

Corporate education in personnel training for engineering and civil engineering industries

Kirill Kazantsev^{1,2,*}

¹Institute of Economics and Industrial Engineering, Siberian Branch, Russian Academy of Sciences, 17, Lavrentiev ave., Novosibirsk, Russia

²Novosibirsk State University, 2, Pirogova Str., 630090, Novosibirsk, Russia

Abstract. Period of active global cybernation and business automation was marked by a problem for Russian employers in the form of a shortage of qualified personnel capable of ensuring the development and competitiveness in world business markets. There was a problem of forming a system for training new human resources that would satisfy the changing economic realities. The Russian Federation had a higher education system as one of the most stable and well-functioning mechanisms for training personnel for all economical sectors until the 90th of the last century, before the country collapse and the beginning of political and economic reforms. An indicator of the system effectiveness was that the graduates of Russian universities were invited to work by well-known corporations from many countries of the world. Over the years of the reforms, Russia has lost its previous model of education, which significantly affects the quality of personnel training today [1]. Many Russian enterprises are forced to follow the path of independent training and specialists retraining. At first, training was organized locally, it was by chance, but Russian entrepreneurs began to adopt foreign experience in forming a knowledge system in a company and even create corporate universities over the time. The study examines preconditions for the system formation and the corporate education market development, provides current models of knowledge accumulation and proposes the author's cognitive model of personnel professional development.

1 Introduction

Global crisis of 2020-2021, caused by the pandemic of the new coronavirus infection COVID-19, forced employers to drastically reconsider their approach to their own personnel policy. The transition to a remote mode of operation and forced emergency shutdown of a significant part of the business processes in various world economical sectors led to the fact that the personnel dependence of business began to be perceived as an additional risk that must be leveled in the long term.

Leading global corporations have been looking for an opportunity to reduce their own business dependence on the quality and fullness of the labor market for a long time. This is superimposed on the global trend of automation and robotization of the business processes.

* Corresponding author: k0rtez@inbox.ru

The world economy is experiencing a five-year boom in robotics, according to the World robotics report, IFR [2], from 2014 to 2019 robotization level of industrial production in the world has grown by 85%. According to Gerry Milton the President of the Robotics World Federation, industrial robots stock is the highest in the history of mankind today.

On this background, the focus of companies' interests is shifting from the use of cheap labor to the search for highly qualified specialists, who are capable of serving increasingly complex business structures. A sharp drop in employers' interest in a low-skilled labor force may become a pretext for a social explosion against the background of growing unemployment and increased competition in the labor market [3]. In fact, it should be admitted that today none of the world educational systems is capable of producing large-scale training of personnel necessary for the "sixth technological order" economy, according which Japan, the USA, South Korea and Germany have been actively moving since 2010, ahead of the previously given forecast about the transition beginning only by 2035 [4].

The existing education system inability to solve the problem of training qualified personnel for the new wave economy, and the lack of a large-scale system of retraining and advanced training leads to the various regulatory theories creation in the labor market, ranging from government regulation of the jobs substitution degree with automation to the adoption of unprecedented measures of social support in the form of an unconditional basic income, which introduction may threaten a global social catastrophe and massive degradation of society, according to some researchers [5].

Today, a significant number of researchers are engaged in solving the problem of personnel training and optimizing the educational process. Thus, the concepts of professional-activity, competence-based and personality-oriented models of education organization are reflected in the works of Russian scientists (P. G. Shchedrovitsky [6], S. N. Chistyakov [7], E. A. Klimov [8], V. A. Bolotov [9] and others). A great contribution to the development of the competence-based approach theory to education was made by foreign researchers, for example, Lyle M. Spencer Jr. and Syne M. Spencer [10].

The author suggests that the most effective solution to the problem lies in the development of corporate education and its interaction with other educational and social institutions today. The objectives of this study are: the state analysis of the qualified specialists in the Russian market, identification of urgent tasks, facing corporate education and analysis of the world's leading practices in the field of corporate education. The study result may be a proposal for a preliminary actual model of the professional knowledge system formation.

2 Methods and materials

The methodological basis of the study was the official Russian and international statistics, scientific works of Russian and foreign researchers on the formation of the corporate education market. The research was carried out, using methods and tools of statistical, systemic, retrospective, comparative and logical analysis.

The statistical basis of the study was data from the Federal State Statistics Service of the Russian Federation, analytical center "SberUniversity" researches, reports of the Analytical Department of Scientific and Technological Development of the Skolkovo Institute of Science and Technology, statistical reviews of the Russian and international rating agencies.

3 Results

Today we can state with regret that years Russia can not claim to move to the "sixth technological order", in terms of the jobs automation level in the next 5–7, the country is not even among the top 20 leaders [2]. On the one hand, this reduces the overall competitiveness of the Russian economy in terms of the production manufacturability and the production cost, on the other hand, it makes it possible to make a softer personnel transition to the business processes automation than in countries, which are at the stage of active transition to a new technological way of life. This seems to be a feasible scenario, taking into account the general level of the personnel potential assessment in Russian enterprises, relative to the global level.

The level of general global personnel training is assessed by the analytical agency Hays together with the Oxford Economics organization in the annual research The Hays Global Skills Index, where the overall level of the personnel qualifications in Russian enterprises ranked 27th out of 33 studied countries, according to the state at the end of 2019 [11]. In a global context, this indicator looks quite presentable.

The basis for the qualified personnel reproduction is of special interest. In its current form, there are only 2 ways to expand it: the education of our own personnel and the attraction of personnel from other countries. Russia is in 43rd place out of 100 (in 2018 - by 48), according to the state at the end of 2020, according to the annual ranking of countries by the level of attraction and the quality of qualified personnel training, published by the INSEAD Institute in cooperation with the Adecco Group and the Human Capital Leadership Institute (HCLI). This indicates a rather weak general professional training of personnel and a decrease in its quality, taking into account the fact that Russia was ranked 18th in this rating in 2010 [12]. This causes a certain degree of concern, although, the personnel base has been quite stable over the past 5 years (Table 1), according to official Russian statistics, but there has been a significant reduction in the management and qualified agricultural workers. And if the latter can only hit directly on the agricultural and related industries, then the reduction of managers in absolute and relative terms can lead to a loss of overall manageability and a decrease in the level of training at enterprises of all economical sectors. The general aging of staff and increasing need of employers for specialists of retirement age are also of concern.

Table 1. Composition of qualified specialists at Russian enterprises in 2015–2019, thousand people.
Source: Rosstat data: Russia in figures, 2020.

Professional category	2015	2016	2017	2018	2019
Total	72 324	72 393	72 316	72 532	71 933
Leaders	6 253	5 090	4 919	4 766	4 354
in% of the total	8.6	7.0	6.8	6.6	6.1
Specialists of the highest qualification level	14 740	17 212	17 596	17 819	17 948
in% of the total	20.4	23.8	24.3	24.6	24.9
Intermediate level specialists	11 080	9 441	9 544	9 390	9 999
in% of the total	15.3	13.0	13.2	12.9	13.9
Skilled workers in agriculture, forestry, fish farming and fisheries	2 424	2 486	1 814	1 806	1 742
in% of the total	3.4	3.4	2.5	2.5	2.4
Skilled workers in industry, civil engineering, transport and related occupations	9 481	9 387	9 573	9 717	9 661

in% of the total	13.1	13.0	13.2	13.3	13.4
Total qualified specialists	43 978	43 616	43 446	43 498	43704
in% of the total	60.8	60.3	60	59.6	60.8
% of employed men of retirement age	4.9	5.0	5.4	5.9	6.1
% of employed women of retirement age	14,3	14,6	14,9	15,6	16.3
Average age of employees, years	40.6	40.7	40.9	41.1	41.3

Within the framework of this study, the author studied relevant research on the satisfaction of employers with the education quality of specialists, graduated from Russian higher educational institutions. Unfortunately, none of the studies analyzed seemed complex enough to present its results in this paper. However, it is possible to single out individual indicators over the past 5 years, given in studies on this topic. Thus, in a study by Astrakhan State University [13], overall satisfaction with education in terms of practical training on the students part is estimated at 53.7%, and on the part of employers at 57.9%, which is a rather low indicator in our opinion, in fact, employers are forced to independently improve their qualifications for more than 40% of graduates. In order to support this position, the same study provides indicators of the education quality, which employers are least satisfied: 50% noted a low level of practical training, 25% noted a lack of a self-development desire, and another 25% noted a low level of general professional training. A.A. Stepanov's study results, held within the framework of the Russian University of Economics. Plekhanov [14], where it was concluded that employers were significantly dissatisfied with the quality of workers training in the Russian Federation as a whole. This reason may be an outdated education system, formed in the industrial era and unable to adapt to the urgent needs of the modern business process.

This situation is solvable in the long term, subject to the coordination of state training programs with the real needs of the market, but in the short term, the problem of personnel retraining completely depends on the employer. All this contributed to the development of the additional professional education market in Russia, which volume is estimated at 93.8 billion rubles according to the state at the end of 2020. [15]. At the same time, the cost of additional education turned out to be incomparably higher than that of university education, as a result, many employers in dire need of a large number of qualified personnel turned to the experience of creating their own corporate universities, which came from the United States.

The first corporate university was the Engineering and Management Institute, which was created in 1927 by General Motors, then the corporate universities creation boom occurred in the 80th in the United States, and in Europe - in the 90th of the last century. In Russia, the first corporate university was founded in 1999 by VimpelCom (now Bee Line) [16]. Today, about 62% of Russian companies conduct training on their own, while only 38% of companies use external resources, according to a study by Theory and Practice [17].

4 Discussion

There are several approaches to the system of professional knowledge formation, analyzing the existing systems of corporate education.

Company model *Teltech*. [18] was presented in 1997 and suggests two development paths:

- 1) The "treasury" model focuses on the accumulation of knowledge and formalization into a single structured information base accessible to all employees (the basis of most modern corporate universities is taken).

2) The “pointer” model is intended for companies that do not have sufficient resources to build a full-fledged corporate university and assumes a situational transfer of knowledge, depending on the current position of the business.

Disadvantage of the *Teltech*. model is only in describing the variation of the knowledge accumulation and transfer, as well as in the assessments absence of the real goals and human resources of a company.

David Sinclair's model takes into account different levels of enterprise organization. On the basis of this model, the Russian agency HR-tv.ru proposed the methodology for building a corporate university (Table 2) [19]. The disadvantage of David Sinclair's model is the "depersonalization" of the enterprise's employees self-interests, ignoring their current level of professional development and involvement in the creative process.

Table 2. The structure of a corporate university building, based on David Sinclair's model.

Organization Analysis Levels	Level components	Substantial nuances, which are important for building a corporate university	Corporate University Programs
System (general business concept of the company)	Business characteristics. Mission, strategy of the company	Mission and philosophy, which are declared and broadcast, the presence of their attributes.	Purposes of creation. Work technology. Mission and ideology. HR strategy and principles
Organizational structure	The structure of business processes.	Job requirements for each company position. Interconnection of existing systems	Business processes
Politics	Distribution of power, information. Key figures	Leaders are like-minded people and opponents. Existing channels of information.	Channels of information that can be used for change management and for internal PR
Corporate culture	Accepted forms of interaction. The system of rituals. Values and norms. Acceptable Behaviors	Declared and maintained values	Aligning the goals and values of employees and the organization, building commitment
Staff	Real qualifications. Systems for the selection, adaptation, training of personnel.	Requirements for employees, their compliance with the required qualifications, adequacy to corporate culture, motivation.	Training and development programs, assessment, adaptation, career building, etc.

As the study result, the author proposed a cognitive model for the system of professional knowledge formation (Fig. 1).

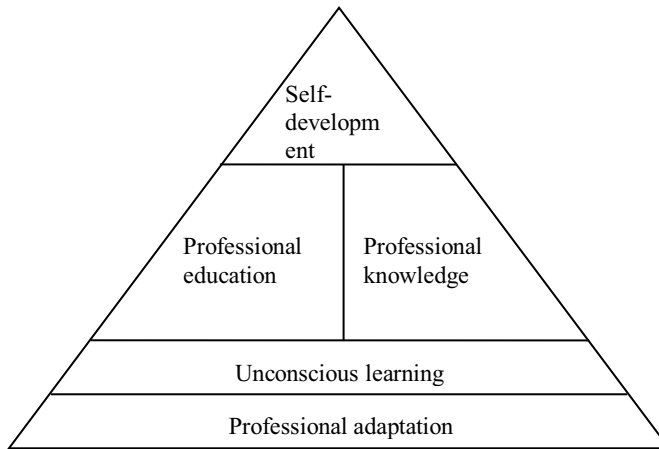


Fig 1. Cognitive model of the professional knowledge system formation (compiled by the author).

Let us describe the blocks of the presented system in details.

Professional adaptation includes introduction to the profession, understanding of one's job responsibilities and the place of the main work process, points of responsibility transfer in the structure of the company's business processes, and also includes adaptation in a specific team.

Unconscious learning involves following unspoken and not declared basic guidelines of the employee's activity, as well as "tuning" the psychophysical state of the employee in the team.

Professional knowledge includes classic concept of corporate training, that is, the transfer of systematized corporate knowledge through a single information environment.

Professional education presupposes "inculcation" of unified industry (non-corporate) work standards to the employee, professional vision formation and development paths as a specialist.

Self-development is a controlled process of an employee self-development with the aim of moving to a new professional level.

5 Conclusion

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Today, increasingly complex business processes and rapidly changing market conditions force employers to invest more and more resources in human resources development. At the same time, both professional knowledge and skills of a particular employee and his ability to adapt to market conditions changing come to the fore.

Most Russian higher educational institutions are focused on transferring a structured system of knowledge and skills to future specialists that fit into the concept of "hard skills" (skills that can be easily taught and measured the learning outcome), however, the current market situation increasingly requires the development of "Soft skills" - universal competencies, which are difficult to measure by quantitative indicators (ability to work in a team, poise, involvement, dedication), but which significantly affect the final result of the employee's work and the competitive advantages formation of the entire enterprise. There are the corporate education system formation and the establishment of its interaction with the higher education system that can give a fairly quick positive result for employers and open up new broad opportunities for personnel training for the Russian economical sectors.

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