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Providing Education Services to the Population of the Region

Mukhitdinov Khudoyar Suyunovich, Abdiraimov Shogdor Davronovich

Professor of Karshi engineering-economic institute
Master's studentof Karshi engineering-economic institute

ABSTRACT: Analyzing development processes of each sector 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.

KEY WORDS:econometric modeling, differential equations, static and dynamic parameters, structural analysis, synthesis.

I. INTRODUCTION

In the world practice, it is important to conduct researches on improving the service sectors and their mechanisms which are based on promising and high technologies, improving the scientific and methodological basis of complex modeling, accelerating service processes and increasing their efficiency.

A number of scientific works on econometric modeling and forecasting of the development of public service sectors in the context of globalization, in particular, improving the systematic analysis of service sectors, assessment of important factors which affect them, widespread use of econometric models in forecasting process, comparative assessment of statistical information systems, introduction of automated information systems for comparative assessment of their indicators and indicators system of service sector and creating ways of open data portal. In this process, the introduction of modern service sectors, ensuring the transparency and openness of the data system of indicators of service sectors, improving the method of econometric and statistical calculations through the effective use of international standards and principles are considered one of the urgent issues.

In world practice, it is important to conduct scientific researches in order to improve the scientific and methodological bases for the comprehensive evaluation of innovative projects in the field of services.

During the years of independence in Uzbekistan, the service sector has been developing rapidly, and its role as a propulsive factor in boosting the national economy, creating new jobs, improving the welfare of the population of country and solving other social problems has been growing.

But it is still low compared with the level which was achieved by developed countries. According to the above mentioned factors, the accelerate development of this sector in Uzbekistan is planned. Important tasks for further development of the Republic of Uzbekistan have been identified. Effective implementation of these tasks requires to use optimal options of foreign experience in the development of the service sector in our country.

The main goal of the social policy which is being carried out by the state in our Republic is considered to create a favorable social environment and conditions which can satisfy the basic living needs of the population in society through the development of service sectors.

The development of public service sectors depends primarily on the results of reforms which are being carried out in all regions and territories.

The problems which associate with modeling the development of public service sectors, are examined in detail in this article.

Theories of econometric modeling of the development of public service sectors form the directions of public administration in the socio-economic development of the regions. However, it can not limit with studying them, because they are largely based on theories of economic growth of regions. It is necessary to search for and implement new approaches, models and methods for the development of public service sectors.

The role of the service sector in the current situation is determined by the following factors:

New jobs are constantly being created;

Increases its share in the country's GDP;

The service time is shortened in household and it increases the quality of life of the population.

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In some undeveloped or countries which are transiting to development level, three-quarters of the population is dependent on agriculture. In developed countries, the indicator consists of only 10 percent of the total working age of population. Even at least 50 percent of the population are employed in the service sector in countries which are not included in the leading 20 and do not use all opportunity in order to do them. Especially, the share of the "service economy" is much higher than GDP in countries where profits from services consist of 3/4 of GDP. This share was 85 percent in Luxembourg, 87 percent in France, 86 percent in the United States, 85 percent in Belgium, 83 percent in the United Kingdom, and 94 percent in some countries in Southeast Asia, in particular, 94 percent in Hong Kong and 91 percent in Singapore. As a rule, services which are based on finance, credit, guarantees, surety, insurance, education, tourism, medicine, communication and information, innovation and nanotechnology are developed in countries which achieve a high level of service. The base of GDP consists of services in tourism industry in countries such as Spain, Italy and France. On the other hand, a number of U.S. companies own at least 50 percent of their manufacturing revenue through the sale of services which are related to manufacturing[1]

II. METHODS

In our opinion, there are the following actual issues which are waiting for their solution, in the development of the service sector: identifying classification of the types of services which are provided to the population, evaluating the nature of the service sector, developing a system of indicators of service sectors in current situation, improving the process of econometric modeling of development of public service sectors and forecasting it through them.

Human creates and serves the object of service to himself. Because of this, it is possible to introduce the belief that services are for the human and performing the service is also a human. This means that both the producer of the services and its consumer are also human. This can be expressed as follows:

It is known that as a result of the service, the GDP of country will increase. This will be done in the following directions: a gross domestic product will be created in the conditions of market relations, as a result of service, irrespective of creating or non-creating a material wealth. Therefore, it is expedient to look at services not from the point of view of the creation of material wealth, but from the point of view of the creation of gross domestic product.

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.

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 householding 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.

[1] http://uza.uz/oz/business/-07-09-2019.

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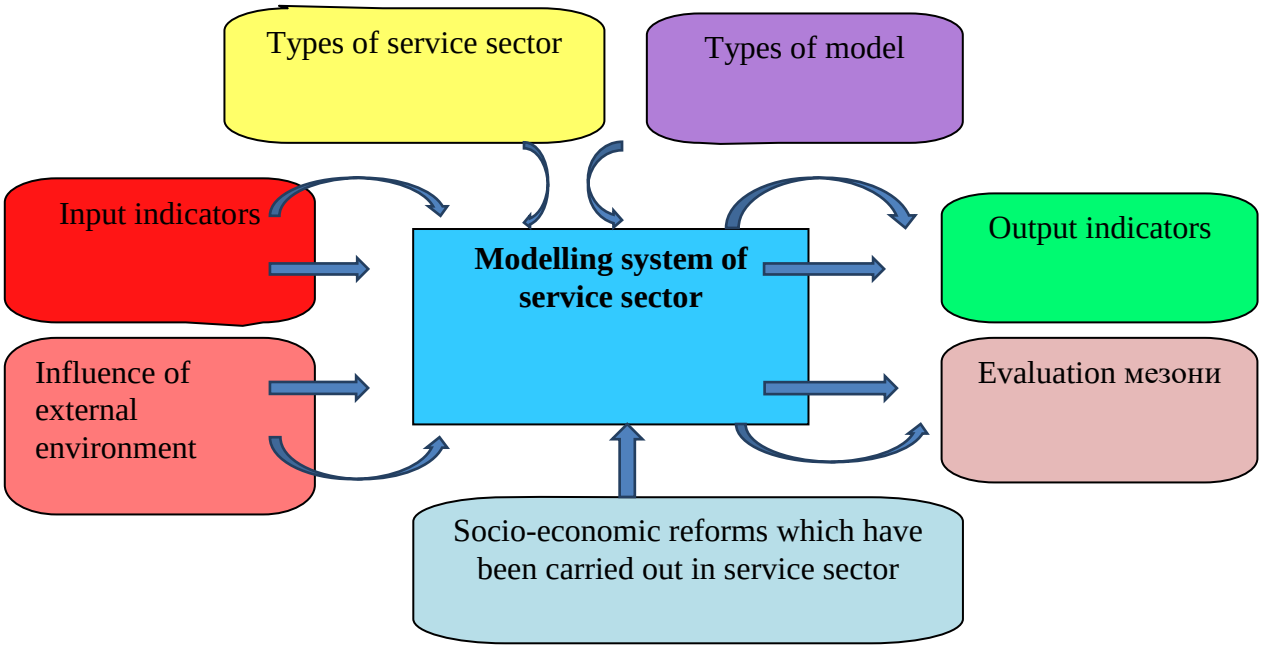

Figure 1. Systematic analysis, synthesis and optimization in the modeling of service sectors

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.

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.

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III. RESULTS AND DISCUSSION

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).

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 1.
Service sectors for the population of Kashkadarya region and the factors which influence them

$T_{o'x}$–providing education services to the population of the region (in billion soums)	Y_1
MK_x – providing household goods and computer repair services to the population of the region (in billion soums)	Y_2
A_s– total number of the population of region (thousand people)	X_1
TFO_{bx}– total expenditures related to improving the welfare of the population of the region (in billion soums)	X_2
O'_s– the number of teachers per thousand students in the region	X3
Xtx – expenditures for public education in the region (in billion soums)	X_4

For example, if the total income of the population of the region becomes factor which influences all service sectors, the expenditures for the regional health care will be considered the factor which only influences the development of the health care sector for the population of this region.

$T_{o'x} = f(O'_s, TFO_{bx}, MKx \quad Xtx) + E$

$T_{o'x}$–providing education services to the population of the region

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

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 $i = 1,...,n$, 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:

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

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

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

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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 Kashkadarya region, was calculated in the program Eviews 9. 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 1).

Table 2.
Correlation matrix among factors which influence the educational service sector to the population of the region

Covariance					
	Y_1	X_3	X_2	Y_2	X_4
Y7	4010.294				
Correlation	1.000000				
t–Student criteria	-----				
Probability	-----				
X_{14}	-138.6083	10.00907			
Correlation	-0.691838	1.000000			
t–Student criteria	-3.454672	-----			
Probability	0.0043	-----			
X_{12}	3329.935	-111.4473	3648.468		
Correlation	0.870547	-0.583200	1.000000		
t–Student criteria	6.378583	-2.588556	-----		
Probability	0.0000	0.0225	-----		
Y_{11}	5322.235	-225.5928	4488.000	7498.544	
Correlation	0.970549	-0.623455	0.558043	1.000000	
t–Student criteria	14.52601	-5.232830	6.023860	-----	
Probability	0.0000	0.0002	0.0000	-----	
X_{19}	23178.60	-871.1318	20535.46	31352.95	137403.0
Correlation	0.987418	-0.542829	0.717173	0.776769	1.000000
t–Student criteria	22.51411	-4.000576	8.298609	16.43436	-----
Probability	0.0000	0.0015	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:

$$Y = a_0 + a_1x_1 + a_2x_2 + \cdots + a_nx_n \quad (4)$$

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

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

$$\begin{cases} na_0 + a_1\sum x_1 + a_2\sum x_2 + \dots + a_n\sum x_n = \sum y \\ a_0\sum x_1 + a_1\sum x_1^2 + a_2\sum x_1x_2 + \dots + a_n\sum x_nx_1 = \sum yx_1 \\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \\ a_0\sum x_n + a_1\sum x_1x_n + a_2\sum x_2x_n + \dots + a_n\sum x_n^2 = \sum yx_n \end{cases} \quad (5)$$

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

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

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

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

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

In model (7), if we make the definitions $\ln(y) = y'$, $\ln(a_0) = a_0'$, $\ln(x_1) = x_1'$, $\ln(x_2) = x_2'$, $\dots$, $\ln(x_n) = x_n'$ then we get the following view:

$$y' = a_0' + a_1x_1' + a_2x_2' + \dots + a_nx_n'. \quad (8)$$

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

$$\begin{cases} n\grave{a}_0 + \grave{a}_1\sum x'_1 + \grave{a}_2\sum x'_2 + \cdots \grave{a}_n\sum x'_n = \sum y' \\ \grave{a}_0\sum x'_1 + \grave{a}_1\sum x'^2_1 + \grave{a}_2\sum x'_1x'_2 + \cdots \grave{a}_n\sum x'_1x'_n = \sum x'_1y' \\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \\ \grave{a}_0\sum x'_n + \grave{a}_1\sum x'_nx'_1 + \grave{a}_2\sum x'_nx'_2 + \cdots \grave{a}_n\sum x'^2_n = \sum x'_ny' \end{cases} \quad (9)$$

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

In order to have multi-factorial empirical models of the processes, several options were calculated in the Eviews 9 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.

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Table 3
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	4.954385	0.660405	7.502044	0.0000
X_2	-0.282665	0.047388	-5.964887	0.0001
Y_2	0.320081	0.078184	4.093951	0.0022
X_4	0.169310	0.019435	8.711392	0.0000
C	-263.7938	35.03946	-7.528476	0.0000
R – determination coefficient	0.917418	The average value of the dependent variable		66.87333
Flattened R – determination coefficient	0.906386	The standard deviation of the dependent variable		65.54955
Standard error of regression	3.940818	Akayke's information model		5.841855
The sum of the squares of the remains	155.3005	Schwartz's information model		6.077872
The value of the maximum similarity function	-38.81391	Hannan-Quinncriter.		5.839341
F–Fisher criteria	965.8553	DW-Darwin-Watson criteria		2.369623
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 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 4).

Table 4
Elasticity coefficient of the empirical model which is built to provide educational services to the population of Kashkadarya region

$T_{o'x}$-model coefficients of providing education services to the population of the region			
Variable	Model coefficients	Standardized coefficient	Elasticity coefficient
X3	4.954385	0.247513	3.810989
X_2	-0.282665	-0.269612	-0.485385
Y_2	0.320081	0.437684	0.435337
X4	0.169310	0.991042	1.183737
C	-263.7938	NA	-3.944678

The results of the elasticity coefficient of parameters of the empirical model which is built in Table 12 show that the multifactorial empirical model which is built for the development of educational services to the population of the region ($Y1$) gives the following results: if the number of teachers per thousand students in the region (X_3) increases by 1%, the volume of providing educational services to the population of the region (Y_1) will increase by 3,81%, if total expenditures related to improving the welfare of the population of the region (X_2) increases by 1%, the volume of

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providing educational services to the population of the region (Y_1) will decrease by 0,49%, if the amount of providing household goods and computer repair services (Y_2) increases by 1% , the volume of providing educational services to the population of the region (Y_1) will increase by 0,44%, and if the amount of expenditures for public education in the region (X_4) increases by 1%, the volume of providing educational services to the population of the region (Y_7) will increase by 1,18%.

We achieved the following efficiency when we analysed them with empirical models: As we can see from the table 13, the consistent implementation of the priorities which was set out in the Decree of our President "On the Action Strategy for the five priority areas of development of the Republic of Uzbekistan in 2017-2021", empirical models which is built in order to develop service sector to the population of Kashkadarya region in the future and forecasting results which are obtained with taking into account the ongoing reforms in this sector, show the followings:

Table 5
Forecast of service sectors for the population of Kashkadarya region (billion soums / thousand soums)

Indicators	2019 (real)	Forecast years					
		2020	2021	2022	2023	2024	2025
	164,13	*182,50*	*201,79*	*221,98*	*243,06*	275,2	324,1
$T_{o'x}$–providingeducation services to the population of the regionY_7/ per capita	287,90	380,64	501,95	657,77	854,66	1098,7	1397,6
	88,65	*115,04*	*148,96*	*191,73*	*244,77*	309,3	386,7
	23,86	*30,51*	*39,46*	*51,52*	*67,81*	89,8	119,4

Providing educational services ($T_{o'x}$) is forecasted to increase by 1,32 times in 2020 compared to 2019, and by 4,85 times by 2025;

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.

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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