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ESTABLISHMENT OF REGRESSION MODELS FOR THE ASSESSMENT OF THE QUALITY OF CONSUMPTION OF ECONOMIC INFORMATION SYSTEMS OF SMALL BUSINESS ENTITIES

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ABSTRACT

This paper investigates establishment of regression models for the assessment economic information systems. Moreover, the role of the role of small business and private entrepreneurship in the economic reforms being successfully implemented by the usage of information systems as whole. On this way, necessary normative and legal acts on the creation and effective functioning of small business entities have been adopted and their share in the structure were observed while making strong analyses. Nevertheless, innovation technologies play an important role in further developing and increasing the competitiveness of small businesses. In conclusion, better development of the regression models was considered as a major points of the deployment at all.

Keywords : *regression models , small business, competitiveness, information systems, economic information systems*

Introduction

The role of the role of small business and private entrepreneurship in the economic reforms being successfully implemented in our country. All normative and legal acts on the creation and effective functioning of small business entities have been adopted and their share in the structure of gross domestic product is increasing. Nevertheless, innovation technologies play an important role in further developing and increasing the competitiveness of small businesses.

One of the key factors in solving the problems of small businesses, improving the quality of their work and developing this field is the creation and implementation of an effective management system based on information and communication technologies (ICT). For this purpose, all conditions have been created in our country. Many managers of small business are convinced that their business processes need automation.

Small businesses do not require substantial large investments, but provide the economy with an effective solution of restructuring problems, filling the market with goods and consumer goods. Small businesses make a huge contribution to the formation of a competitive environment in the context of limited financial resources.

Small businesses play a major role in the social and economic life of industrialized nations. It is important to use a systematic approach to the identification of the specific features of the small business, which is characterized by the following:

- The firm is an independent entity and is not a part of a larger entity;

- The economic environment in which the small enterprise operates is characterized by high degree of uncertainty;
- The firm has a very small market share and produces a relatively small number of products;
- have relatively limited resources (captain, human resource, production capacity, etc.);
- In most cases, the companies do not form the management units of the entrepreneurs themselves;
- The majority of entrepreneurs' profits are derived from entrepreneurial income.

Nowadays, in light of the globalization of markets and the rise of competition, small businesses need a lot of information to make correct management decisions. That's why all market participants are constantly looking for information that will positively affect their business development. In order to effectively manage your business, you need not only know the internal and external environment of an organization.

Literature review

The evaluation of the consumption of a number of economic information systems (EISs) for small businesses based on modern instrument tools and econometric models are believed as a major feature of the development.

In the planning of active experiments, the quality of the Y-parameter allows us to perform the functional operation of different EISs. In this section paper conducts experiments on the "Parus", "Galactic-Start", "BEST-office" and "BEM".

"Parus" EIS is a platform for small business entities, which reflects their accounting and warehouse accounts, personnel accounting and customer relationships. This EIS is a software platform, with the ability to add new functionality and to get different types of reports and forms.

Practice shows that transferring the Parus EIS to the Microsoft SQL Server 2000 platform creates many additional opportunities for small businesses and microfirms, and for large enterprises, the issue is still up-to-date. The second major problem is the high cost of introduction.

We carry out studies on four functional information systems that are close to each other. Parameters for the four information systems are the number of tables and the number of primary documents. All information systems are limited to the evaluation of one functional operation, including the calculation of warehouse accounting, ie, the calculation of the goods and inventory of the goods in the warehouse. The name of this report is valid even though the systems under consideration are different. Different EISs may be used partially or entirely to measure the performance of these operations.

When calculating the full scale of the report, the EIS will process all the data, while the indicators will be calculated when the data is added. The first approach in assessing consumer quality characteristics is to increase the amount of "functional processing time", while the second approach accelerates the functional operation and reduces the value of the "consumer interface errors".

In all the experiments, the factors influencing the reporting information, such as the receipt of goods for the warehouse.

We use " Ep.PP " and " Ep.DB " automated evaluation modules for the other two in the experiments on "Parus" and "Galactic-Start" EIS.

When driving an automotive experiment using the " Ep.PP " module, it is necessary to evaluate two additional indicators of consumer quality. First, this is the "user-interface" of the client, which represents the EIS response to data entry, ie the first step in the active experiment is the same as the final step in the final step of data entry. The second indicator is "the availability of the system", which is the ratio between the start of the first stage and the last (the rate of performance of the investigated functional process) of all the stops between the last. Knowing the value of these indicators will allow end users to know how much time they spend on EIS movement

Experiments on various Economic Information Systems

Experiments on "Parus" EIS.

In this system, we estimate the time required to perform a "warehouse declaration" functional operation.

Full-featured experiments have been conducted to evaluate Parus's EIS speed for small businesses, with a factor of three. The planning was carried out on two levels. The main levels of factors, interval changes and planning matrix are given in Table 1 below.

The main factors contributing to these experiments were "goods movements", "storage of goods from warehouses" and "storage of goods" (according to x_1, x_2, x_3). The value of the "reference books" and "measurements of the units of measurement" (x_4, x_5), which is auxiliary, is constant in experiments.

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Table 1. Value of factor level (number of records in MB)

	x_1	x_2	x_3	x_4	x_5
Major rate	5000	5000	5000	700	700
Change interval	2000	2000	2000	-	-
High level	7000	7000	7000	700	700
Lower level	3000	3000	3000	700	700

Measurements of the response time of the system are provided in the appendix of graphical visualization of data.

Following the results of the experiments, the following equation has been obtained, which allows to conclude on the basis of the factors that are being analyzed for the time of formation of a "warehouse report" report.

Following the experimental results, the following equation was obtained:

$$y = 8,15 + 0,25x_1 + 0,08x_2 + 0,2x_3 + 0,03x_4 + 0,03x_5$$

Factors influencing coefficients in independent variables. The higher the coefficient, the greater the effect of this factor. If the coefficient is positive, the optimic parameter increases as factor factor increases and if the minus decreases.

The coefficient value is taken into consideration when the parameter value of the parameter is greater than the zero or the transition level. After calculating the model's coefficients, models are checked for adequate models. For this purpose, the dispersion of adequacy was calculated. In this experiment, the dispersion of adequacy is 0,058.

It may be necessary to erase the most inaccurate errors in your experimental data, such as retries. For this purpose, the uniformity of dispersions is checked on various statistical criteria.

In our case, we use the Cochrane criteria. This criterion is based on the number of $f_1=n-1$ and $f_2=N$ degrees of freedom. In our case the degree of freedom is $f_1=2$ (the number of parallel experiments is constant and triple) and $f_2= 8$ (the number of experiments in the experiment matrix).

The hypothesis of dispersibility is confirmed, if the value of the experimental criterion is not greater than the value. The value of the Cochrane's criterion for the optimized parameter is 0.12. The table value is 0.2756. The value of the experiment criterion is not greater than the table, ie the uniformity of the dispersion.

The significance of the obtained regression coefficients was determined by the t-criterion of Styüdent and this t-criterion was calculated. The calculated t-criterion values for regression equation b_1,b_2,b_3,b_4,b_5 , are 9.2; 2.97; 9,55; 1.12; 1.35 hectares accordingly. The table value of Styüdent's criterion was t = 2.059.

As a result, when the significance level is 5%, coefficients x_1, x_2, x_3 are important. The coefficients were insignificant when the significance level was 5% in the interaction between other factors and factors.

We use the Fischer criterion to test the model's admissibility hypothesis. The F-criterion for the resulting equation is 2.49. The table value of the Fisher criterion is 3.3 when the significance level is 5%. The inadequacy of the linear model hypothesis can be denied if the significance level is 5%.

Thus, the result of the functional operation of "Warehouse statement" is the final support of the regression equation:

$$y = 8,15 + 0,25x_1 + 0,08x_2 + 0,2x_3$$

Analysis of the obtained coefficients shows that the value of each functional factor increases with the value of each factor. Based on this model, predictable and actual values of the time required for the "warehouse statement" functional execution are shown in *Figure 1* below

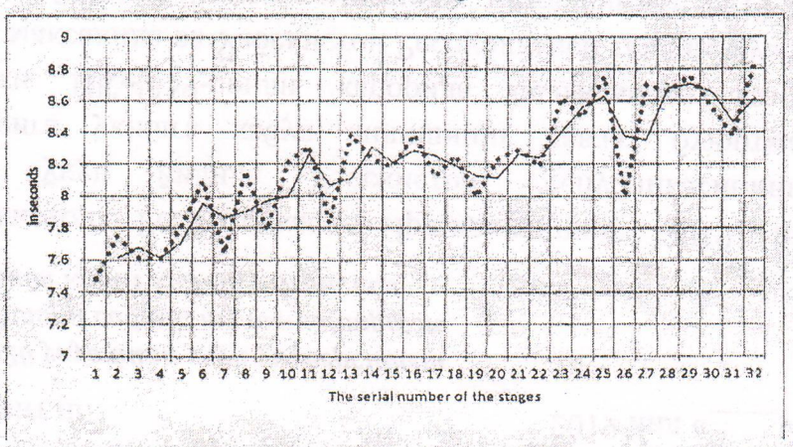

Figure 1. Predicted and actual values of the time required for the "Warehouse Statement" functional execution.

Extreme experiments on EIS "Galaxy-start".

Particularized experiments were performed on this system. The functional operation of the "Warehouse Statement" was defined. x_1, x_2, x_3 , x_4 , x_5 , x_6 and x_7, x_8 are the main factors for the different EISion of fragmented experiments.

Where x_1 - tabl_1 is the number of tabs, the number of records in the table x_2 - tabl_2, the number of records in the table x_3 - tabl_3, the number of records in the table x_4 - tabl_4, the number of records in the table x_5 - tabl_5, the number of records in the table x_6 - tabl_6, the number of records in the x_7 - tabl_7, x8 - number of records in x_8 - tabl_8.

These factors were selected using the "Ep. DB" module. As you can see from the list below, the names of the tables do not represent their functionality. The experiment was two levels. The values that are given to the factors that make the active experimenting are listed in Table 2 below.

Table 2. The value of the factor level

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Major rate	5000	5000	5000	5000	5000	5000	2000	2000
Change interval	2000	2000	2000	2000	2000	2000	-	-
High level	7000	7000	7000	7000	7000	7000	2000	2000
Lower level	3000	3000	3000	3000	3000	3000	2000	2000

During the experiment, the number of parallel experiments was three. The following equation obtained from the experiments will be able to draw conclusions on the effect of the factors that are being analyzed on the time of the "Warehouse Statement of action" functional operation:

$$y= 9,98 + 0,07x_1 + 0,25x_2 + 0,02x_3 + 0,05x_4 +0,24x_5+ 0,01x_6+ 0,03x_7+ 0,01x_8$$

Checking the uniformity of dispersions is based on the criteria of Koohren. If the calculated criterion was 0.13, then the table was 0.2756, confirming the dispersion's uniformity. Use Fisher's criterion to check the adequacy of the equation. If Fisher criterion is equal it is calculated to 2.62, the tablet equals to 3.3, which means that we can accept the model's admissibility hypothesis when the significance level is 5%.

Estimated values of the t-criterion of Stuudent are b_1, b_2, b_3, b_4, b_5, b_6; b_7, b_8 monolithic for coefficients 9.3, 2.87; 9,47; 0.74; 1.99; 1.04; 0.12; While the value of the table was 2,059. As a result, the regression equation for the "Warehouse Statement" functional operation is as follows:

Estimated values of the t-criterion of Stuudent are b_1, b_2, b_3, b_4, b_5, b_6; b_7, b_8 monolithic for coefficients 9,3; 2,87; 9,47; 0,74; 1,99; 1,04; 0,12; 0,36 while the value of the table was 2,059. As a result, the regression equation for the "Warehouse Statement action" functional operation is as follows:

$$y = 9,98+ 0,2x_1 + 0,07x_2 + 0,24x_3$$

The analysis of the obtained coefficients indicates that the value of each functional value increases with the value of each factor. The forecasted and actual values of the time spent for the functional operation of the Warehouse Warehouse Warehouse, calculated on the basis of this model, are shown in Figure 4 below.

We carry extreme experiments at BEST-office EIS.

In this information system, we estimate the time spent for the "Warehouse Report" functional operation. The dimensions of the following tables in the data base of the BEST-office EIS are variables that are experimentally changed, that is, the number of records in table *x Indexes* while showing the same in *tabl_b*

In this information system, we estimate the time spent for the functional operation of the Warehouse report. The dimensions of the following tables in the data base of the "BEST-office" EIS are variables that are experimentally changed, that is, the number of records in table x_1 - tabl_b1; x_2 - tabl_b2 The number of records in the table; x_3 - tabl_b3 of records in tabl_b3 tables; x_4 - tabl_b4 The number of records in the table; x_5 - tabl_b5 The number of records in the table.

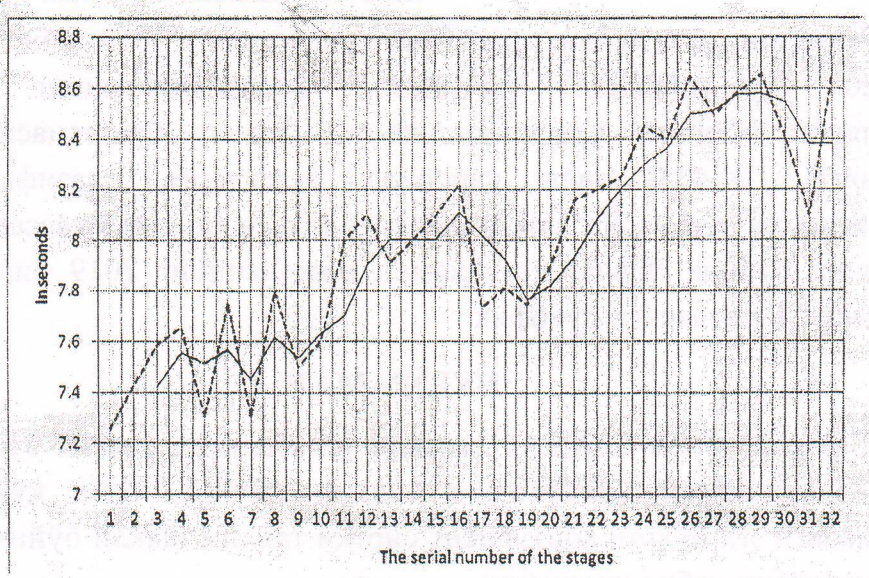

Figure 2. Estimated and actual values of the time required to perform the "Warehouse Statement Action" functional operation.

On the above mentioned Figure 2, blue line means "calculated amount" where black one is average amount as whole .

The main factors in our experiment are x_1, x_2, x_3, x_4,and para-meter, and x_5 as an assistant. Table 3 below gives you the values to be given to the factors that make the experiment active

3- Table

The value of the factor level

	x_1	x_2	x_3	x_4	x_5
Major level	5000	5000	5000	5000	1000
Change interval	2000	2000	2000	2000	-
High level	7000	7000	7000	7000	1000
Lower level	3000	3000	3000	3000	1000

The validity of the functional run time can be found in the following regression equation:

$$y = 9,16 + 0,2x_1 + 0,12x_2 + 0,26x_3 + 0,11x_4 + 0,01x_5$$

When the degree of freedom is 26, the dispersion is 0.05. Checking the uniformity of dispersions was based on the criteria of the Cochrane. If the calculated value of this criterion is equal to 0.0882, the tablet is 0.2756, that is, the hypothesis of the uniformity of dispersion is confirmed when the significance level is 5%. The calculated dispersion value s2y = 0.031

The calculated values of the t-criterion for regression equation coefficients are monon 6,51; 4,04; 8.04; 3,35; 0.39. The table's t-criterion is equal to 2,059, meaning coefficients x1, x2, x3, x4. In other factors, where the level of significance was 5%, the coefficients were not significant.

The F criterion for the equation obtained is 1.57. The table value of the Fisher krite- ri is 3.3, ie when the significance level is 5%, the inadequacy of the linear model is denied.

Thus, the regression equation for the "Warehouse report" functional operation in the BEST-office EIS is as follows:

$$y = 9,16 + 0,2x_1 + 0,12x_2 + 0,26x_3 + 0,11x_4$$

The estimated and actual values of the functional time spent on this model are shown in Figure 3 below.

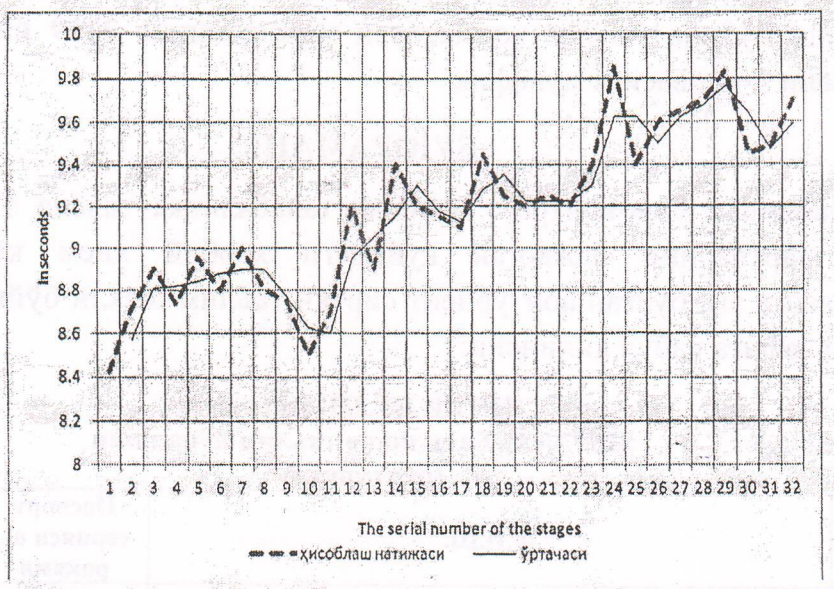

Figure 3. "Warehouse report" is the estimated and actual values of the time required for the functional operation.

We carry out extreme experiments at BEM. Below we make a full-fledged experiment to assess the typical configuration of the "BEM" as a part of EIS. We analyze the functional operation of " Record of the remains of seized goods ". In our study, we have analyzed the impact of the following factors: x_1 - "Registration of residual goods in a canteen"; x_2 - The certificate of "warehouse of material resources"; x_3 - "Removal of material resources"; x_4 - Reference ID "Nomenclature"; x_5 - "Measurement unit" document.

The planning was carried out on two levels. When using the BEM, the correlation interval and key factors are given in Table 4 below.

Table 4. The value of the factor level

	X_1	X_2	X_3	X_4	X_5
Major point	5000	5000	5000	700	700
Change interval	2000	2000	2000	-	-
High level	7000	7000	7000	700	700
Lower level	3000	3000	3000	700	700

The experiments were conducted in parallel with three experiments. Following the results of the experiments on the functional operation of the "Record of the remains of seized goods", the following equation was obtained:

$$y = 7,99 + 0,26\,x_1 + 0,1x_2 + 0,3x_3 + 0,03x_4 + 0,04x_5$$

Checking the duplicate dispersions was conducted according to the criteria of Kohren. The estimated value of the criterion was 0.112, and the tablet was 0.2756, which means that the dispersibility is identical. Fisher's criterion was used to verify equivalence. If the calculated value is 2.31, the table value is 3.3, for instance, this model is adequate. The calculated value of the t-criterion for the coefficients b_1, b_2, b_3, b_4, b_5 is monon 9.34; 3.79; 10.83; 1.12; 1.61, the value of the level of 5% was equal to 2.059. Thus, the final outcome of the regression equation for the functional operation of the " Record of the remains of seized goods " is as follows:

$$y = 7,99 + 0,26x_1 + 0,1x_2 + 0,3x_3$$

The predictive and actual values of the timely execution of the functional operation of the " Record of the remains of seized goods " based on the model above are given in Figure 5 below.

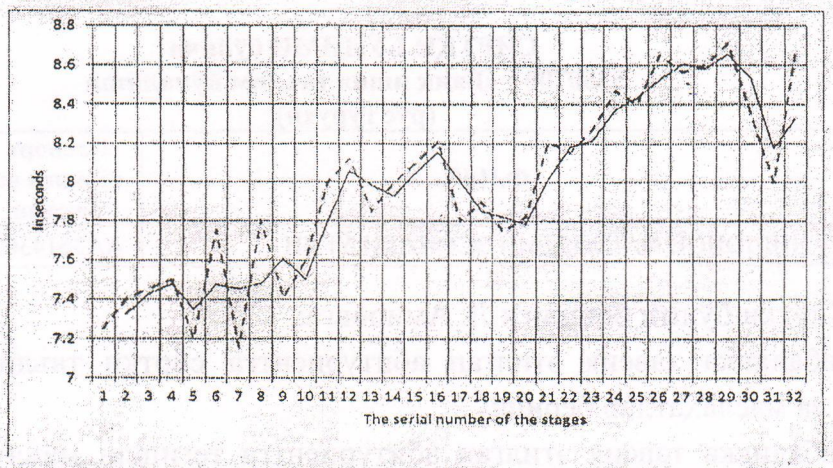

Figure 5. Estimated and actual values of the time required to perform the functional operation of a warehouse trademark.

The main results of our researches and experiments have been summarized in Table 5 below for each EIS.

Table 5. The results of active experiments on economic information systems designed for several small businesses

Operations	Capacity of information				
		Parus	Galaxy-start	BEST-office	BEM
Average time of operation		9,29	11,235	9,97	8,95
Operations in one sequence		0,02	0,018	0,099	0,111
Interface fraud		94 %	91 %	93 %	98 %
The availability of the system		99 %	99 %	99 %	99 %
Average time of operation		10,23	11,88	11,28	11,41
Changes in %		10,14 %	5,7 %	13,1 %	11,41 %
Operations in one sequence		0,019	0,016	0,094	0,1
Interface fraud		91 %	90 %	91 %	95 %
The availability of the system		90 %	88 %	91 %	93 %

As you can see from the table above, the best results for functional operations are displayed by the Parus and BEM Economic Information Systems (EISs). Parus as a part of EISs reduced the rate of operation by five operators simultaneously with one functional operation, and the value of the " Operation in seconds " indicator decreased significantly. When data enlargement is increased three times, we can observe a significant decrease in EIS speed, with the exception of Galaxy-Start, which slows down to 10%.

In summary, in this section, we evaluate the efficiency of the four economic information systems, which formally comprise original regression models that can provide baseline conclusions on the impact of information systems on functional operations. The use of EIS's consumer quality assessment tools significantly reduced the time of conducting an active expedition.

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