Statistical Research in Evaluation of Human Resources Performance in Rail Transport

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- **Abstract**. The world economical reality from the last years allows the making evident of some indubitable defining features: the diversification and the renewal of the goods offer, the progresses in the technology area, the globalization occurence, the growth of clients'and society's exigencies. The analyse of the human resources performance in the railway transport, which is the main goal of this project, aims the identification of the performance indicators of the wage earner on one hand, and on the other hand the presentation of the relations and of correlations between the wage level, the work age, the work conditions and the requirements of the workplaces for the wage earner from the Constanta CFR railway station.

- **Keywords**. Performance indicators, rail transport, human resources

Introduction

The application of the evaluation methods must be sustained by the entire managerial group for maximum efficiency. The lack of this support only damages the response to the evaluation. But, not all the research have investigated the effects of implementation upon the managerial systems at RU, I am talking about the growth of the performance of the firm. On the contrary, some scientists say that the general effects of this process are expensive and time consuming , or raise the bureaucracy.

In this context, one of the directions of the research is the testing of quantity and quality of the relation between the different practices (methods, techniques and instruments) of the management system of quality and performance of the firm.

The objects and the relevance of the research

- **The purpose of the research project "Statistical research in evaluation of human resource performance in rail transport" was to offer managers modules, methods and work instruments in quantity and quality for the evaluation of the performance management system of RU.**

- The research problem is actual and opportune one because during the market transition, when the preparations where made for Romania to enter the UE, the Romanian organizations must become more efficient if they want to keep up at the new contestants gallop.

- The research problem is tide to a practical problem because it will offer managers methods, models and quantity work instruments for the evaluation of the performance program referred to quality and choosing the best decision.

- The research problem covers a small researched domain not only in the Romanian Specialty Literature but also on an international scale. Until now, in the specialty literature, the effects of the different practices of management systems of RU where poorly treated. The majority of the studies done for this purpose were quality investigations with the search for the improvement of the quality

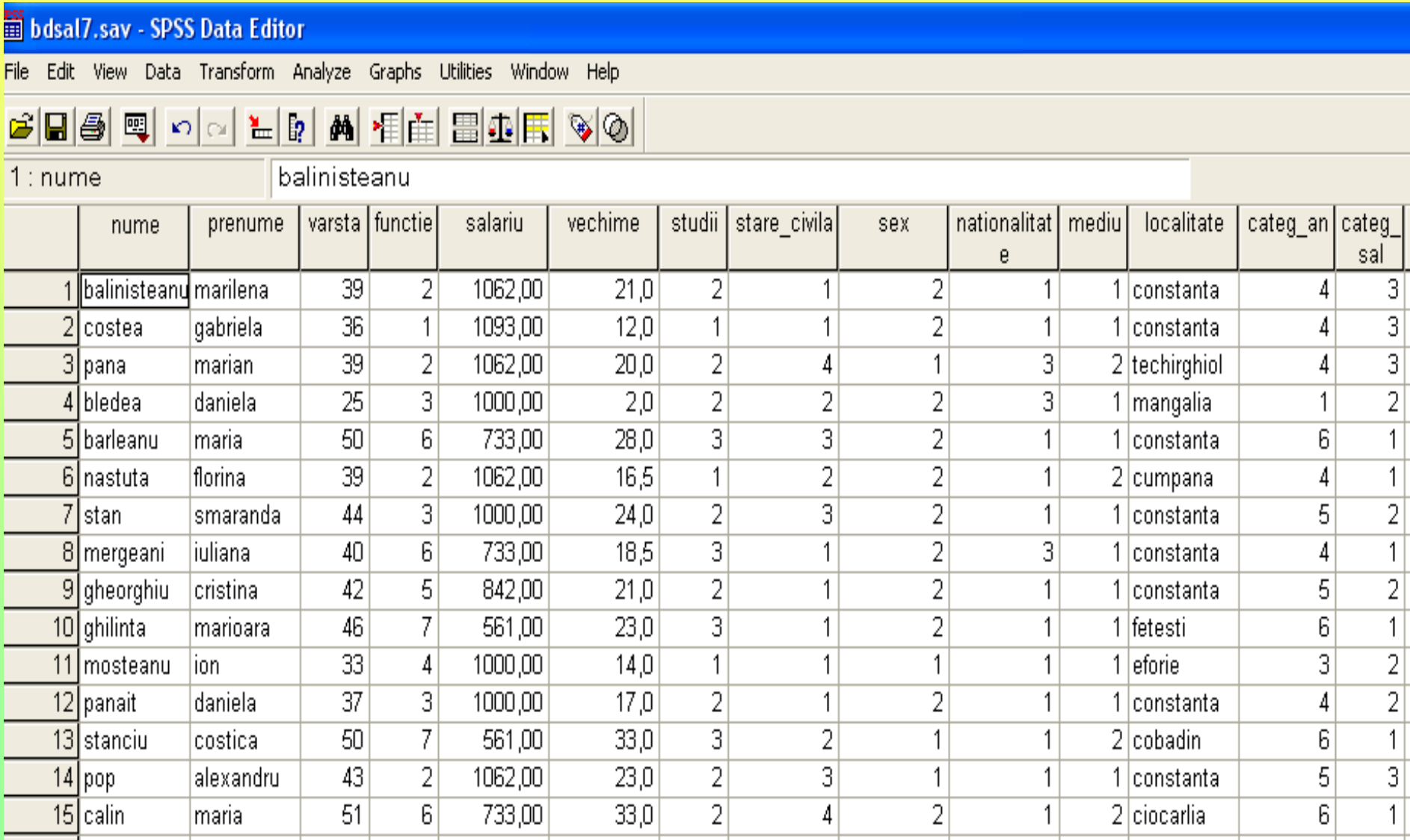
Research methodology

- The analysis of the performance of the human resources in railway transport, which is the main objective of this project, it searches for the performance indicators of the employees and, in parallel, the presentation of the ties and the correlations between the levels of the valorizations, the experience, work conditions and the demands of the post of the employees from the Constanta CFR station. At the same time, we have to determine the elements that will lead to the growth of the performances of the RU in the activity of the railway transport.

- The creation of the data folder has at its base the information given by the department of the Human Resources from within the C.N. CFR Regional Infrastructure Constanta. Initially there were only 14 variables (3 nominals and 11 numerical) and these were: name, surname, sex, nationality, salary, age, environment of providence, knowledge level, position, age categories, salary categories, location, marital status and experience. Afterwards there were 3 numerical variables introduced: experience bonus, brut salary and tax.

Research tools used

Figure no.1. The database with the employees of the CFR Constanta



bdsal7.sav - SPSS Data Editor

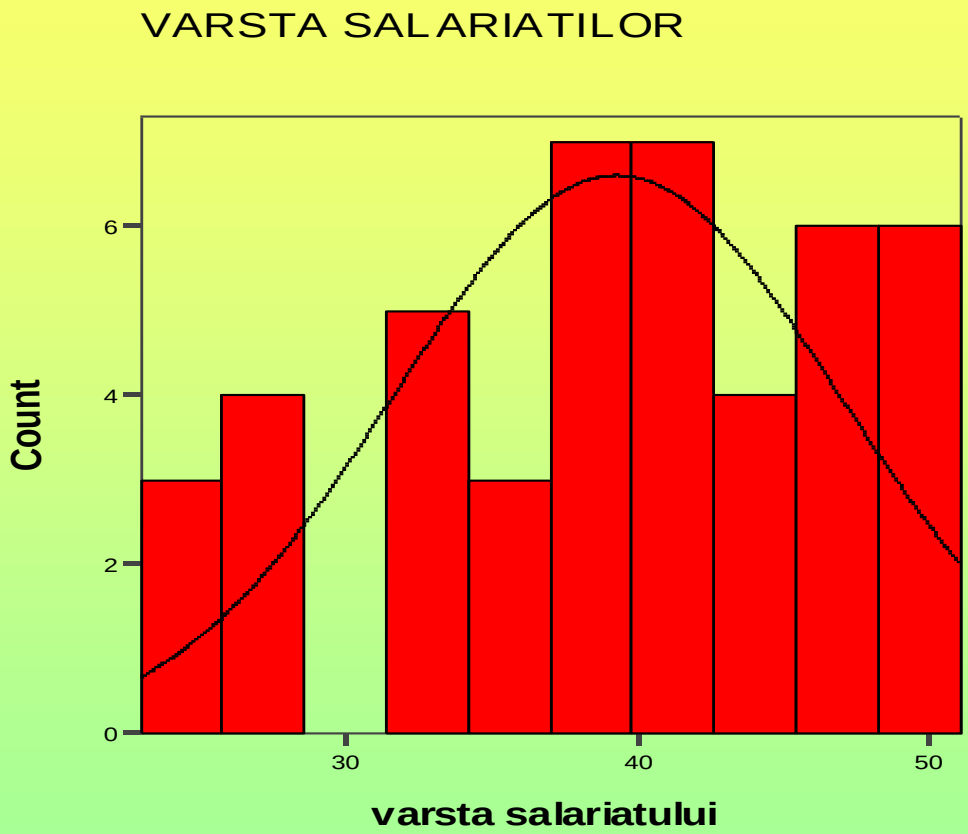
File Edit View Data Transform Analyze Graphs Utilities Window Help

1 : nume balinisteanu

	nume	prenume	varsta	functie	salariu	vechime	studii	stare_civila	sex	nationalitate	mediu	localitate	categ_an	categ_sal
1	balinisteanu	marilena	39	2	1062,00	21,0	2	1	2	1	1	constanta	4	3
2	costea	gabriela	36	1	1093,00	12,0	1	1	2	1	1	constanta	4	3
3	pana	marian	39	2	1062,00	20,0	2	4	1	3	2	techirghiol	4	3
4	bledea	daniela	25	3	1000,00	2,0	2	2	2	3	1	mangalia	1	2
5	barleanu	maria	50	6	733,00	28,0	3	3	2	1	1	constanta	6	1
6	nastuta	florina	39	2	1062,00	16,5	1	2	2	1	2	cumpana	4	1
7	stan	smaranda	44	3	1000,00	24,0	2	3	2	1	1	constanta	5	2
8	mergeani	iuliana	40	6	733,00	18,5	3	1	2	3	1	constanta	4	1
9	gheorghiu	cristina	42	5	842,00	21,0	2	1	2	1	1	constanta	5	2
10	ghilinta	marioara	46	7	561,00	23,0	3	1	2	1	1	fetesti	6	1
11	mosteanu	ion	33	4	1000,00	14,0	1	1	1	1	1	eforie	3	2
12	panait	daniela	37	3	1000,00	17,0	2	1	2	1	1	constanta	4	2
13	stanciu	costica	50	7	561,00	33,0	3	2	1	1	2	cobadin	6	1
14	pop	alexandru	43	2	1062,00	23,0	2	3	1	1	1	constanta	5	3
15	calin	maria	51	6	733,00	33,0	2	4	2	1	2	ciocarlia	6	1

Results and discussions

Figure no. 2. The histogram and the Frequency curve for the age variable



The graphics represent in a synthetic way, under visual form, a static distribution. With the help of the graphics we could have, from a single look, an overall view of the data. The choice of the graphic for the representation of a distribution is made depending on the followed reason and depends, essentially, on the number of the considered variables, and also the their type.

Following the construction algorithm, we obtained the histogram for the distribution for the employees after age, from which we can observe, that the list is selected after age on the left, prevailing the adult class. The classes 38-42 and 46-50 years have the highest frequency, adding up to approximately half of the personal volume.

Results and discussions

Figure no. 3
The BAR diagram for study variable using GRAPH

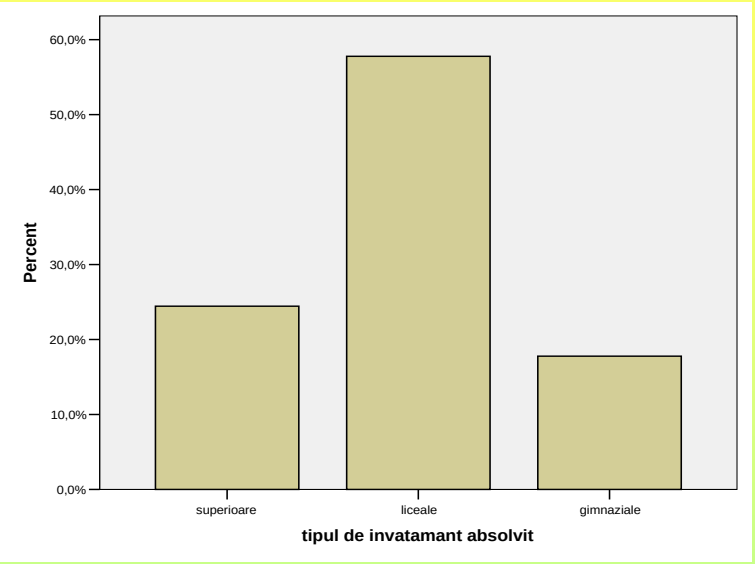
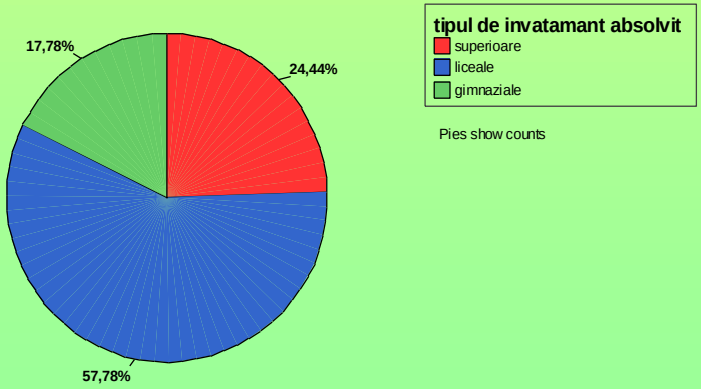


Figure no. 4. The PIE diagram for study variable using GRAPH



As you can see from the figure number 3 and4 , according to the knowledge level the employees with mid-school degrees (57.78%) are more than the ones with superior degrees (24.44%). The structural diagram (Pie Chart) and the bar diagram (Bar Chart) are o way to synthesize a set of nominal data. Each circle sector of the Pie diagram represents a category, its area being direct proportional with the number of cases within this category of the nominal variable. The Bar diagram is often used for the illustration of the categories of a distribution, in a convenient way. The Bar has the same base, equal with the unit, and the height is proportional with the category frequency, as such the area of each bar represents the number of considered categorized cases.

The indicator of the central tendency expresses in a synthetic and generalized way, what is a distribution from the statistics variable point of view. The dispersion represents the scattering phenomenon of the individual values of the X variable, unto the medium level.

Results and discussions

Table no. 1. The distribution parameters employees' age and framed salary

Descriptives

			Statistic	Std. Error
varsta salariatului	Mean		39,24	1,136
	95% Confidence Interval for Mean	Lower Bound	36,96	
		Upper Bound	41,53	
	5% Trimmed Mean		39,49	
	Median		40,00	
	Variance		58,053	
	Std. Deviation		7,619	
	Minimum		23	
	Maximum		51	
	Range		28	
	Interquartile Range		13	
	Skewness		-,491	,354
	Kurtosis		-,569	,695

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The calculus for the central indicators tendency, dispersion and the form for a unique-variety statistic distribution with the help of SPSS can be realized through more than one ways. The mostly used way is: *Analysis* menu, *Descriptive Statistics* command, *Descriptive* option, which opens the dialog box with the same title from which will select the variable/variables for which we wish to calculate the distributions parameters, also the indicators that follows the calculus.

Interpretation of research results

- The asymmetrical coefficient (skewness) in the case of the variable “age”, it starts from -1 and ends at 0. This shows the presence of a negative asymmetrical distribution, with a left departure. This result came from the histogram for the same variable. The same interpretation is for the distribution after “framed salary”.
- The bolt coefficient (kurtosis) is a spreading measure of each observation around a central value. In our case, for both variables it is negative, thus indicating a weaker grouping around the central value, the frequency curve is more flattened and the name of the distribution is “*platicurtiaue distribution*”.
- For the “age” variable, the average is 39.24 years, very close to the median (40 years), and the standard departure (sigma) is 7.69 years has a lower value, and in the same time we can say that the value is next to medium. In this case the interpretation is this one: because the differences of the medium aren’t that big, it results that the average is representative for the table chosen as a database.

Interpretation of research results

*Table no. 2. Distribuţia de frecvenţă "categorii de salarii*categorii de vârstă"*

Count Salariul brut (Euro)		categorii de varsta						Total
		<25 ani	26-30 ani	31-35 ani	36-40 ani	41-45 ani	>45 ani	
categorii de salarii	<800	1	1	0	4	2	8	16
	801-1000	1	0	2	3	4	3	13
	1001-1200	1	3	3	5	2	1	15
	>1201	0	0	0	1	0	0	1
Total		3	4	5	13	8	12	45

The frequency distribution "salary categories*age categories" explains the distribution of the simultaneously observed persons after two considered variables, meaning they show how many persons from each age category have a certain level of income. On the example presented on the 5'th table we can notice that no persons with the age between 31 – 35 years hasn't got their salary lower than 800 euro, meanwhile in the 45 years group the most of them (8) have lower salaries than 800 euro.

We will make two tests: one referred to the average salary, in which, through the null hypothesis we will presume that the salaries of the two groups (urban, rural) don't differ significantly and a second test referred to the salary framed on the sex, in which we will assume through the null hypothesis that there are no big salary differences between males and females.

Interpretation of research results

After we applied the *Independent-Sample T Test*, for the first case, we obtained test t =1,139, with 43 liberty grades and a probability of Sig. De 0.228 (greater than 0.05), which shows us that for the average of these two groups (urban - 946.90 euro and rural – 875 euro) we cannot draw the conclusion that they differ significantly, thus the null hypothesis is accepted. At the same result we arrive observing the differences between the two values. The interval contains the 0 values, as a result we cannot draw the conclusion that the difference between the averages values of the two groups differ significantly .

Table no. 3. The Independent Sample T Test output for the "framed salary-environment"

Group Statistics

	mediu	N	Mean	Std. Deviation	Std. Error Mean
salariul de incadrare	urban	32	946,9063	186,89869	33,03933
	rural	13	875,0000	204,64970	56,75961

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
salariul de incadrare	Equal variances assumed	1,498	,228	1,139	43	,261	71,90625	63,15397	-55,45586	199,26836
	Equal variances not assumed			1,095	20,594	,286	71,90625	65,67535	-64,83709	208,64959

The testing of the correlations coefficient starts from the hypothesis that there is no correlation between the variables. The hypothesis verification H0 is made with the help of the t test for the simple correlation coefficient. The calculated value of t is compared with the theoretical value taken from the t table (Student), for n-2 liberty degrees and the set significant level. If *t calc.>t table, then the H0 is denied*, and the conclusion is, normally with a considerable risk (5%), that the value of the correlation coefficient is not equal with 0; meaning, that between the researched variables there is a significant tie, this meaning that the correlation coefficient is significantly statistic.

Interpretation of research results

For the correlations analysis between the *age and tax* variables, through the H0 hypothesis we assume that there is no tie between the paid tax by each employee and his age. Undertaking the data we will have:

Table no. 5. Output SPSS for the correlation analysis

Correlations

		varsta salariatului	IMPOZIT
varsta salariatului	Pearson Correlation	1	-,365*
	Sig. (2-tailed)		,014
	N	45	45
IMPOZIT	Pearson Correlation	-,365*	1
	Sig. (2-tailed)	,014	
	N	45	45

*. Correlation is significant at the 0.05 level (2-tailed).

Interpretation. For the considered example, we obtained a Pearson correlation coefficient equal with -0.365, suggesting that the between the variables there is a inverse correlation, weak, the coefficient's value being negative and closer to 0 than it is to 1. The coefficient's correlation test it is done with the help of the t test. The Sig. corresponding value, equal with 0.014, is smaller than 0.05, accepting the null hypothesis, meaning that between the two variables (tax and age) there is no significant correlation.

Interpretation of research results

To example this kind of correlation we chosen a second case, in which I want to analysis the correlation between *tax* and *brut salary*. Through the H0 hypothesis I presume that there is no connection between the paid tax by each employee and the brut salary. Undertaking, we have:

Table no. 6. Output SPSS for the correlation analysis (second case)

Correlations

		IMPOZIT	SAL_BRUT
IMPOZIT	Pearson Correlation	1	1,000**
	Sig. (2-tailed)		,000
	N	45	45
SAL_BRUT	Pearson Correlation	1,000**	1
	Sig. (2-tailed)	,000	
	N	45	45

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation. For the considered example, we have a Pearson correlation coefficient equal with, this meaning that between the variables there is a direct link, perfect, the coefficient value being positive and exactly 1.

Conclusions

The objective of project "Statistical Research in Evaluation of Human Resources Performance in Rail Transport" was to offer managers templates, methods, quantity and quality work instruments for the evaluation of the quality management system.
Among the top contributions of research for the development of knowledge in the area of expertise we can remember:

- The development of a conceptual frame and a coherent research methodology, which will permit the quantity and quality study of the system management performance of quality in the rail transport.
- The base terminology for the classification and systematization of the system management performance of quality.
- Broadening the known horizon and the development of the existing information volume in the appreciation of the system management performance of quality.
- The discussions of certain models and performance evaluation existent in the specialty literature.
- The development of an own model of system management performance quality.
-The construction of relevant performance indicators for the performance evaluation of the quality management system.

As a direct future research, the author proposes to develop and implement a soft which will permit the constant monitoring of the system management performance of the RU with specific quantitative indicators.

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