correlation coefficient R = 0,976, the total coefficient of determination shows that the variation of resultant variable by an average of 95,3% is explained by the variation factor variables included in the model. The income from the statutory and business activities more elastic with respect to income attributable to one expert. The growth of this factor variable by 1% leads to an increase in the effective sign of 19,022%.

With β-coefficients evaluate the priority of factors, arguments on a productive sign of the effectiveness of constructed models of municipal museums in the districts of the Samara region, placing them in the following order:

Model 1: $\beta_3, \beta_7, \beta_6, \beta_4$.

Model 2: $\beta_1, \beta_2, \beta_4, \beta_6$.

Model 3: $\beta_5, \beta_7, \beta_2, \beta_8$.

Target orientation of the museum audience based on survey method

During the research task was to determine the factors that contribute to attracting young people to visit the municipal museums (Figure 1).

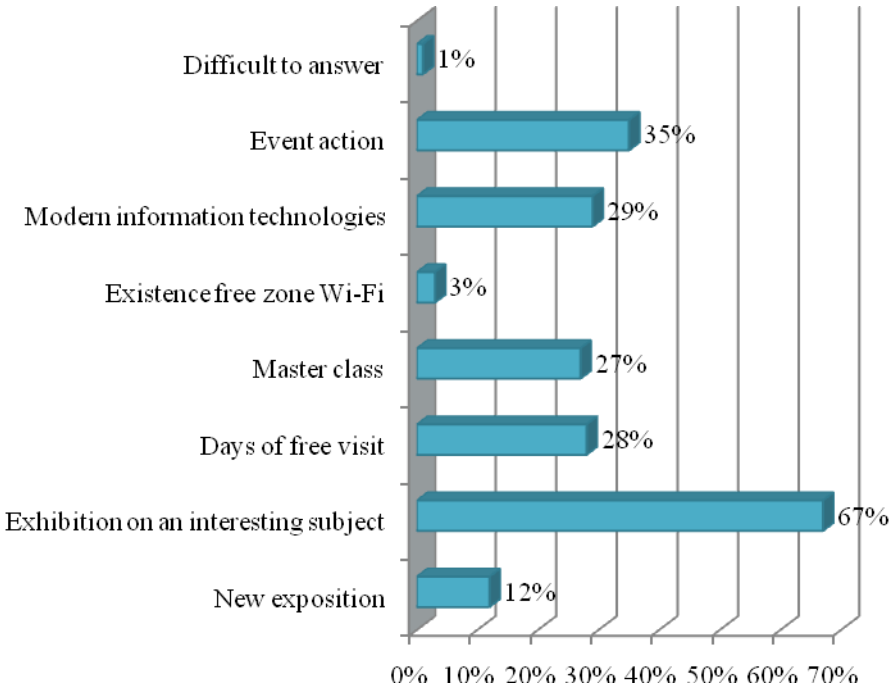

Figure 1. Factors contributing to the attraction of visiting the municipal museums (multiple answers, in% of respondents)*
*According to the results of a poll conducted by the Samara students aged 17-25 years.

More than half (67%) of respondents indicated potential visitors as such factors exhibit an interesting topic for them.

Comparing the responses of young respondents to the question, what could attract them to visit the museum in the province, we can conclude that the interest in traditional crafts is large enough. This is evidenced by the fact that almost a third of respondents from among attract real visitors to visit the provincial museums workshop.

In addition, as shown by the results of research, and for the real, and the patrons are very important recreational function of museums. They are waiting for the museum vivid impressions, emotional recovery, a festive atmosphere, transfer to another, in comparison with everyday reality. This is evidenced by the preference given to potential visitors in this event-cultural and educational activities, as a festival, fair, folk festivals, meeting with interesting people.

Modern information technology in the museum attracted 29% of respondents. Multimedia - it is not just electronic media, it is a way to interact and museum visitor. With a total load of information society, bright presentation of information about the museum exhibit or theme in the form of copyright installations using multimedia technologies allows you to leave more impressions in the memory of the subject and the overall feeling of a more interested by visiting the museum.

Forecast of successful features

To describe the trends and extrapolations for Museum Development Indicators were used linear models. Prediction using the pair of linear regression can be performed by substituting the values of the explanatory variable in the regression equation obtained (Wong et al., 2016).

In our case, we obtained the regression equation relating the number of museum (thous.) And the number of visitors to the museum events (pcs.):

$$Y_1 = 4995{,}762 + 31{,}492 X_3; \quad (9)$$

share of excursion visits to persons under the age of 18 years (% of total number of visitors to the museum) and the population of the service area (thous.):

$$Y_2 = 41{,}207 + 0{,}025 X_1; \quad (10)$$

income from statutory and business activities based on m 2 of exhibition area (thous..) and revenues (RUR / specialist.):

$$Y_3 = 21{,}82817 + 0{,}8014 X_5. \quad (11)$$

To determine the number of visitors to the museum when the number of events equal $x_0 = 20$ a year is necessary to substitute the value of x_0 into the equation. Forecast visits:

$$Y(20) = 4995{,}762 + 31{,}492 \cdot 20 = 5625{,}602 \text{ thous. people.} \quad (12)$$

To determine the proportion of excursion visits to persons under the age of 18 years when the number of the service area, equal $x_0 = 500{,}0$ thous. people predictive value will be:

$$Y(50,0) = 41,207 + 0,025 \cdot 500,0 = 53,707 \text{ thous. people.} \quad (13)$$

To determine the income from statutory and business activities based on m 2 of exhibition area substitute in the regression equation $x_0 = 10,0$ thousand Roubles (income (thous. Rub. / Specialist).

We obtain Forecast:

$$Y(10,0) = 21,82817 + 0,8014 \cdot 10,0 = 29,84217 \text{ thous. roubles.} \quad (14)$$

Completion of the forecast cannot be implemented automatically. By itself, the forecast - it is only a hypothesis certain enough about the development status of museums in the future. However, it can serve as a guideline for the development of regional development programs and activities to enhance the museum's activities in municipalities.

Results

In general, by results of the carried-out correlation and regression analysis it is possible to draw a conclusion on continuous influence of the factors, characterizing social efficiency, on features of the municipal museums activity of the Samara region. This type of analysis makes it possible to realize the logic of action of the main factors of development of museums, to quantify their impact, to understand what factors and in what proportion, and perhaps should be changed to improve the effectiveness of museums, as well as to assess the problems and prospects of the regional museums development in the Samara region (Polyanskova & Nuykina, 2014).

Discussions

The museum field of activity which was earlier rather not often acting as economic and statistical researches object even more often becomes an object of attention, discussion and studying in recent years.

From the point of view of statistical analysis should be noted that many indicators museum sphere essentially immeasurable because the effect of these parameters only subjectively perceived and can be uniquely expressed in the physical parameters. Therefore, the development of museum activity and effectiveness of the services provided by it can be measured only indirectly through related indicators of the real sector. In this regard, the need for data characterizing the activity of municipal museums, stimulates the activity to develop a fundamentally new statistics.

The key problem of museum activities is limited financial resources allocated from the local budgets museums. The economic crisis is worsening financial support of municipal cultural institutions. Students of educational institutions of higher and secondary vocational education was asked Samara region on how to proceed with the financing of museums due to the difficult economic situation in the country (see Figure 2).

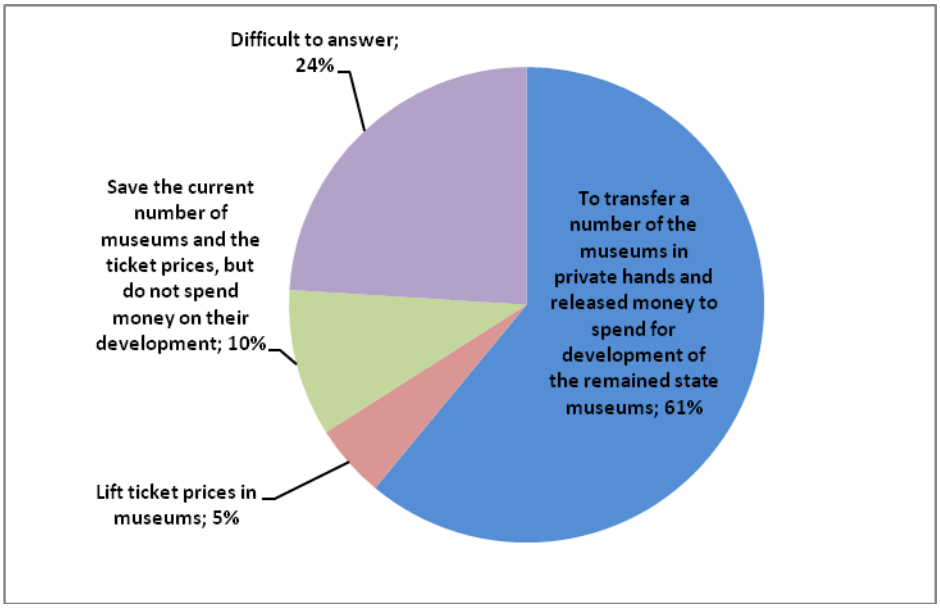

Figure 2. Solving the problem of financing museums (in% of respondents)

According to the results of a sociological study revealed that most young people find it possible to give priority to those or other museums, passing a number of museums in private hands, and release the money to spend on the development of the remaining state-owned museums (61%). The assumption that the younger generation indifferent to the problems of museums, has been refuted. Only one tenth of the respondents said that everything should be left as is, 24% of respondents were undecided.

Activities of municipal museums can be effective if a museum, preserving the specifics, traditions, will keep pace with the times, developing creativity, creativity and originality of its activities, accumulating maximum resources from the external environment, including changing the structure of financial investments in the museum business for borrowed funds.

Our research has practical significance of the results that may have practical importance as a means of information support in the development of socio-economic development of regions. In addition, they can assist municipal administrations in the governance of cultural institutions, be used in the scientific staff of museums, research and training and educational activities in the development and reading courses on the economic history of the Volga and Samara region for students of humanities specialties.

Conclusion

On the basis of the study can be seen that the indicators of social efficiency of municipal museums play the most prominent role in shaping the impact of museum activities in the areas of the Samara region. Despite the positive dynamics of growth in the number of visitors, the quality and quantity of cultural programs should be related to the needs and interests of society (Polyanskova & Sherstobitova 2014). Specifically, the activities of museums should be directed, first, the implementation of the main objectives identified in the framework of state programs, and secondly, to develop economic and

institutional mechanisms for their implementation. In addition, the process of urbanization leads to an outflow of young professionals, aging working population area, which leads to lower employment of citizens, especially in the museum industry (Mihaila, 2014).

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No potential conflict of interest was reported by the authors.

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