Econometric Modeling Of Public Service Networks

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ABSTRACT

In this article the factors that affect the development of public service networks entities in the region's economy and determination the relationship between them through correlation-regression analysis as well as directions of development of social and labor relations in the enterprises of the industry are identified.

Keywords:

econometric model, freedom of economic activity, service networks, development of service networks, statistical service analyzes, communication and information services, services.

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Introduction

Over the years of independence, the country has undergone structural changes in the service sector as a result of reforms aimed at modernization, technical and technological re-equipment of economic sectors.

There are a number of shortcomings, both at the development stage and in the implementation of the country's infrastructure development programs. These shortcomings are mainly associated with a lack of entrepreneurial skills in the development of the service sector.

Entrepreneurship should create convenience for the population by improving the provision of services, improve the well-being of households, and it is also necessary to introduce modern forms and methods of housekeeping and housing construction.

The entrepreneur does not have a clear vision of targeted programs, models and mechanisms for their implementation for the development of the future of the country. This, in turn, has a negative impact on socio-economic reforms in the country, in particular, on the development of services.

As the First President of the Republic of Uzbekistan I.A. Karimov, “it is necessary to radically review regional programs for the development of the service sector and take additional measures to accelerate their development as an important factor in increasing employment, especially for young people” [1].

LITERATURE REVIEW

When we understand the services that a person provides to a person (or people) for the good, we see that some of these services are not sold in the free market. The demand and supply of the Flow Circuit Diagram market economy model (N. Mankyu [2], P. Samuelson [3]) is supplemented by the introduction of paid services in the market of goods and services, as well as the direct transfer of free services from the market.

R. Zh. Kurbanova developed [4] a methodology for determining the technical and economic level of equipment, determining the

technical and economic level of service and service enterprises using methods for calculating the effectiveness of introducing new equipment.

In determining the economic efficiency of the material and technical base of the enterprise in an innovative measure, proposed V.I. Shalun [5], was recognized as the most effective using the least cost-effective method of calculating each output.

With regard to reducing transportation costs, it is worth noting that "studies show that in developing countries the cost of road transport is 1.5 times higher than in developed countries. The cost of transportation increased by 1.5-1.6 times, and the operating costs of vehicles increased by 1.6-2 times due to a decrease in speed due to road conditions" [6].

Research Methodology

Kashkadarya region, which is distinguished by socio-economic development among the regions of the country, is of particular importance for solving the above problems.

Kashkadarya region is a region with huge economic potential and promising natural resources. Today, the oil and gas industry, agriculture, animal husbandry, and cotton and grain production are on the rise, reaching new levels.

In the future, the development of market infrastructure in industry, agriculture and the service sector will become an important problem for the development of new industries that have the potential for effective development in the region. In this regard, it is necessary to effectively implement programs for the localization and modernization of production in the region to accelerate the provision of services.

One of the most important tasks of the economic science of the Republic is to deepen economic reforms in the country, modernize the country, economic modeling of the priorities of the processes of integrated development of the services sector in each region, the development of scientifically based recommendations and forecasts.

In the context of deepening economic reforms in our country, the main attention is paid to man and his well-being. First of all, this factor is determined by the movement that is currently moving towards democratic development.

The main goal of the social policy pursued by the state in the republic is the creation of favorable social conditions and social environment to meet the basic needs of the population through the development of services. The basis of this social policy is:

- freedom of economic activity
- increase in labor activity of the population
- targeted social protection of the population
- development of a network of public services.

In the early years of the reforms, the past negatively affected real incomes. Active institutional changes, a number of measures aimed at privatization and privatization, as well as macroeconomic stabilization led to lower inflation and the emergence of new sources of income and increased diversification of the population in favor of the private sector.

The development of a network of public services depends, first of all, on the results of reforms in all its regions and territories.

This article discusses the problems associated with modeling the development of the service sector.

Results

When describing management processes in an econometric modeling of the development of service networks, a real object is represented by two systems: a manager and a managed (manager). Figure 1 shows the general structure of control systems in econometric modeling of a diversified services sector. Here is the $\vec{x}(t)$ vector of input actions (tasks); $\vec{\upsilon}(t)$ - vector of environmental impact; $\vec{h}'(t)$ - error signal vector; $\vec{h}''(t)$ - vector of control actions; exogenous variables: $\vec{z}(t)$ - vector of the system state S; $\vec{y}(t)$ - is the vector of output variables, usually $\vec{y}(t) = \vec{z}(t)$.

In this case, the econometric modeling

control system is a set of software and hardware that provide a specific target control system. Given the goal of achieving the control object, we can decide on the state of the coordinates y(t) for a one-dimensional system. The difference between the value of the assignment of the law of the control variable yzad (t) and the actual value of y(t) lies in the control error h '(t) = yzad(t) - y(t). If the law of changing the number of controls is consistent with the law of changing the input action (task), that is, if x(t) = yzad(t), then h'(t) = x(t) -y (t).

A system with a control error h '(t) = 0 for all time instants is called an ideal system. In practice, it is impossible to develop ideal systems. Therefore, the error in automatic control should be minimized based on the principle of negative feedback (output variable y (t) and its assignment value as information about the deviation between them).

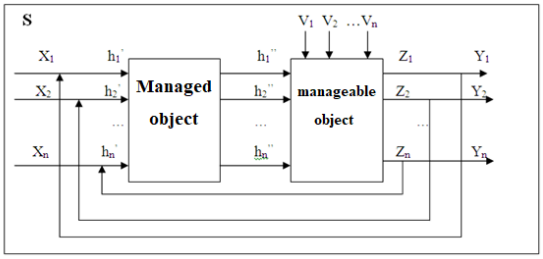

Fig. 1. The structure of the control system in econometric modeling of the development of service networks.

In econometric modeling, the task of control systems is to change the variable y (t) with the accuracy specified by the law (with an allowable error). When designing and operating automated control systems, it is necessary to select the required operating system S, as well as parameters that allow the system to maintain stability during the transition.

If the system is stable, then the practical behavior of the system in time, the maximum deviation of the control variable u (t), the transition process time, etc. are of interest. The properties of automatic control systems of various classes can be generalized using the types of differential equations that best describe the processes in system. The order and values of the coefficients of the differential equation completely determine the static and dynamic parameters of the system.

Using Figure 1 can develop continuous deterministic S-defined systems and evaluate their main characteristics, using analytical or simulation approaches in the form of appropriate languages for modeling continuous systems or using analog and hybrid computing methods.

In a market economy, service enterprises operate in different forms of ownership, complete economic independence and competitiveness. This implies the flexible use of various forms of market management and the selection of econometric models of services that allow the entrepreneur to quickly adapt to changes in the environment.

The importance of econometric modeling of public service networks in entrepreneurship is as follows:

- the rational use of material, labor and monetary resources;
- serve as a leading tool in the analysis of economic and natural processes;
- it is possible to make some adjustments when forecasting the development of the public services sector;
- Service networks not only provide in-depth analysis, but also reveal new unexplored laws. It also helps predict the future development of the service sector;
- automates calculations, facilitates intellectual work, provides an opportunity to organize and manage the work of staff on a scientific basis.

Improving the economic well-being of the republic and positive changes in economic life will create new types of demand and increase demand for the quality of customer service.

In this article, the state of public services is primarily due to innovative activities in the service sector. Therefore, the provision of services to the population is influenced by socio-cultural, economic, intellectual, technical and technological and other factors. To study the influence of these factors, a correlation-regression analysis is considered.

Our goal is to analyze the services sector

in the region and improve its models.

There is a wide area for experimenting with the construction of econometric modeling of public service networks. We can change the model parameters several times to determine the optimal performance of service enterprises. With this model, we can experiment on electronically calculated machines, and then apply them in life.

Experiments on real objects can lead to many errors and significant costs.

To create a model, service networks are comprehensively studied and analyzed. After the model is created, it can be used to obtain new information about the processes of network services. Thus, the network process becomes a continuous process.

Based on the foregoing, new methodological approaches to assessing the service sector in work were proposed.

We use the following formula to determine the level of coverage of the population with service networks.

The level of provision of the population with the service sector

$$Ax_d = \frac{\sum_{i=1}^{n}(Y_i)}{\sum_{j=1}^{m} A_j} = \frac{Y_1+Y_2+\cdots+Y_n}{A_1+A_2+\cdots+A_m} \qquad (1)$$

Here: Ax_d level of provision of the population with all types of services; A_j –j is the number of people in the region; Y_i-i kind of service industry.

Currently, the number of services in the world, especially in our country, exceeds a thousand. To study and to some extent regulate them, a period is required for their classification. Thus, a person is a member of society, actively influences nature, creates material conditions and organizes production. At the same time, it is influenced by its own material conditions and production activities. Therefore, we selected 12 of the most important indicators of the service networks of Kashkadarya region. Communication and information services, financial services, transportation services, accommodation and catering services, market services, real estate services, educational services, medical services, rental services, household goods and computer services, personal services, technical testing and architecture services and other services.

This requires the search and implementation of new approaches to the development of the service sector economic and mathematical models and methods.

Table 1: Kashkadarya Regional Statistical Service analyzes 13 types of services and service areas

Scope of services and services by sectors in Kashkadarya region, UZS billion					
Indicators	2014	2015	2016	2017	2018
Total Services	3066,4	3645,6	4556,2	5859,3	6975,9
including the main types:					
Communication and information services	241,2	274,8	328,7	370,6	426,1
Financial services	254,2	312,9	412,8	566,9	787,4
Transport services	652,2	792,8	910,1	1491,5	1608,9
Accommodation and food services	20,9	25,4	146,9	185,1	220,8
Trading Services	1133,8	1290,6	1646,3	1935,8	2337,0
Real Estate Services	108,3	136,9	170,2	191,3	226,9
Educational services	89,8	106,5	131,1	163,9	227,8
Medical services	28,2	39,5	45,8	54,4	75,0
Rental services	88,1	109,1	135,9	158,0	197,7
Repair services for household and computer equipment	135,4	185,3	216,4	226,5	256,5
Customized services	150,8	158,3	209,2	234,5	262,9
Technical Testing and Architecture Services	21,2	33,3	30,0	50,3	76,7
other services	142,3	180,2	172,8	212,2	272,2

We can see a 5-year growth trend in the services sector in Kashkadarya region. At the same time, if we analyze the share of services, we can see the share of each industry in the total volume of services by 2018.

At the same time, on the basis of data from service networks (2004-2018) of the Main Department of Statistics of Kashkadarya Region (table 2), we developed the following trend models and evaluated the evaluation criteria.

We have created trend models for the development of each service network for the population of Kashkadarya region in n-exponential and exponential terms. To do this, we used the least squares method to create trending models.

$$Y_x = a_0 + a_1x + a_2x^2 + \cdots + a_kx^k \quad (2)$$

the following work is necessary to create a trend model:

$$F = \sum(Y - Y_x)^2 \to min \quad (3) \text{ or}$$

$$F = \sum\left(Y - a_0 - a_1x - a_2x^2 - \cdots - a_kx^k\right)^2 \to \min \quad (4)$$

if we extract the partial derivative from this, then we can obtain the following system.

$$\begin{cases} \sum Y = a_0n + a_1\sum x + a_2\sum x^2 + \cdots + a_k\sum x^k \\ \sum Yx = a_0\sum x + a_1\sum x^2 + a_2\sum x^3 + \cdots + a_k\sum x^{k+1} \\ \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\ \sum Yx^k = a_0\sum x^k + a_1\sum x^{k+1} + a_2\sum x^{k+2} + \cdots + a_k\sum x^{2k} \end{cases} \quad (5)$$

$$Y_x = a_0e^{a_1x} \quad (7)$$

To obtain a trend model, you must perform the following work:

For this, both sides of the equation are naturally logarithm.

Table 2: Scope of services and services by sectors in Kashkadarya region (UZS billion)

Years	Scope of services	Communication and information services	Financial services	Trade services	Transport services	Accommodation and catering services	Real estate services	Educational services	Medical services	Rental services	Individual services	Household and computer equipment repair services	Technical testing and architecture services	Other services
2004	**207,9**	8,7	16,6	83,9	37,6	7,9	5,4	3,9	2,4	7,6	13,5	4,7	4,9	10,8
2005	**273,6**	10,1	19,3	98,7	59,9	10,4	7,8	7,8	3,7	9,1	17,9	6,1	7,7	15,1
2006	**359,7**	17,9	26,3	116,1	85,1	17,2	12,4	11,9	4,3	12,3	20,4	7,6	9,1	19,1
2007	**440,1**	27,9	37,6	145,6	91,8	18,1	14,1	15,2	5,4	15,6	22,7	11,2	12,3	22,6
2008	**590,4**	48,8	62,2	192,7	110,2	18,9	18,3	18,9	7,9	16,3	28,9	20,7	14,7	31,9
2009	**776,6**	55,6	78,8	223,8	172,5	29,6	26,7	32,3	13,6	21,7	37,6	30,8	15,8	37,8
2010	**997,2**	89,4	83,1	312,6	198,9	31,4	31,4	39,3	16,4	29,7	57,1	48,4	20,3	39,2
2011	**1285,2**	101,3	83,3	458,8	299,7	27,8	40,6	38,9	13,1	38,9	56,7	60,6	12,3	53,2
2012	**1757,5**	131,9	103,4	734,4	355,2	26,3	63,7	46,2	14,8	44,8	78,3	61,8	16,9	79,8
2013	**2410,3**	187,7	207,4	928,8	476,2	26,9	89,5	69,6	26,9	70,6	112,4	92,3	20,6	101,4
2014	**3066,4**	241,2	254,2	1133,8	652,2	20,9	108,3	89,8	28,2	88,1	150,8	135,4	21,2	142,3
2015	**3645,6**	274,8	312,9	1290,6	792,8	25,4	136,9	106,5	39,5	109,1	158,3	185,3	33,3	180,2
2016	**4556,2**	328,7	412,8	1646,3	910,1	146,9	170,2	131,1	45,8	135,9	209,2	216,4	30,0	172,8
2017	**5841,0**	370,6	566,9	1935,8	1491,5	185,1	191,3	163,9	54,4	158,0	234,5	226,5	50,3	212,2
2018	**6975,9**	426,1	787,4	2337,0	1608,9	220,8	226,9	227,8	75,0	197,7	262,9	256,5	76,7	272,2

$$\ln Y_x = a_1 x + \ln a_0 \quad (8)$$

$$F = \sum(\ln Y - \ln Y_x)^2 \to min \quad (9) \text{ or}$$

$$F = \sum(\ln Y - \ln a_0 - a_1 x)^2 \to min \quad (10)$$

if we extract the partial derivative from this, then we can obtain the following system.

$$\begin{cases} \sum(\ln Y) = n \ln a_0 + a_1 \sum x \\ \sum(x \ln Y) = (\ln a_0) \sum x + a_1 \sum x^2 \end{cases} (11)$$

We evaluate the results according to the following criteria:

The average approximation error is determined by the following formula:

$$\overline{A} = \frac{1}{n} \sum_{i-1}^{n} \left| \frac{y_i - \hat{y}_{xi}}{y_i} \right| \cdot 100\% \quad (12) \text{ or}$$

$$\overline{A} = \frac{1}{n} \sum_{i-1}^{n} \left| \frac{y_i - a_0 - a_1 \cdot x - a_2 x^2 - \ldots a_k x^k}{y_i} \right| \cdot 100\%. \quad (13)$$

Possible Values $\overline{A}$ should not exceed 8-10%.

To assess the "significance" of the regression equation, the Fisher F-test is used. Fisher's F-test is related to the coefficient of determination as follows:

$$F_{haqiqiy} = \frac{r_{xy}^2}{1 - r_{xy}^2} \cdot (n-2), \quad n \geq 3. \quad (14)$$

If $\alpha = 0{,}05$ (five percent significance level) and if the degree of freedom $k_1 = 1$ and $k_2 = n-2$, $F-$ the Fisher value, the tabular value - F_{jadv} is random numbers from the Fisher distribution tables. If inequality $F_{\text{haqiqiy}} > F_{jadv}$ is appropriate, the regression equation is statistically significant.

The study calculated the coefficient of elasticity in order to determine the economic essence of the correlation coefficient.

RESULT AND DISCUSSION

Based on the created trend models, the results of the forecast of 5 annual development of service networks were achieved (table 3).

If we analyze the total cost of services for the population by region in 2018, then it is 2.27 times higher than in 2014, and it is expected that by 2023 it will increase by 2.85 times compared to 2018.

Educational services increased 2.54 times in 2018 compared to 2014; it is expected that by 2023 they will increase 3.88 times compared to 2018. The health services sector increased 2.66 times in 2018 compared with 2014, and it is expected that by 2023 it will increase 2.42 times compared with 2018.

Accommodation and food services increased 10.6 times in 2018 compared with 2014, and in 2023, growth is expected to be 4.14 times compared to 2018. Growth trends of other service networks are shown in table 3.

Table 3.

Forecast of service sectors in Kashkadarya region obtained through the trend model (UZS billion)

Indicators	2019	2020	2021	2022	2023
Total Services	**8727**	**10723**	**13164**	**16165**	**19872**
Communication and information services	496,7	564,2	636,0	712,2	792,8
Financial services	946,6	1241,3	1627,6	2134,3	2798,6
Transport services	2264,3	2948,5	3839,3	4999,2	6509,7
Accommodation and food services	323,6	434,3	568,2	727,3	913,8
Trading Services	2674,9	3075,0	3503,9	3961,4	4447,7
Real Estate Services	265,3	305,1	347,8	393,3	441,6
Educational services	312,28	405,0	525,3	681,2	883,52
Medical services	86,4	105,4	127,5	152,9	181,8
Rental services	266,68	339,36	431,8	549,5	699,3
Services for the repair of household appliances and computers	313,5	359,0	407,7	459,5	514,5
Customized	311,8	356,0	403,3	453,	507,1

services				7	
Technical Testing and Architecture Services	93,198	121,7	156,2	197,3	245,72
Other services	371,8	468,5	590,2	743,6	936,8

The development and planning of the social sphere is largely dependent on regional factors and demographic processes associated with material production. When planning the development of the social sector, it is necessary to take into account the level of economic development of the region, the size of settlements, the size and composition of the population, as well as its location. Social networking services are limited in terms of replacing one type of service with another to meet individual needs.

The government will take legal, administrative and economic measures to regulate the labor market. These methods are aimed at reducing unemployment, efficient use of labor resources, eliminating unmet demand for labor and achieving the optimal ratio of demand and supply of labor.

In this regard, calculations were carried out using econometric modeling methods to obtain planned values for the services sector in the region.

Conclusion

When we predicted the models, we achieved the following: it is these indicators that determine the volume of paid services to the rural population of our region, which will increase the volume of paid services until 2023. It is predicted that the volume of paid services will increase by almost 1.76 times per capita in 2023 compared to 2018. It is known that every year the quantity and quality of paid services increased. The number, size and type of enterprises depend, first of all, on local conditions, population, composition, density and purchasing power, the nature of migration processes, rural construction and the transport network.

The public services sector will continue to grow as well as paid services, which will lead to increased employment, income and better living conditions. By 2023, per capita growth will be 2.29 times higher than in 2018.

The volume of medical services to the population will grow every year, 1.13 per capita in 2019 compared with 2018, by 2023 it will increase 1.62 times, there will be an increase in the access of the population to a medical examination before the disease, medical care will be improved through outpatient and pharmacy services. The availability of hospitals will increase, medical facilities will be better equipped with the necessary equipment.

In conclusion, we can say that it is necessary to create a database of legal norms for public service reform and improve its models based on the requirements of the stages of transition to market relations. The problems associated with existing problems are, firstly, the need to regulate population growth rates, increase employment through labor resources and create new jobs in the employment and employment sectors for the unemployed.

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