Regression Analysis of Personality and Social-Psychological Correlations of Scientific and Technical Specialists Responsibility

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Abstract. The article presents an empirical study of the relationship of behavioral settings and communicative characteristics of professionals: social flexibility, ability to establish close contacts with the environment, maturity of social behavior (social activity, predisposition to dominance, readiness for changes, radicalism) with the level of their responsibility. Responsibility of the subject in the research was defined as the conscious attitude of a specialist to the fulfillment of all norms and requirements offered to him by society and production. During the empirical research through interviews and standardized surveys, we have studied what personality qualities are considered to be important prerequisites for successful professional activity by professors, scientists, and engineering staff in technical higher education institutions. The array of data obtained was analyzed by the method of step by step inclusion, step by step exclusion and finding the best subsets. The conclusion about the adequacy of the model was inferred by the F-criterion at a given level and relatively high scores of the multiple correlation coefficient and the multiple determination coefficient. According to the results obtained, the common positive correlates of responsibility in scientific and technical activity are the degree of scientific and methodological support of professional activity and the level of self-realization for professionals at the age above 35 years, constructive self-realization for professionals under 35 years. There are also coincidences regarding the negative correlates: successful career does not increase the degree of responsibility of technical departments specialists. Qualitative data analysis showed that it is also necessary to take into account the internal (level of selfrealization, self-esteem, extraction of applied meanings from informal communication, personality maturity) and external (scientific and methodological support of professional activity, satisfaction with the style of relationships with colleagues, career growth, salary) aspects of responsibility in the professional activity of specialists in the scientific and technical field.

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1. Introduction

Professional behavior of a specialist is manifested in a certain socio-cultural environment. This environment is objectively determined by one or another ways of the behavior of professionals and can be positive, aimed at the development of the organization, and negative, destructive. Their relationship is a regulatory structure that in some way regulates the behavior of employees in the distribution of powers and responsibilities.

Accordingly, a technically oriented specialist must understand the limitation, partiality of his knowledge that today threatens the very existence of life. He must realize that the mistakes in his profession, which are multiplying today (turned wrong way, made wrong protection, did not take into account vital factors, etc.), arise not so much because of the low professional culture (though this in our country has place), but due to the lack of humanitarian culture, relevant values, adequate time of worldview. According to I. Yalom, responsibility defines authorship, this way existentialism gives each person the possession of own being and responsibility for existence [28, p. 175].

One of the important conditions for the realization of personality in the professional activity many scientists (Ball [4]; Kokun [13]; Maksymenko [16]; Molyako [18]; Serdyuk [19]; Yakovytska [24], [25] consider the responsibility of personality. The higher is the level of personality freedom and responsibility of individual, the more it is the subject of its own activity. As a subject of one's own actions, a specialist must act consciously and take into account the experiences and actions of other people, norms of social morality, and be aware of the responsibility to society for the results of research. In the psychology of management, the most widely studied are the individual outcomes of corporate social responsibility (Ahmad, Magda et al [3]; Aguinis, Glavas [1], [2]; Berens, van Riel et al [5]; Li, Li et al [15]; Vachos, Epitropaki et al [21]).

In the vast majority of studies, responsibility is studied from the standpoint of the social, moral and legal relation of the personality to society and other people, which is characterized by the fulfillment of one's moral obligations and legal norms. J.J.Go [9] examines the effects of various aspects (social, economic, political, internal and external) on personal responsibility for actions. M.Brambilla, S.Sacchi et al [7] prove that behavioral intentions within a group are influenced only by moral information. The attribution of responsibility with a new category of social agents, namely, robotic workers, whose growth in society is becoming irreversible, has recently been explored (van der Woerdt, Haselager [22]; Krauth-Gruber, Bonnot [14]). The results of the study show that attribution of responsibility, affective and behavioral responses to robots are different from reactions to human agents in such situations, so the study of personal correlates of responsibility in scientific and technical professional activity makes significant practical sense and is relevant to production activities.

The term "scientific profession" was used to refer to those professionals whose main activity is related to the storage, transmission and multiplication of formal knowledge, that is, fixed and codified knowledge. Any profession is defined by certain main features. They are inherent in scientific and technical activities:

- professional responsibility for the storage, transfer and use of a specialized amount of knowledge, for the dissemination of this knowledge, both in practical and theoretical directions;

- high autonomy of the profession in the field of attracting new members, preparing and controlling of professional behavior;

- the third feature of the profession is its popularization in society.

A true scientist must also be a leader, perceiving own mission not only as a professional, but also as a cultural and social affair (according to A.G. Maslou [17], all people of such type strive for the realization of higher values, which, as a rule, cannot be reduced to something above all, among them there are goodness, truth, decency, beauty, justice, excellence, etc., that appear as vital needs for them). A specialist in the scientific and technical field must be pragmatic and aware of his responsibility not only within the production tasks, but also throughout the life that is surrounding. Thus, a specialist must combine "the talent of the leader and the responsibility of the partner" [10, p.161].

In the context of social philosophy, the responsibility of personality is a counterbalance to the utilitarian understanding of freedom. Often, inaccurate interpretation of freedom encourages inappropriate behavior of the person, and subsequently the will becomes irresponsible. The ethics of responsibility offers the individual to be anyone but capable of securing a better future. To implement a chain of will that combines "I want" and "I will do", responsibility is required. Responsibility is an ability of a person to separate important from the casual, to foresee the future, to determine the goal, the means of its achievement and the evaluation of results.

Max Weber's conclusion is also of particular importance in the sense of responsibility: "We must realize that every ethically oriented action can obey fundamentally different, even opposite maximums: it can be oriented either to "ethics of persuasion" or "ethics of responsibility" [23, p. 696]. Only in the second case ethics become practical, in addition, it is necessary to be responsible for the foreseeable consequences of one's actions.

The realism of the person is manifested in the nature of the redistribution of actions and responsibilities between individuals, between the individual and the group, the overall vision of the situation. In order to learn the essence of this personality feature, in our opinion, it is necessary to study the behavioral attitudes and communicative characteristics of professionals: social flexibility, ability to establish close contacts with the environment, emotional stability, social maturity (social activity, predisposition to dominance, readiness for the change, radicalism).

Goal. Empirically investigate the relationship of behavioral settings (social flexibility, ability to establish close contact with the environment, social maturity) and personal characteristics of specialists in the scientific and technical field with the level of responsibility.

The research of N.Biller-Andorno, T.Zeltner [6]; V.M.Kazak, D.O.Shevehuk, N.A.Tymoshenko, L.V.Pomytkina [11] examines the peculiarities of the technical university's educational environment and its role in forming the personality qualities of future engineers, in particular, intellectual mobility. The educational environment of the technical university is considered as a complete synergistically organized intellectual-educational space, which allows to open and form the intellectual qualities of future engineers: intellectual responsibility, intellectual activity, intellectual mobility. The relevant results were obtained in a study of Spanish colleagues. According to them, there is an influence of the personal and social responsibility (TPSR) of the teacher on increasing the independence of students (O.Camerino, A.Valero-Valenzuela et al. [8]), however, these studies are aimed at studying responsibility as a result of the interaction of teacher-student in the educational space of technical university.

The hypothesis of our study is the assumption that the professional environment is objectively determined by the ways of behavior and personality characteristics of professionals as subjects of activity, which can be both positive and negative correlates of responsible attitude to the implementation of norms and requirements proposed by the social group.

2. Methods

In the course of the empirical study we have studied what personal characteristics are considered as important prerequisites for successful professional activity by teachers, scientists and engineering staff of technical higher education institutions. The study involved professionals with working experience from 5 to 40 years and more: professors, associate professors, engineers, assistants, heads of the laboratories. Conversations and standardized surveys were conducted to clarify personal thoughts about one's prerequisites for self-actualization in a professional activity. To find out the degree of responsibility of the participants in the study, we used the "Responsibility and independence" test methodology developed by the Department of integration of training with production. During the empirical study, the sample was 213 persons (152 respondents were teachers and engineers of technical departments and 61 respondents were teachers of economic departments). In addition, by age, respondents were divided into two subgroups: professionals under 35 years and professionals over 35 years.

3. Results

The results of the "Responsibility and independence" test methodology showed that personal responsibility has a relatively equal score across all groups. This can be explained by the fact that the professional responsibility of the personality acts as a psychological factor that determines career advancement. The attentive attitude towards professional responsibility in a group of colleagues over the age of 35 is explained by the opportunity to evaluate and control the processes of professional forecasting in the scientific and technical sphere. In addition, in an informal society,

responsibility largely determines the status of a specialist, and to what extent he or she is trusted by colleagues and managers.

In the research, responsibility of the subject was defined as the conscious attitude of the specialist to the fulfillment of all standards and requirements offered by the society [27]. Most respondents agreed that a responsible attitude may require the development of certain personality traits, not always inherent, depending on the functions performed. In the group under 35 years, the analyzed indicator is relatively equal. This can be explained by the fact that the professional responsibility of the personality acts as a psychological factor that determines the career growth of a young specialist, because it is related to the assessment of motivation and control of professional activity. A certain increase in professional responsibility in a group of more experienced colleagues is explained not only by evaluation and control in the moment of making choice, but also by the processes of professional prognosis, determination of the purpose and formation of life and professional plans in the near and distant future of the specialist. The statistically significant differences in the degree of responsibility among professional groups of different ages were not defined.

The personal correlates of responsibility were then examined. The array of data obtained was analyzed by the method of step by step inclusion, step by step exclusion, and finding the best subsets. The conclusion about the adequacy of the model was inferred by the F-criterion at a given level and relatively high scores of the multiple correlation coefficient and the multiple determination coefficient.

Preliminary analysis of the results of the research showed that there are differences in the choices not only regarding the work experience in the scientific and technical sphere, but also about the direction of the department, therefore the models for teachers of technical and economic departments were calculated separately, taking into account the length of the working experience in their professional activity.

Thus, the model of responsibility of teachers of technical departments of the university under the age of 35 years included the following correlates that positively influence their responsibility: constructive self-realization (X1); thoughts about work (X2); scientific and methodological support of professional activity (X3); technical support (X4); interest in technical sciences (X5). Negatively influence their responsibility: career growth (X6); reflective abilities (X7), material considerations (X8), recommendations of parents (X9). The linear regression model of responsibility of teachers of the technical university under 35 years is calculated by the following equation (see table 1):

aged under 35 years				
(Constant)	1,196	,000		
constructive self-realization	1,318	,000		
recommendations of parents	-,105	,000		
thoughts about work	,901	,000		
scientific and methodological support of professional activity	,610	,002		
material considerations	-,164	,000		

 Table 1. Linear regression model of responsibility of teachers of technical departments

interest in technical sciences	,072	,000,
career growth	-1,287	,000,
reflective abilities	-,230	,004
technical support	,500	,007

Responsibility = 1,196+1,318X1+0,901X2+0,61X3+0,5X4+0,072X5 - 1,287X6 - 0,23X7 - 0,164X8 - 0,105X9 at F=20,101; p<0,000

According to the results obtained, such personal correlates as the desire for constructive self-realization, thoughts about work outside working hours, proper scientific and methodological support of professional activity, most influence the degree of responsibility of professionals under 35 years.

The model of responsibility of teachers of technical departments of the university over the age of 35 years included the following correlates. Positively correlates with the responsibility: scientific and methodological support of professional activity (X1); satisfaction with the style of relationships with colleagues (X2); the level of self-realization (X3). Negatively correlates with the responsibility: autonomy (X4); satisfaction with the style of relationships with management (X5); career growth (X6). The linear regression model of responsibility of teachers of the technical university over 35 years is calculated by the following equation (see table 2):

 Table 2. Linear regression model of responsibility of teachers of technical departments aged over 35 years

(Constant)	2,282	,000
level of self-realization	,203	,000
scientific and methodological support of professional activity	,520	,024
satisfaction with the style of relationships with colleagues	,256	,001
career growth	-,088	,009
autonomy	-,958	,003
satisfaction with the style of relationships with management	-,149	,042

Responsibility = 2,282+0,520X1+0,256X2+0,203X3-0,958X4-0,149X5-0,088X6 at F=14,054; p<0,000

According to the results obtained, such correlates as scientific and methodological support of professional activity, satisfaction with the style of relationships with colleagues, the level of self-realization most influence the degree of responsibility in the group of specialists of technical departments aged over 35 years.

Comparing the two models, we can see that the common positive correlates of responsibility in scientific and technical activity is the degree of scientific and methodological support of professional activity and the level of self-realization for professionals over 35 years, constructive self-realization for professionals under 35

years. There are also coincidences about negative correlates – it is career growth, that is, a successful career does not increase the degree of responsibility of specialists of technical departments.

The model of responsibility of teachers of economic departments of the university aged under 35 years, perhaps because of a small sample (less than 30) was not constructed, due to the lack of correlates of responsibility among the primary indicators.

The model of responsibility of teachers of the economics departments of the university over the age of 35 years included the following correlates. Positively correlated with the responsibility: self-esteem (X1); extraction of applied meanings from informal communication ((X2); personality maturity (X3); career growth (X4); salary (X5). Negatively influences the responsibility of professionals: adaptation to the professional environment (X6); normative self-realization (X7); technical creativity (X8); recommendations of parents regarding the choice a specialty (X9). The linear regression model of responsibility of teachers of economics departments aged over 35 years is calculated by the following equation (see table 3):

 Table 3. Linear regression model of responsibility of teachers of economic departments aged over 35 years

over 55 years				
(Constant)	2,528	,000		
adaptation to the professional environment	-1,815	,000		
recommendations of parents	-,237	,000,		
technical creativity	-,827	,000,		
self-esteem	1,823	,000		
extraction of applied meanings	1,593	,000,		
personality maturity	,829	,000,		
career growth	,290	,000,		
salary	,178	,000,		
normative self-realization	-,835	,000,		

Responsibility = 2,282+ 0,520X1+ 0,256X2 + 0,203X3 + 0,958X4 +0,149X5 - 0,088X6 -0,835X7 - 0,827X8 - 0,237X9 at F=46,641; p<0,000

4. Discussion

According to the results obtained, such correlates as self-esteem, extraction of applied meanings from informal communication, personality maturity most positively influence the degree of responsibility in the group of specialists of technical departments aged over 35 years. Negative correlates of adaptation to the professional environment, normative self-realization, recommendations of parents regarding the choice of speciality characterize the degree of integration of the personality in public relations and social expectations about it. Their negative impact can be explained by the effect of dissipation

of responsibility, thus, they accept the rules of activity, but the responsibility for its consequences is either dissipated or transferred to other participants.

Comparing the models of responsibility of teachers of technical and economic departments of the university at the age over 35 years, we see that the responsibility of teachers of technical departments correlates with activity orientation (scientific and methodological support of professional activity, satisfaction with the style of relations with colleagues, the level of self-realization). For teachers of economics departments, responsibility correlates with personality characteristics (self-esteem, extraction of applied meanings from informal communication, personality maturity) and normative signs of social success (career growth, salary). For teachers of technical departments, on the contrary, career growth, satisfaction with the style of relationships with management are not positive correlates of responsibility, which can be explained primarily by the focus on solving technical problems and the contradictions that arise in the course of professional activity. This way, in the works of J.D.Steadman, motivational mechanisms that influence moral responsibility of a person are self-control and good sense [20].

Thus, specialists in the scientific and technical field often want to determine for themselves the proper and valuable in the professional field on their own. In this case, responsibility becomes a means of internal control (self-control) and internal regulation (self-regulation) of the activity of personality. The main subject of personality self-regulation in professional activity is actions aimed at transforming a person's attitude to different types of activity, to other people, to oneself.

5. Conclusions

Analyzing the problem of responsibility, it is necessary to distinguish its internal (level of self-realization, self-esteem, extraction of applied meanings from informal communication, personality maturity) and external (scientific and methodological support of professional activity, satisfaction with the style of relations with colleagues, career growth, salary) aspects. In many pragmatic sciences it is also necessary to take into account the value and purpose settings of people. A specialist in the technical field should not only seek to solve the engineering problem and technical contradictions that have arisen, but also to reflect the features of own search activity, taking into account the humanitarian and environmental requirements within which the research is carried out. The nature of scientific and technical activity forces scientists to take a certain ethical position as well. As soon as the above connections are sufficiently taken into account, it is immediately apparent that the technical sciences are completely imbued with social and psychological content. Ideally, it should be about the conscious observance of the humanities principles of ethics of responsibility by specialists of the scientific and technical field.

In the future, we will direct research on the identification of additional psychological and socio-psychological factors that affect the development of responsibility of specialists in the scientific and technical field.

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