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Providing Trade Services to the Population of the Region

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ABSTRACT

Analyzing the details of providing trade services to the population of the region of the service sector, the sequence of choosing and modeling the main factors which influence their development are represented through simulation schemes in this article.

KEYWORDS: *service sector, complex modeling, econometric modeling, differential equations, static and dynamic parameters, structural analysis, synthesis, optimization, multifactorial empirical models, regression equation, correlation coefficient, Darbin-Watson criterion, Fisher and student criteria*

I. INTRODUCTION

The development of digital (information) technologies at the present stage affects almost all spheres of economic activity. The article highlights the results of providing trade services to the population of the region to the population of the territory based on empirical models.

The research was carried out using analysis and generalization tools to determine and classify the boundaries of the problem area. When forming an empirical forecasting model and describing its individual elements, a systematic approach and digital information technologies were used.

Of the foreign scientists in this field, the research was conducted by an English economist M. Keynes and one of the Russian scientists V. M. Granberg[5; 14], but the research of scientists of our country has studied some aspects of optimal regulation of the economic system of regions. In particular, the theoretic and methodological aspects of the complex and proportional development of the territories were considered in the works of B. Ruzmetov[15]. Despite many years of research, the issue of accurate forecasting of the development of the economic system remains relevant.

II. Methods

Only in 2004, the Russian economist scientist S.G. Svetunkov for the first time created the theory of constructing complex numerical econometric models [16;17;18;21]. This marked the beginning of the formation of an integrated digital economy. As noted in the studies of A. A. Afanasyeva, O. S. Ponomareva. And G. B. Kleiner "such production functions as describing the influence of production resources on the result of production, help to solve many practical issues." [19; 20]. T. V. Merkulov F. I. Prikhodko in his studies, "the advantages of complex numerical econometric modeling lie in the fact that with their help there are opportunities for solving complex problems that cannot be solved by functions with real variables." An important factor in the territorial system is the theory of optimal regulation. Its distinctive feature is analyzed and the corresponding scientific conclusions are drawn on the need for consistent application of the principle of optimality in solving the entire complex complex of problems of regulation and management of the economic process in the region [22].

According to the famous American researcher P. Strassman, investments in information technology are most closely related to such indicators of service enterprises as administrative and management costs[6]. Media and technology can reduce the cost of internal governance in the industry. In his works, P. David[7].argues that information technologies are "General-purpose technologies". Harvard Business School professor G. Loveman[8] .also emphasizes a similar point of view. Information technology creates the potential for the development of other digital technologies, but technologies that do not exist without digital technologies will not bring immediate benefits by themselves. Information technology provides a platform for improving organizational processes and introducing fundamentally new tools into the existing service sector.

A similar operation was carried out by scientists E. Brinolfsson and L. Hitch, having studied the activities of 527 large American firms. In this approach, the authors note, an essential role is played by additional assets (assets that change under the influence of information technologies: experience and qualifications of employees, communication tools and technologies, quality of decision-making, changes in business processes, etc.). Over time, the results of the introduction of digital technologies appear gradually, in a general form. The complexity of public service systems (systems based on the use of information technologies) requires taking into account the specifics of digital technologies.

III. Results and Discussion

There are two approaches to creating a digital economy: planned and market-based. For developing countries, the development of the service sector is one of the most effective ways to improve the living standards of the population.

Empirical methods do not negate simple, traditional methods, but help to further develop them and to analyze objectively variable outcome indicators through other indicators.

The real object is presented in the form of two systems: control and controllable (control object) in econometric modeling of the development of service sectors, in the description of management processes.

In the modern era of development of social and service sectors, the provision of services is gaining popularity. Therefore, the labor efficiency per unit of achieved output

is required to be able to calculate fixed assets, material and financial costs.

Production and services have long been a part of human economic activity, social community life. The interaction among people as a social community institution of services, the existence of useful activities - are considered necessary condition of society and life of human. It should be noted that it is not exaggeration if we say that services will increase the level of development of society, not only at the level of its productive forces, but also taking into account its spiritual and enlightenment status.

In this study, we will mark public service sectors as a system by improving the development models of public service sectors as a basis for systematic analysis. At the same time, we consider a single object and the types of services as a collection of collected elements in order to achieve the goal. Namely, we will systematically study to increase the efficiency of public services and living conditions. These researched types of services are understood as interconnected integrity in their integrity. As a result of systematic analysis, the economic-effectiveness indicator will be determined.

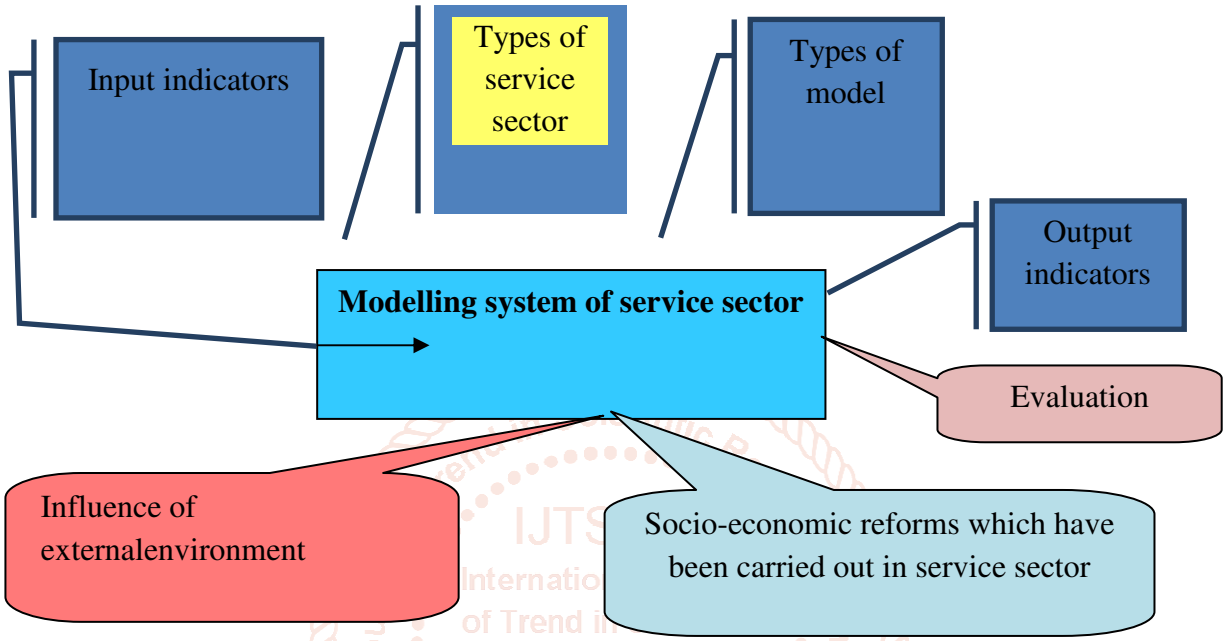

Figure 1 Systematic analysis, synthesis and optimization in the modeling of service sectors

If we consider the process as a system in the modeling of service sectors, we must choose the main influencing factors, namely, input indicators. When modeling a process, we will choose the type or appearance of the model to be generated, if we choose which type of service sector. It is not impossible to take into account all factors in modeling, so we must choose the main influencing factors and take into account the ongoing socio-economic reforms which have been carried out in this field. The outcome factor and evaluation criteria are determined from the generated model (Figure 1).

It should be noted that the attitude of the population to the service sector is formed in the conditions of social ownership to production tools, a single centralized system of economic movement, limited economic independence of enterprises.

In the condition of market economy, service enterprises operate in a variety of forms of ownership, full economic independence and competitiveness. This market involves the flexible use of different methods of house holding management and the choice of econometric models of service, in this case, it creates opportunity for rapid adaptation to changes in the external environment in a competitive environment.

A systematic methodology of complex problems in the field of services is developed on the basis of a systematic approach and general concepts. During the analysis, we take into account the internal and external environment of the service sectors. This means that it must be taken into account not only internal factors, but also external factors such as economic, geopolitical, social, demographic, environmental and other factors.

Each system of the service sector includes its own service elements, while at the same time it reflects the low-level subsystem elements. In other words, the elements of the service sector will be interconnected with different systems in many ways, without interfering with each other.

The systematic approach is expedient for each element of its structural structure in ensuring the completeness of the public service system.

In order to do this, the service sector is considered as a complex system, quantitative and qualitative aspects of its expression laws are studied. Imitation has important role in the analysis of the activities of the service sector which is considered as a complex economic process.

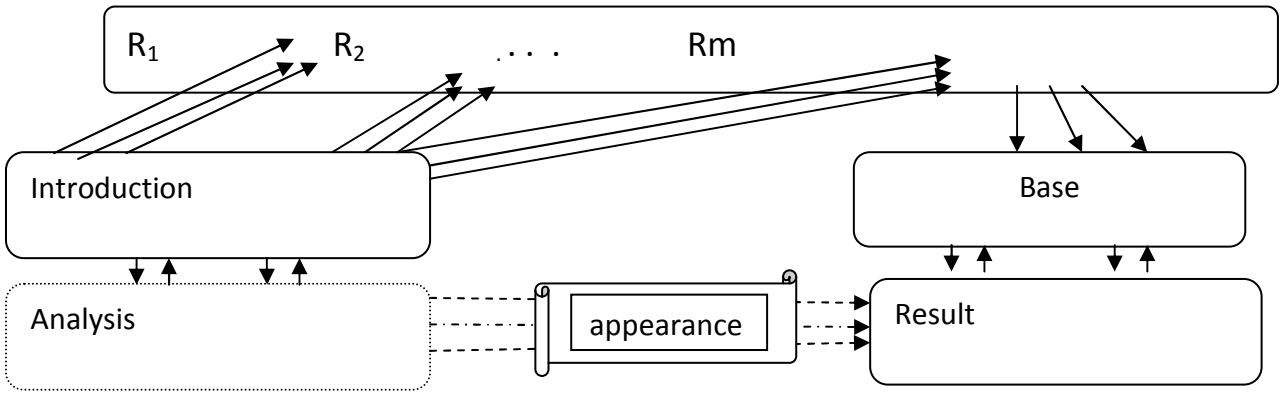

Figure 2 Scheme of systematic imitation of econometric modeling of the public service sector

The imitation model is constructed for each sector to predict the future state of the public service sector. The following tasks should be done in order to do this (Figure 3):

forming database of service sector networks and factors which influence it;

identifying the relationship between each service sector and the factors which influence it, the factors which influence it;

developing a separate model for each service sector;

examining developed models according to evaluation criteria;

forming a database forecast on the basis of certain legitimacies of factors which influence forecasting through models which are considered significant;

achieving outcome factors on the basis of databases and models.

In this case, special functions are reviewed, attention is paid to the algorithms of system operation. It is implied the properties which lead to the goal as function. In this case, performing functions of the system are evaluated on the basis of a functional approach. It creates opportunity to determine the activity of the system, to determine its status, to mark the management legitimacies of systems. An important aspect of this is considered appearing hierarchical subordination among these parts and reflecting it in the relative independence of these parts. This will help the population to develop an integrated systematic imitation model of all elements of its service sector on the basis of a single system.

It is expedient to study the correspondence of different values to the factors which influence to the social phenomena, not the same values, and the correlation connection of their interdependence. Because a characteristic feature of the social spheres is that it is impossible to determine a complete list (strength) of all the factors which affect this sphere.

Besides, only approximate expressions of the connections can be written using the formula. Because the number of factors which influence the living conditions of the population is so large, it is impossible to determine a complete list of them and write an equation which fully represents the connection with influencing outcome sign.

The development of the living conditions of the population is considered so incompletely connection, that different values of the results of the factor which influence it in the different time and space, correspond to each value of the factors. Hence, the total number of influencing factors will be unknown. It is expedient to study such a dependence through correlation connections.

Our task consists of evaluating the existence of strong and weak connections which influence the development of public service sectors. We use the correlation analysis method in order to perform this task. Because our goal is considered to evaluate the importance and reliability of the interdependencies which influence the development of each sector which serves the population. We measure the criterion of dependence which influences the living conditions of the population through correlation analysis, but we cannot determine the cause of the relationships.

We selected information which belong to the reporting years 2004 - 2018, these information identified the areas of service and the factors which influence them, on the basis of certain signs (Table 1).

Table 1 Providing Accommodation and Food Services to the Population of the Region

(billion sum)

N	years	Sales services	Transportation services	Accommodation and catering services	Rental services	individual	Other services
1	2004	83,9	37,6	7,9	7,6	13,5	10,8
2	2005	98,7	59,9	10,4	9,1	17,9	15,1
3	2006	116,1	85,1	17,2	12,3	20,4	19,1
4	2007	145,6	91,8	18,1	15,6	22,7	22,6
5	2008	192,7	110,2	18,9	16,3	28,9	31,9
6	2009	223,8	172,5	29,6	21,7	37,6	37,8
7	2010	312,6	198,9	31,4	29,7	57,1	39,2

8	2011	458,8	299,7	27,8	38,9	56,7	53,2
9	2012	734,4	355,2	26,3	44,8	78,3	79,8
10	2013	928,8	476,2	26,9	70,6	112,4	101,4
11	2014	1133,8	652,2	20,9	88,1	150,8	142,3
12	2015	1290,6	792,8	25,4	109,1	158,3	180,2
13	2016	1646,3	910,1	146,9	135,9	209,2	172,8
14	2017	1935,8	1491,5	185,1	158,0	234,5	212,2
15	2018	2337,0	1608,9	220,8	197,7	262,9	272,2

In this case, the factors which influence the development of each service sector are separately divided in the modeling. Therefore, we took the development of some service sectors as a factor which influences to other service sectors. The impact of influencing factors affects service sectors in different degrees. Selected factors may be involved in modeling once or more. Because we consider one factor as the main factor which influences each service sector, and we can consider another factor as the main factor which influences only one service sector.

Table 2 Service sectors for the population of Kashkadarya region and the factors which influence them

S_x – providing trade services to the population of the region (in billion soums)	Y_3
A_s– total number of the population of region (thousand people)	X_1
I_{ba}– employed part of the population of the region (thousand people)	X_2
A_d– total incomeof the population of region (in billion soums)	X_3
U_i– total consumption of the population of the region (in billion soums)	X_4
SH_i– personal consumption of the population of the region (in billion soums)	X_5
I_i–social consumption of the population of the region (in billion soums)	X_6

We created the following functional view on the basis of the service sectors in Table 1 and the factors which influence them (Table 3).

Table 3 A functional view of the empirical models which are structured for each providing trade services to the population of the region for the population of the region

S_x – providing trade services to the population of the region	$S_x = \varphi_3(A_s, A_d, U_i, K_m, C_m, Q_{xm}) + \varepsilon_3$

We used statistical data from 2004 to 2018 to create multi-factorial empirical models through the service sectors for the population of Kashkadarya region and the factors which influence them.

Table 4 Statistical data of the providing trade services to the population of theKashkadarya region

Y1	X1	X2	X3	X4	X5	X6
83.9	541.7	430.3	339.3	773.9	432.36	2378.2
98.7	653.5	539.1	437.3	1375.3	538.5	2419.8
116.1	850.3	701.75	697.9	1896.5	670.63	2462.2
145.6	1068	877.8	830	2257.2	796.13	2506.2
192.7	1376.6	1130.7	1630.7	3049.5	949.9	2565.9
223.8	1803.4	1494.4	2193	4082.9	1079.8	2615.5
312.6	2380.4	1938.7	1598	3958.8	1329.8	2671
458.8	2692.1	2199.4	1802.8	4759.2	1407.3	2713.2
734.4	3186	2596.5	2030.3	5313.2	1552.1	2762.3
928.8	3723.5	3027.4	2257.6	5862.3	1696.9	2895.5
1133.8	4304.4	3492.1	2484.5	6406.7	1841.7	2958.9
1290.6	4928.9	3990.5	2711.4	6946.2	1986.5	3025.6
1646.3	5597.1	4522.6	2938	7480.9	2131.3	3089.4
1935.8	6308.6	5088.6	3164.5	8010.7	2276.1	3148.1
2337.0	7063.8	5688.3	3390.8	8535.7	2420.6	3186.8

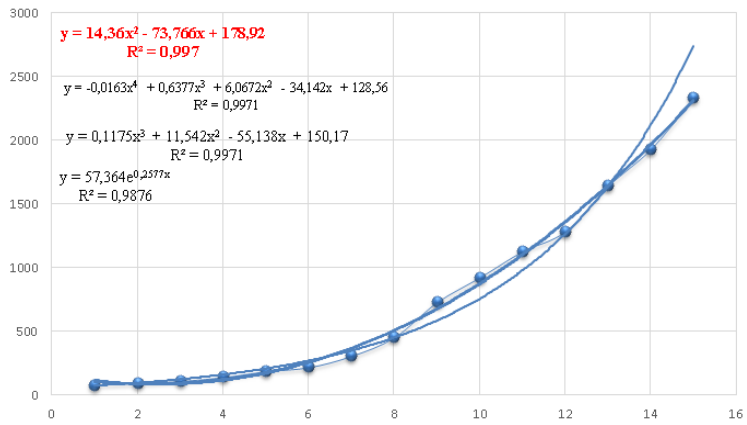

Fig.1.Sales services

One of the main rules of constructing a multi-factorial empirical model is considered to determine the connection densities among the factors which are selected for the model, namely, to investigate the problem of multicollinearity of the connection among the selected factors. To do this, the correlation coefficients among the factors are calculated in order to do this, and when x_i and y_i variables accept the values of $i=1,\ldots,n$, they are considered the most common indicator which shows the linear relationship between *x* and *y*, and the correlation coefficient. It is calculated as follows[23,24]:

$$r_{xy}=\frac{Cov(x,y)}{\sqrt{Var(x)}\sqrt{Var(y)}}. \quad (1)$$

The value $Cov(x,y)$ in the dividend of the fraction of equation (1) is determined by the following ratio:

$$Cov(x,y)=\frac{1}{n-1}\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y}) \quad (2)$$

and it is called the covariance of the variables x and y and it is found as follows:

$$Cov(x,x)=Var(x),\ Cov(y,y)=Var(y). \quad (3)$$

The correlation matrix among the factors which influence the development of each sector of the service sector in Kashkadaryaregion, was calculated in the program Eviews9. For example, we have selected the number of teachers per thousand students in the region, the total expenditures of improving the living standards of the population of the region, the expenditures for public education in the region and providing household goods and computer repair services to the population of the region as factors which influence modeling quality education services. We carry out an autocorrelation analysis in order to determine if there is not multicollenity among these factors (Table 5).

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Table 5 Correlation matrix among factors which influence the educational service sector to the population of the region

Covariance							
	Y_3	X_3	X_4	X_7	X_{10}	X_8	X_1
Y3	1.255058						
Correlation	1.000000						
SSCP	18.82586						
t–Student criteria	-----						
Probability	-----						
X3	0.900800	0.665278					
Корреляция	0.985814	1.000000					
SSCP	13.51200	9.979175					
t–Student criteria	21.17709	-----					
Probability	0.0000	-----					
X4	0.895553	0.662259	0.659356				
Correlation	0.984463	0.999921	1.000000				
SSCP	13.43330	9.933878	9.890346				
t–Student criteria	20.21488	287.1062	-----				
Probability	0.0000	0.0000	-----				
X7	0.703569	0.542158	0.541221	0.490731			
Correlation	0.896505	0.948860	0.951464	1.000000			
SSCP	10.55353	8.132369	8.118314	7.360969			
t–Student criteria	7.296052	10.83688	11.14690	-----			
Probability	0.0000	0.0000	0.0000	-----			
X10	0.717710	0.544414	0.543415	0.470891	0.468033		
Correlation	0.936438	0.975640	0.978212	0.982561	1.000000		
SSCP	10.76565	8.166216	8.151227	7.063358	7.020501		
t–Student criteria	9.623851	16.03490	16.98885	19.05297	-----		
Probability	0.0000	0.0000	0.0000	0.0000	-----		
X8	0.570485	0.426195	0.424644	0.354285	0.354912	0.275180	
Correlation	0.970742	0.996088	0.996912	0.964102	0.988949	1.000000	
SSCP	8.557272	6.392920	6.369665	5.314279	5.323682	4.127699	
t–Student criteria	14.57601	40.64484	45.77264	13.09110	24.05149	-----	
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	-----	
X1	0.106375	0.076489	0.076046	0.059995	0.060855	0.048363	0.009156
Correlation	0.992303	0.980019	0.978703	0.895010	0.929600	0.963478	1.000000
SSCP	1.595626	1.147337	1.140686	0.899921	0.912829	0.725446	0.137347
t–Student criteria	28.89251	17.76496	17.19009	7.234669	9.093873	12.97257	-----
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-----

All above-mentioned factors are taken in order to create a multi-factorial empirical model on the factors which influence the development of each sector of the public service sector, and it is examined how their importance are in the model.

It is expedient to use a linear and hierarchical multi-factorial econometric model on the basis of its evaluation criteria according to its condition for each sector of the service sector.

We use the least squares method to construct and analyze an econometric model between public service sectors and the factors which influence them.

The linear multi-factorial econometric model has the following view:

$$Y = a_0 + a_1 x_1 + a_2 x_2 + \cdots + a_n x_n \quad (4)$$

Here: y - the outcome factor; $x_1, x_2, \ldots, x_n$ - Influencing factors.

The following system of normal equations is constructed to find the unknown parameters a_0, $a_1, a_2, \ldots, a_n$ in the model (4):

$$\begin{cases} na_0 + a_1 \sum x_1 + a_2 \sum x_2 + \ldots + a_n \sum x_n = \sum y \\ a_0 \sum x_1 + a_1 \sum x_1^2 + a_2 \sum x_1 x_2 + \ldots + a_n \sum x_n x_1 = \sum y x_1 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ a_0 \sum x_n + a_1 \sum x_1 x_n + a_2 \sum x_2 x_n + \ldots + a_n \sum x_n^2 = \sum y x_n \end{cases} \quad (5)$$

The hierarchical multi-factorial econometric model has the following view:

$$Y = a_0 * x_1^{a_1} * x_2^{a_2} * \cdots * x_n^{a_n} \quad (6)$$

Here: y - the outcome factor; $x_1, x_2, \ldots, x_n$ - Influencing factors.

If we take the substitution in the model (6) by the natural logarithm, then we have the following view:

$$\ln(y) = \ln(a_0) + a_1 \ln(x_1) + a_2 \ln(x_2) + \ldots + a_n \ln(x_n). \quad (7)$$

In model (7), if we make the definitions

$$\ln(y) = y', \ \ln(a_0) = a_0', \ \ln(x_1) = x_1', \ln(x_2) = x_2', \ldots, \ln(x_n) = x_n'$$

then we get the following view:

$$y' = a_0' + a_1 x_1' + a_2 x_2' + \ldots + a_n x_n'. \quad (8)$$

The following system of normal equations is constructed to find the unknown parameters $\grave{a_0}, \grave{a_1}, \ldots, \grave{a_n}$ in the model (8):

$$\begin{cases} n\grave{a}_0 + \grave{a}_1 \sum x'_1 + \grave{a}_2 \sum x'_2 + \cdots \grave{a}_n \sum x'_n = \sum y' \\ \grave{a}_0 \sum x'_1 + \grave{a}_1 \sum x'^2_1 + \grave{a}_2 \sum x'_1 x'_2 + \cdots \grave{a}_n \sum x'_1 x'_n = \sum x'_1 y' \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ \grave{a}_0 \sum x'_n + \grave{a}_1 \sum x'_n x'_1 + \grave{a}_2 \sum x'_n x'_2 + \cdots \grave{a}_n \sum x'^2_n = \sum x'_n y' \end{cases} \quad (9)$$

If this system of normal equations (9) is solved analytically by several methods of mathematics, then the values of the unknown parameters $\grave{a_0}, \grave{a_1}, \ldots, \grave{a_n} \grave{a_0}, \grave{a_1}, \ldots, \grave{a_n}$ are found.

In order to have multi-factorial empirical models of the processes, several options were calculated in the Eviews9 program and appropriate results were obtained. For example, builds an empirical model for providing quality educational services to the population of the region is built in table 6 and it is shown their importance using criteria in the evaluation of this model and its parameters.

If there is not autocorrelation in the residuals of the outcome factor, then the value of the calculated DW criterion will be around 2.

Table 6 Build an empirical model to provide educational services to the population of the region

Method: the least squares method				
Variable	**Model coefficients**	**Standard errors**	**t-student criteria**	**P-value**
X_3	43.49010	13.80558	3.150184	0.0136
X_4	-43.54139	14.47025	-3.009028	0.0168
X_7	-1.164721	0.302940	-3.844723	0.0049
X_{10}	4.795962	1.502857	3.191231	0.0128
X_8	-3.688429	1.358397	-2.715280	0.0264
X_1	5.175837	1.753005	2.952552	0.0184
C	-48.22153	14.77718	-3.263243	0.0115
R – determination coefficient	0.926997	The average value of the dependent variable		6.110852
Flattened R – determination coefficient	0.914744	The standard deviation of the dependent variable		1.159614
Standard error of regression	0.084068	Akayke's information model		-1.809665
The sum of the squares of the remains	0.056539	Schwartz's information model		-1.479241
The value of the maximum similarity function	20.57248	Hannan-Quinncriter.		-1.813184
F–Fisher criteria	442.6285	DW-Darwin-Watson criteria		2.649359
Prob(F-Fisher criteria)	0.000000			

It was determined that the value of the DW criterion which were calculated the empirical models which were constructed for each sector of the service sector was higher than the table value. This indicates that there is not autocorrelation in the residues of outcome factor. The Fisher and Student criteria were calculated and the calculated value was compared with the table values, the magnitude of it was determined that they were higher than the table values.

The results of the analysis of the empirical models constructed for each sector of the public service sector in the region are presented in Table 7.

Table 7 Empirical models which were built for each sector of the service sector to the population of the region

№	The view of empirical models	R^2	F	DW
3.	$Y_3 = e^{-48,222} * X_3^{43,490} * X_4^{-43,541} * X_7^{-1,165} * X_{10}^{4,796} * X_8^{-3,688} * X_1^{5,176}$ t $(-3,263)\ (3,150)\ (-3,009)\ (-3,845)\ (3,191)\ (-2,715)\ (2,953)$	0.9270	442.629	2.649

The parameters which were taken into account in the models which were built for each service sector (for linear regression equations) consist of different indicators. Therefore, it is necessary to calculate the coefficients of elasticity in the analysis. For example, we calculated the coefficients of elasticity in the analysis of the model built for the sector of communication and information services to the population of the region (Table 8).

The results of the empirical model which is built for providing trade services to the population of the region (Y_3) show that the volume of trade services to the population of the region (Y_3) will increase by 5,18%, if the total number of the population of the region (X_1) increases by 1%, if the total income of the population of the region (X_3) increases by 1%, the volume of trade services to the population of the region (Y_3) will increase by 43,49%, volume of total consumption of the population of the region (X_4) increases by 1%, the volume of trade services to the population of the region (Y_3) will decrease by 43,54%, if capital investment of the population of the region (X_7) increases by 1%, the volume of trade services to the population of the region (Y_3) will decrease by 1,17%, if the volume of regional industrial production (X_{10}) increases by 1%, the volume of trade services to the population of the region (Y_3) will increase by 4,8%, and if the amount of regional agricultural production (X_8) increases by 1%, the volume of trade services to the population of the region (Y_3) will decrease by 3,69%.

IV. Conclusions

It is expedient to separate econometric modeling of each service sector. Because development of each sector of the service sector has a positive impact on development of another sector. Therefore, the use of econometric models in the form of interconnected equations system has particular importance in development of service sectors. Together with this, the organizational-economic mechanism of development of service sectors represents a hierarchical system of interconnected elements and groups (subjects, objects, principles, forms, methods and tools) at different levels, as well as their interrelationships, innovative infrastructure form relationships with market participants.

According to forecasts which was carried out, the total volume of services which are provided to the population of Kashkadarya region is expected to increase by 3,46 times by 2025, at the expense of saving the current trend. Providing educational services sector is expected to increase by 4.85 times by 2025 compared to 2019, providing health care services sector is expected to increase by 2, 68 times by 2025.

It is expedient to pay essential attention to the innovation factor for the sustainable development of the service sector for the population of the region in the future. It is necessary to encourage innovative ideas and newly opened service sectors, to encourage the factors which create conditions for the development of high-quality service sectors for developing and organizing service sectors on the basis of innovation in the region.

It is necessary to econometrically model the management plans for the elimination of imperfections in the way of achieving the social goals which are set for the economic

growth and living standards of the population and the development of the living conditions of the population. During 2017-2021 years (also, in next periods), it is expedient to develop long-term forecasts (2020-2025) in order to plan policy and projects which will be accepted as the part of action strategy of regional development of the region, plan technologic modernization and service sectors, intensive development of infrastructure, orient them to the welfare of the population.

In the current situation, the service sector to the population offers a variety of additional services, the main content of these services composed of releasing the population from the anxieties in living conditions, improving the quality of services and achieving to live in meaningful daily life.

As a result of the research, recommendations are made on forming the methodology and development goals of the service sector, choosing options for decision-making methods and evaluation criteria variants, developing optimal options.

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