Social Responsibility of Engineering Staff Workers as a Factor in the Economic Growth of the National Economy

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Abstract

In the article, the authors justify the importance of the social responsibility of engineering and technical workers in the process of global changes in the economy, including the processes of digitalization and modernization. The relevance of studying the social responsibility of engineering and technical workers is due to the rapid pace of technology development, the need for the process of modernization of the Russian economy. When analyzing the problem, the authors pay special attention to the analysis of the decrease in social responsibility of the employee as a risk situation of the digitalization process of the economy, in which the rash introduction of innovations or the use of software technologies for selfish purposes arises. The importance of engineering activity as a factor of growth of the national economy ensuring safe development and functioning in the "man-technician" system, satisfying the needs of society, and actively developing modern information technologies is considered. The transition of the Russian economy to the stage of information technology makes objective the process of transferring the construction of a "knowledge-based economy," the main carrier of which is the engineer. The level of knowledge of the professional competencies of an engineer, combined with creative potential and social responsibility, becomes an important factor in the economic development of the country and the transition to an innovative socially-oriented level of the Russian economy. The authors presented the results of the sociological analysis of the types and level of social responsibility of engineers in the field of the fuel and energy complex on the example of leading Russian oil refineries.

Keywords

Social responsibility • Engineering activities • Digitalization of the economy • Security of society • Economic development

JEL Code

A14 • O1 • O14 • O15

1 Introduction

The relevance of the study is due to the dependence of innovative processes in the economy on the state of the engineering system. The experience of industrialized countries shows that it is the activities of engineering staff workers (ESW) that affect the development of a new product in demand and its production, thereby driving scientific and technological progress.

Digitalization of economy at the beginning of the twenty-first century gained global character, extending the impact on all branches of economy, including the fuel and energy complex (FEC). New technologies, innovative engineering developments contribute not only to economic development but also impose certain obligations on author's teams.

The responsibility of engineering workers for actions to society, as world practice shows, is an important factor in the development of scientific and technological progress of world economic leaders. It is the engineering innovations developed, including digital information technologies, that ensure the viability of the Chinese, Japanese, Korean and American economies. Other economic conditions, such as the availability of natural and human resources, play a secondary role. Given that the Russian economy of recent decades has been developing with the partial introduction of new equipment and the purchase of foreign technologies, it

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can be stated that the process of innovation of the Russian economy is significantly weakened. The socially responsible activity of engineering workers aimed at creating a competitive product, in our opinion, is one of the leading factors for improving the efficiency of the national economy.

The authors presented a study of the level of social responsibility of engineering workers of Russian oil refining enterprises, analyzed mechanisms that contribute to the development of social responsibility of ESW.

2 Methodology

Most researchers (Ustinova et al., 2016) conclude that the processes of globalization and digitalization of society lead to significant changes in the social system and take the issue of responsibility beyond the assessment of individual behavior. The need for the survival of humanity as a biological species shifts the emphasis in the definition of social responsibility to the analysis of the relationship between the activities of an engineer and the activities of a society focused on certain values.

Based on research (Garanina, 2016), we mean by the social responsibility of engineering and technical workers the integrity of creative performance of professional competencies, taking into account the safety of the results of activities to society.

The innovative transformation of the national economy is inextricably linked to the activities of the ESW, including the creation of new technologies and trends in the development of society, determining the quality of life of citizens of the country and their safety. In this regard, the role of the social responsibility of the engineer increases, as he must analyze the global consequences of activities on the environment and human conditions. New technologies created during the closed cycle of "engineering activity - technology - needs - engineering activity" spread at great speed, increasing the influence of technology on social processes. Researchers (Gaisina et al., 2015) describe how the influence of transnational industrial and information corporations has spread to political power, lobbying the interests of certain segments of the economic elite, radically rebuilding the geopolitical map of the world. The role of technocracy is growing not only in the economy but also in the spiritual sphere of society.

In modern theories of engineering ethics, the topic of social responsibility is given considerable attention. It can be stated that in the works of both Western researchers (R. Merton, H. Jonas, G. Kyung, A. Huning) and Russian researchers (B.I. Kozlov, A.V. Chebotarev, S.I. Gerasimov, and others), the main mission of the engineer is proclaimed not only the competent use of technology for society but the subordination of technology for "service to society.

We consider the engineer's social responsibility as a multifaceted structure, including the following levels:

- Legal level, or responsibility of the engineer before the law for actions;
- Moral level or responsibility towards society in general and social groups in particular;
- A subjective level, or a personal understanding of one's behavior from the point of view of the requirements of society and the desire to meet them.

The researchers (Mechdiev et al., 2018), studying modern engineering transformations in Europe, emphasize that man is the main factor in all changes in technological sphere. At the beginning of the twenty-first century, the role of the level of education of ITR was especially increased in order to ensure that multifunctional equipment is reliable and safe. A safe space for people's lives depends on the engineer's understanding of responsibility for the product he created.

The topic of social responsibility of the engineer does not lose relevance. Therefore, in the middle of the twentieth century, the researcher's theory was popular (Negodaev, 1954) that the process of transforming the surrounding world should take into account possible negative consequences, focusing on a "humane approach to technical modeling," that is, social demands for the creation of new technology. However, researchers (Filippova et al., 2019) conclude that the idea of early industrialization of society, without taking into account the negative consequences of technocratization, nevertheless prevailed in the scientific circles of Soviet scientists.

According to researchers (Kosintseva et al., 2017), when developing digital technologies, it is necessary to focus on universal human values. The denial of moral norms and ideological values leads to an increase in such deviations in economic behavior as cyberbullying, etc. As a result, society will be forced to radically change the lifestyle, limit the growth of technology and humanize them.

In this scientific research (Vasileva et al., 2017) the authors consider that the insufficient volume of financial resources negatively affects development of national economy. First of all, the insufficient investment of finance affects process of modernization of infrastructure of the industrial enterprises. In this regard increase in potential of the Russian engineering system is of particular importance compensating for a lack of financing.

Considering social responsibility of technical workers in terms of orientation of their activity, researchers (Gaisina et al., 2018a, b) focus attention on various attitudes towards environmental safety of engineering workers of the city and the village. Rural experts in professional activity are focused on minimal risks for the environment and society.

Researchers (Kirillova & Kantor, 2011; Popkova, 2012) analyzing a number of factors of economic development of regions of the Russian Federation, specified by one of important factors improvement of a system of management of the enterprises on the basis of social responsibility.

Researchers (Belenkova et al., 2019; Vanchukhina et al., 2018), when studying a role of a human factor as a key resource of development of a technogenic civilization, consider social responsibility as important competence of the expert of production.

3 Results

In order to study the social responsibility of ESW in the fuel and energy complex, an author's specifically sociological study was conducted among employees of "Rosneft" and "Sibur" oil refineries. The survey was conducted by questionnaire method. The sample population was calculated by spontaneous selection and amounted to over 350 people. Expert interviews were conducted among the faculty of technical departments of Ufa State Petroleum Technical University.

The results of the study confirmed our hypothesis that the majority of engineering workers (65.7% of respondents) cannot unambiguously define the results of professional activities as "moral" and "non-moral." The correctness of actions is assessed by them according to the result in each situation. At the same time, respondents analyze actions as aimed at "the good of society," or "to the detriment of society."

It is significant that the opinion of respondents about whether engineers are responsible for the consequences of scientific discoveries is divided. A third of respondents (34.4%) believe that engineers are not responsible for the consequences of discoveries and innovations. Another third of respondents (35.6%) insist on the need to take into account the potential danger from the results of implementations. And finally, the remaining third of respondents (30.0%) believe that the responsibility of ESW depends on the situation and the direction of innovation (Table 1).

As it can be seen from the table, 34.2% of respondents believe that the negative consequences of digitalization of the economy should be foreseen by scientists, 23.1% of respondents are of the opinion that this is the prerogative of officials and heads of regulatory bodies. The responsibility of ITR and enterprise managers was noted by 18.5% and 14.2% of respondents. However, a tenth of the survey participants believes that ordinary citizens should also anticipate the negative consequences of digitalization of the economy.

Most engineers and technicians interviewed by us, assessing the ability to be responsible for professional actions, note the need to perform functions in accordance with orders and regulations (65.0%). Experts from among university workers (100%) noted complete freedom in determining the choice and responsibility for the consequences of scientific developments.

It is significant that 45.0% of respondents believe that the negative consequences of scientific innovations cannot be justified by the need to develop society. At the same time, 40.0% of respondents believe that the negative consequences of scientific discoveries can be partially justified. Only 5% of engineers surveyed believe that negative consequences can be justified.

Let us dwell more on the answers of respondents about personal experience when they had to choose and evaluate professional actions in terms of harming society.

As it can be seen from Table 2, the moral dilemma "morally - not morally" is well familiar to vast majority of respondents. At the same time, nearly a half of the interviewed scientists and engineers of the energy industry enterprises noted that they face this problem of the choice regularly.

In Table 3 the rating of problems of social responsibility which the engineering workers interviewed by us face during the professional activity is shown. Apparently from the drawing, in the first place of ESW put "health saving behavior" (75.0%) as the research was conducted in the period of a pandemic of coronavirus infection of COVID-19. It is natural that desire to make thrifty use of the health and health of people around was reflected in answers of respondents. In the second place, the interviewed engineers put "high-quality performance of work in time" option (54.2%), further with small gap options "responsibility to colleagues" (45.0%) and "ecological aspects of activity"

Table 1 Distribution of respondents' answers to the question "Who in your opinion can foresee the consequences of digitalization of the economy in the first place?" in % of the number of respondents

№.	Answer option	ESW
1	Researchers	34.2
2	Officials, inspection authorities	23.1
3	ESW	18.5
4	Heads of enterprises	14.2
5	Ordinary citizens	10

Source Compiled by the authors

Table 2 Distribution of respondents' answers to the question "How often do you solve the problem of choosing when professional actions harm society?" in %, of the number of respondents

№.	Answer option	ESW	Experts
1	I face this problem regularly	56.0	45.5
2	Encounter sometimes	24.0	34.5
3	Never encountered	15.5	20.0
4	I find it difficult to answer	4,5	–

Source Compiled by the authors

Table 3 Distribution of respondents' answers to the question "What problems of social responsibility in professional activity do you have to solve most often?" in %, of the number of respondents

№.	Answer option	%
1	Quality performance of work on time	54.2
2	Environmental aspects of activities	42.3
3	Responsibility to colleagues	45.0
4	Health saving behavior	75.0
5	Other	12.0

Source Compiled by the authors

Table 4 Respondents' answers to the question "How responsibly do you perform your professional duties?" in %, of the number of respondents

№.	Answer option	ESW
1	Very responsible	56.0
2	to the extent practicable	38.0
3	Activity does not imply liability	6.0

Source Compiled by the authors

(42.3%) follow. The other option was chosen by 12.0% of respondents. As an explanation, they brought such options as "to undertake an initiative", "to carry out duties of "the mentor of the young specialist", "to control a situation in a workplace", "to participate in social projects", "to continue education in a postgraduate study", "to satisfy management requests", etc.

Next, we decided to clarify how the engineers interviewed assess the level of personal responsibility for performing professional duties.

As it can be seen from Table 4, more than half of the engineering respondents (56.0%) adhere to a high assessment of responsibility, another 38.0% chose the option "to the extent practicable".

We will analyze how engineering workers specify social responsibility for activities.

According to the data of Table 5, the interviewed Russian engineers clearly determine for themselves the priorities on which their social responsibility is focused. First of all, these are specific groups of people with whom they are associated with professional activities: management (94.0%) and colleagues (87.0%). We believe that the results of the ranking are determined by the specifics of the vertical model of personnel management in the oil refining industry, which involves building official communications on the basis of orders and orders. In addition, fuel and energy enterprises are one of the most dangerous production facilities in which each employee must strictly fulfill his/her professional duties.

There is a risk that such a "link" in understanding responsibility, instead of society as a whole, to a particular company or employer, may contradict laws and even pose a threat to any social group. Since the interests of the employer can often differ from the standards established by law or society.

However, most of the engineers we interviewed indicated that in activities they also focus on the values of society (82.5%) and the law (70.5%). Such a choice indicates an equal focus of the responsibility of the ESW on socially approved values and norms of the law.

Consider how respondents imagine the mechanisms of the process of forming social responsibility. We suggested that the subjects in the questionnaire answer the question about the timing of starting the formation of the responsibility of engineers. It is clear from the answers of ESW and expert teachers that it is necessary to educate the social responsibility of a specialist in advance, even within the walls of a technical university.

As it can be seen from Table 6, to the question "When should the social responsibility of an engineer be raised?", the most representatives of the ESW (82.5%) and experts (85.0%) chose the answer option "during study at the university", and only 10.5% of surveyed engineers and 15% of experts chose the option "during school".

Table 5 Response rating of respondents to the question "What is the social responsibility for the results of your activity associated with? (you can choose three answer options)", in %, of the number of respondents

№.	Answer option	ESW
1	Responsibility to the manager	94.0
2	Responsibility to colleagues	87.0
3	Responsibility to society	82.5
4	Responsibility to law	70.5
5	Responsibility to family and loved ones	45.0
6	Personal responsibility to moral principles and values	30.0
7	My activities do not imply responsibility	6.0
8	I find it difficult to answer	2.0
9	Another option	–

Source Compiled by the authors

Table 6 Answers of respondents to the question "When should the social responsibility of an engineer be raised?" in %, of the number of respondents

№.	Answer option	ESW	Experts
1	While studying at a university	82.5	85.0
2	While in school	10.5	15.0
3	During work in production	3.0	–
4	I find it difficult to answer	4,0	–

Source Compiled by the authors

Further, it is necessary to find out within which disciplines students should be taught competencies related to professional ethics and social responsibility for the results of activities. According to most experts (64.0%), the mastery of these competencies should take place during an interdisciplinary approach. They reason the opinion with the fact that if to localize a task within only special disciplines, then there will be a narrowing of a concept of social responsibility as need of implementation of duty regulations without violations of labor discipline. Conversely, if we shift the mastery of competencies only to humanitarian disciplines, then the concept will expand before it is considered on a global scale. The results of our survey correlate with the study of scientists (Khairullina et al., 2016).

In order to bring the study of competencies related to social responsibility as close as possible to the student's personality and needs, experts suggest using the following pedagogical techniques:

- Involving students in the drafting of the Code of Engineering Ethics;
- Development of creative activity of young people;
- Discussion with students of topical regional problems;
- Conducting business/role-playing games with a scenario involving the dilemma of choosing an engineer on the scale "morally - not morally";
- Participation of students in volunteer social projects.

Finally, let us consider the recommendations of the experts of the National Academy of Engineering (Byers & Seelig, 2001) that young engineers should be able to calculate the consequences of scientific achievements and inventions. One of the important points of development of the system of engineering education, experts propose to develop social responsibility through the introduction of a system for assessing the activities of an engineer not according to abstract criteria of effectiveness, but according to the influence on the quality of life of society, based on the results of public opinion and orientation on values established in society (ecology, health, safety, etc.).

4 Conclusion

The development of social responsibility of engineering and technical workers is one of the factors for the development of the Russian economy, including ensuring economic security, competitiveness, and importance in the world community.

The transition to the information society, the process of digitalization of the economy makes the issue of the social significance of engineering workers operating complex technical systems especially relevant.

The need to solve global and regional problems of our time actualizes the development of a sense of social responsibility to society among engineering and technical workers.

The results of the author's sociological research make it possible to assert that the values of morality, spirituality and creative validity of the results of the future profession are the

value base for raising the sense of social responsibility of the engineer.

During the study, guidelines for the social responsibility of an engineering employee were determined. The definition of social responsibility is given as the integrity of creative performance of professional competencies taking into account the safety of the results of activities before society.

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