Human Capital in Russian Power Generating Corporations

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Abstract. The Russian energy industry is on the verge of major changes. The potential of existing technologies has been exhausted, and to ensure economic growth, the development and implementation of new approaches in the field of electricity generation is necessary. The human capital of enterprises is the most important driver of changes in the energy sector. The purpose of the article is to analyze the influence of factors characterizing human capital on the effectiveness of Russian power generating corporations. The study found that the efficiency of power generating corporations is most strongly influenced by the share of managers in the structure of employment and labor productivity. Such indicators as the share of specialists with higher education and staff turnover did not significantly affect the efficiency of power generating corporations.

1 Introduction

The electric power industry in Russia is basic. It implements processes such as production, transmission, distribution of electricity. The electricity industry is closely connected with all economic sectors, providing the latter with the necessary amount of electricity and heat, as well as receiving resources in return for its functioning. The role of this industry in the modern world is extremely important for the socio-economic development of the country, since energy consumption affects all spheres of human activity. The emergence of new economic sectors, the impact of scientific and technological progress, improving the quality and conditions of human life, etc. contribute to the expansion of the scope of use of electric power capacities, require increased requirements for uninterrupted and high-quality supply of electricity. At this stage, there is a need to create more efficient and durable materials, equipment, introduce modern technologies that meet international standards.

Human capital is an important element for the development of the electric power industry in any country. It is employees who are the main asset of any company operating in this industry, since they play one of the key roles both in increasing the competitiveness of the company and, in general, affect the development of the national electric power industry. Today, the development of the electric power industry is impossible to imagine without an effective approach to human capital management, implemented within each enterprise in this area.

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The problem of the development of human capital in corporations is in the focus of attention of modern researchers. The main areas of in-depth analysis of this problem are investments in human capital [1], the development of small and medium enterprises through the use of human capital [2-6], resource saving and effective HR-management [7-9], macroeconomic and financial aspects of human development capital [10-14].

2 Methodology and Data

The study is based on an empirical methodology. The work uses the FIRA PRO database, from which data on the largest companies working in the field of Russian electricity generation are extracted using industry filters and filters according to the number of employees. Further, according to data from the websites of these companies, as well as publicly available reports, information is obtained on the dynamics and structure of personnel, as well as their turnover. The study period: from 2016 to 2018. We analyze 9 corporations that differ in location and scale of activity, as well as in the form and structure of ownership (PJSC "MOSENERGO", PJSC "TGK-1", PJSC "ENEL RUSSIA", PJSC "QUADRA", PJSC "YAKUTSKENERGO", JSC " HYDROREMONT-VKK ", PJSC" SAKHALINENERGO ", PJSC" KGC ", JSC" UESK "). The study tests a number of hypotheses:

1. The effectiveness of Russian power generating corporations is affected by the share of administrators and managers in the employment structure
2. The efficiency of Russian power generating corporations is affected by the proportion of employees with higher education
3. The effectiveness of Russian power generating corporations is affected by staff turnover
4. The productivity of Russian power generating corporations is affected by labor productivity

Efficiency is measured by return on sales (ROS), and the degree of influence is estimated by a linear correlation coefficient.

3 Results

The results of the search and retrieval of data we obtain table 1 and table 2

Table 1 Source financial and HR data of Russian power generating corporations

Power generating corporations	Gross revenue, bln. RUR			Net profit, mln. RUR			Employees, persons		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
MOSENERGO	190.3	196.8	199.0	11,062	25,282	23,770	8,134	7,908	7,495
TGK-1	74.5	82.9	87.1	3,636	7,261	7,099	6,485	6,436	6,492
ENEL RUSSIA	72.4	74.5	73.5	5,083	5,942	5,081	2,639	2,552	2,496
QUADRA	49.3	51.4	53.4	-1,565	602	969	10,752	10,912	10,790
YAKUTSKENERGO	26.5	29.0	34.6	132	12	30	5,187	5,263	5,322
HYDROREMONT-VKK	10.4	6.9	8.0	154	345	106	3,208	3,459	3,761
SAKHALINENERGO	9.8	10.7	12.1	579	92	1,000	3,198	3,217	2,668
KGC	7.1	7.3	7.6	302	385	309	2,589	2,482	2,236
UESK	1.1	3.4	3.6	33	-19	-62	1,036	1,054	1,043

The data presented in table 2 are calculated. They are obtained on the basis of commonly used formulas. These data will be used to test formulated hypotheses as explanatory variables.

Table 2. Characteristics of HRM in Russian power generating corporations

Power generating corporations	Share of administrators and managers in employment,% (X_1)			Share of employee with bachelor degree or higher, % (X_2)			Staff turnover, % (X_3)		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
MOSENERGO	34.2	34.9	37.1	50.0	52.0	56.2	5.2	6.4	7.0
TGK-1	24.8	25.1	25.6	54.8	53.4	54.4	4.8	5.6	6.2
ENEL RUSSIA	16.6	17.2	17.2	62.7	64.8	65.6	8.8	8.4	10.3
QUADRA	16.7	17.1	17.4	40.9	41.7	43.7	4,4	5,2	5,3
YAKUTSKENERGO	15.4	15.3	15.1	41.2	42.5	43.1	4.6	5.3	5.6
HYDROREMONT-VKK	13.7	13.4	13.1	31.4	35.0	35.7	8.9	10.2	9.8
SAKHALINENERGO	15.9	16.0	16.6	35.0	36.7	35.4	3.6	3.7	3.8
KGC	11.8	12.2	12.6	20.7	21.5	21.7	9.0	13.0	17.0
UESK	15.8	15.5	15.3	23.1	24.2	24.9	6.6	4.4	5.5

The data obtained indicate the heterogeneity of the sample: the company's revenue varies from 199 billion rubles. up to 3.6 billion rubles. (according to 2018), net profit - from -7 billion rubles. up to 23 billion rubles, according to the number of employees, from 1 thousand people to 10.7 thousand people. At the same time, there is no direct relationship between these three indicators. It is indicative of the facts that out of 30 companies, according to the selected criteria that fell into the sample, only 10 in the public domain have complete information about the structure of human capital and staff turnover. The indicators calculated on the basis of the obtained data also indicate the absence of uniform standards and personnel policies in the industry. Despite the fact that for most company's staff turnover was 3-6%, which corresponds to the average economy, a number of companies experienced significantly higher staff turnover (up to 17%). The share of managers varied significantly, while in larger companies it was usually larger (up to 37.1%), and with a tendency to increase. This is a very large share - up to 5 bosses per 10 employees. The share of employees with higher education showed similar trends: for large companies this share is higher (50-65%), and for smaller companies - about 20%, and from 2016 to 2018 this indicator is growing.

Based on the calculations, the values of the most important indicators in terms of human resource management are determined: return on sales and labor productivity (table 3). This data will also be used to test hypotheses as dependent and explanatory variables, respectively.

Table 3. Return on sales and labor productivity of Russian power generating corporations

Power generating corporations	Return on sales, % (Y)			Labor productivity, mln.RUR per man (X_4)		
	2016	2017	2018	2016	2017	2018
MOSENERGO	5.8	12.8	11.9	23.4	24.9	26.6
TGK-1	4.9	8.8	8.2	11.5	12.9	13.4
ENEL RUSSIA	7.0	8.0	6.9	27.4	29.2	29.4
QUADRA	-3.2	1.2	1.8	4.6	4.7	4.9
YAKUTSKENERGO	0.5	0.0	0.1	5.1	5.5	6.5
HYDROREMONT-VKK	1.5	5.0	1.3	3.2	2.0	2.1
SAKHALINENERGO	5.9	0.9	8.3	3.1	3.3	4.5
KGC	4.3	5.3	4.1	2.7	2.9	3.4
UESK	3.0	-0.6	-1.7	1.1	3.2	3.4

Linear correlation coefficients are calculated to test formulated hypotheses. These values are compared with the critical (for significance level 0.05) equal to 0.6414 (table 4). According to our calculations, at a 5% significance level, hypotheses about the influence of the share of administrators and managers (X_1) and labor productivity (X_4) on the efficiency of power generation corporations are partially confirmed. In both cases, the influence of

factors of medium strength and direct.

Table 4. Linear correlation coefficients with Y (ROS) year by year

	X1	X2	X3	X4
2016	0.328	0.308	0.214	0.552
2017	0.747	0.583	0.348	0.762
2018	0.746	0.582	-0.006	0.683

The analysis is supplemented by the calculation of linear correlation coefficients for lag dependence (factors - 2016, the resulting feature - 2017 and 2018), table 5. The calculations confirm the results obtained: the share of administrators and managers and labor productivity have the most significant impact on return on sales. Fig. 1 and 2 shows scatter plots for relationship between X_1 and Y (fig.1) and X_4 and Y (fig.2) for 2017.

Table 5. Linear correlation coefficients with Y (ROS) with lags

	X1	X2	X3	X4
Y 2017	0.729	0.579	0.238	0.781
Y 2018	0.712	0.582	-0.208	0.673

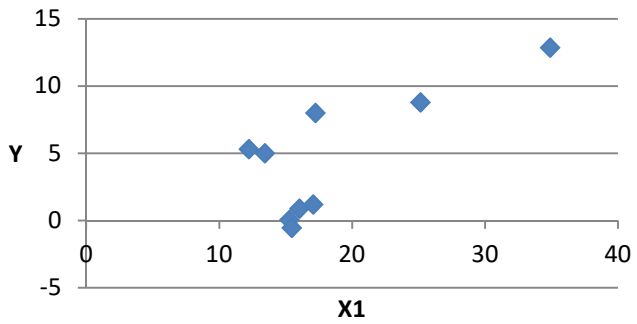

Fig. 1 Scatter plot for relationship between the share of administrators and managers (X_1) and return on sales (Y) in 2017

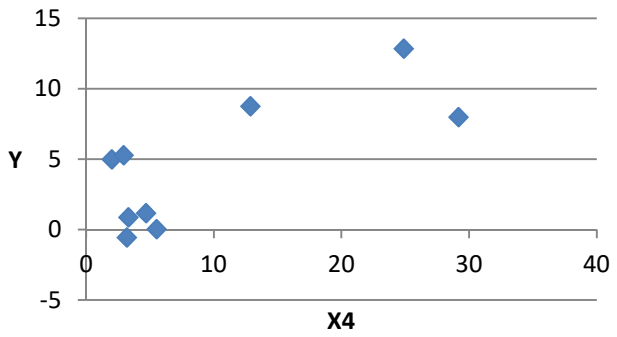

Fig. 2 Scatter plot for relationship between labour productivity (X_4) and return on sales (Y) in 2017

An additional analysis of the correlation of independent variables showed that both (X1 and X4) can be used to build a regression model. Using the least squares method, the parameters of the linear regression model were estimated in 2017:

$$Y = 0.1375X_1 + 0.2320X_4 \quad (1)$$

The resulting model has an R-squarred 0.7438, which indicates its satisfactory quality.

4 Conclusion

As a result of the study, it was found that indicators reflecting human capital in Russian power generation corporations have an impact on their effectiveness. At a five percent significance level, the hypothesis of the significant influence of the share of managers and labor productivity on the effectiveness of the corporation is confirmed. The conclusion about the causal nature of these dependencies was made on the basis that not only the "year-to-year" correlation, but also the lag correlation of precisely these indicators with return on sales turned out to be statistically significant. The other two factors analyzed, the share of employees with higher education and staff turnover, did not significantly affect the efficiency of power generation corporations. This may be due to the small sample size, but it may also indicate that these factors currently do not really have an effect.

Promising areas for further research may be related to:

1. An increase in sample size due to a deeper search for information on the use of human capital in other power generation corporations
2. Analysis of the dynamics of the use of human capital in power generation corporations in 2000-25, the identification of trends and the construction of dynamic factor models
3. Identification of groups of power generation corporations with homogeneous
4. Analysis of qualitative factors affecting the efficiency of use of human capital in Russian power generation corporations
5. Addition to the analysis of the use of human capital in corporations of related industries (electricity transmission, heat generation, distribution of various types of energy)

Based on the results of the study, we can say about the lack of a unified personnel policy in the electric power industry. At the same time, human capital and personnel policies have a direct impact on the effectiveness of Russian power generating corporations, and therefore it is especially important for companies operating in this industry to focus on their human capital, considering it from the point of view of one of the main active assets. It is necessary not only a special approach to the process of investing in human capital at each enterprise, but also a competent, high-quality personnel policy that can fully realize the existing potential of employees in order to achieve greater economic effect both within the enterprise and within the entire electric power industry.

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