To develop a methodology for finding the competencies of agricultural workers with a positive economic return

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Abstract. The paper describes a study by the example of processing the results of a survey of 200 employees of the agro-industrial complex on psychological tests, work experience and salary level. The authors identified the following groups of competencies: intellectual and educational, communicative, motivational and volitional, management. 15 psychological tests were used to assess their presence in respondents. After correlation and variance analyses, a statistically significant model of the dependence of the wage level on 12 indicators was obtained: ability and readiness for self-development and self-education, tolerance, high motivation for success, self-actualization of personality, strong interest in professional development, focus on interaction, high level of emotional intelligence. At the same time, it can be used in research only for the agricultural complex at the current time, i.e., at the beginning of the sixth technological order.

1 Introduction

An important factor in economic development, digitalization and the introduction of new technologies is the development of digital culture, the creation of a new educational environment, the development of technological infrastructure and the formation of human capital. This is also proved by the results of the Digital IQ study, which examines the impact of investments in digital technologies and systems. Any success of the transformation, the transition to a new technological order will depend on not only the intensification of technologies, the use of special sensors, algorithms, analytical tools and information systems, etc., but also on human capital. Organizations of the agro-industrial complex should attract, retain and train specialists of the “digital generation” who form the information society and possess the competencies that are most in demand in their field of activity.

The change in the functions of workers and the conditions of technological development of the agro-industrial complex will inevitably lead to the expansion of forms of employment, changes in working hours, the erasure of territorial boundaries, increased flexibility of labor, the transfer of economic and social activities to the Internet environment, the urbanization of agriculture.

We believe that in addition to classical factors such as education, seniority, place of residence, influencing the formation of human capital, a person's entrepreneurial abilities, high motivation for success and achievement of goals, free orientation on the Internet and possession of information and communication technologies, access to open knowledge can be significant. This is confirmed by the studies of N. Frederiksen, Tangney, V. Bouchard, S. Zaika, O. Gridin, D. Rusmingsih, E. L. Widarni, S. Bawono [1–5].

Drastic changes in the life of a modern person, increasing the pace of interaction in everyday life and production activities have influenced the paradigm of training specialists, i.e. there was a need to move from a qualification model to a competence model. Modern employees should continuously engage in self-education, expand and improve their competencies [6].

It is difficult for researchers to numerically assess most of the competencies of employees, because it is necessary to take into account the psychophysical state of a person, willpower, hereditary traits, so scientists suggest resorting to the use of psychodiagnostic methods. There are several areas of competence research at the interface with psychology:

- contradictions of professional competencies and intrapersonal conflict [7],
- assessment of cognitive characteristics of a person [8, 9],
- identification of success factors in the professional activity of an employee [10],
- economic and legal aspects of competencies, including assessment of economic impact [11–14].

As our analysis of scientific publications has shown, the least attention is paid to the creation of methods for psychodiagnostics of cognitive characteristics of an
employee that form his competencies. And such methods can be developed both for individual industries and be universal.

The purpose of the study is to select and substantiate a set of competencies/psychodiagnosis techniques to identify the competencies of agricultural workers in terms of informative features that affect the amount of wages.

2 Materials and methods

This section includes the main theoretical approaches and terms used in the study, as well as methodological justification and the main steps of scientific work.

2.1. Materials

Let us highlight the approaches and terms that will be used in the work.

First, let us introduce a restriction. We will consider competencies within the framework of a person's professional activity. Competencies are formally described requirements for personal, professional, etc. qualities of employees necessary for the successful functioning of the activities of entrepreneurs and/or organizations.

Professional competencies in Russia are determined by educational standards for educational institutions of different levels.

Critical competencies imply the competencies that are most in demand for this technological stage and this field of activity (and for our research for the agro-industrial complex) in the labor market. They are constantly changing in the process of economic development.

The set of competencies will be divided into the following groups: intellectual and educational, communicative, motivational and volitional, management.

A positive economic return implies an increase in the level of wages if the employee has the competence in question.

2.2. Research methods

To assess competencies, the authors chose the following methods of psychodiagnostics and labeled the results of them as variables:

- Assessment of the ability to self-development and self-education (SC1),
- Readiness for self-development (SC2),
- Creativity (SC3),
- Tolerance index (SC4),
- Communicative tolerance (SC5),
- Diagnosis of interference in establishing emotional contacts (SC6),
- The need to achieve a goal (SC7),
- Measuring tolerance (SC8),
- Resilience (SC9),
- Degree of risk tolerance (SC10),
- Motivation for success (SC11),
- The level of self-actualization of the individual (SC12),
- Morphological test of life values (SC13),
- Diagnosis of personality orientation (SC14),
- Emotional Intelligence (SC15).

The sample size of respondents is 200 employees of the agro-industrial complex. Correlation and variance analyses of the respondents' test results were used for the study.

The hypothesis in the study was that in the presence of the competencies in question, agricultural workers, with other identical characteristics have a higher salary level.

Let us introduce additional notation. The variable $Y$ is salary, $Ex$ – work experience, $Scn$ – points obtained by psychodiagnostics methods for assessing competencies. Let us conduct a correlation analysis between the variables: $SC1, SC2, SC3, SC4, SC5, SC6, SC7, SC8, SC9, SC10, SC11, SC12, SC13, SC14, SC15, Ex, Scn, Y (Figure 1).

3 Results and discussion

Let us construct a correlation matrix for the values: $SC1, SC2, SC3, SC4, SC5, SC6, SC7, SC8, SC9, SC10, SC11, SC12, SC13, SC14, SC15, Ex, Scn, Y (Figure 1).

As we can see from the table, no factor forms a strong correlation. There is no multicollinearity.

Let us output a table with the level of significance of the factors.
It is necessary to remove those factors whose significance level is $p \geq 0.05$. In our case, this refers to the variable "Work experience" and to competencies 3, 5, 6, 7, 10. It is necessary to consistently remove these factors from the regression equation, starting with the factor whose significance level is the higher than the others are, each time rebuilding the model anew (Figure 3, 4, 5, 6, 7, 8).

Let us construct a frequency histogram of the residuals (Figure 9).

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**Fig. 2. Significance levels of the model.**

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**Fig. 3. Significance levels of the model when excluding Sc10.**

**Fig. 4. Significance levels of the model when excluding Sc10, Sc7.**

**Fig. 5. Significance levels of the model when excluding Sc10, Sc7, Sc3.**

**Fig. 6. Significance levels of the model when excluding Sc10, Sc7, Sc3 and work experience Ex.**

**Fig. 7. Significance levels of the model when excluding Sc10, Sc7, Sc3, Ex, Sc5.**

**Fig. 8. Significance levels of the model when excluding Sc10, Sc7, Sc3, Ex, Sc5, Sc6.**

Let us construct a frequency histogram of the residuals (Figure 9).
The histogram is distributed symmetrically, despite the outlier in the center, so the hypothesis of normality is not rejected.

Next, let us look at the normal probability graph (Figure 10).

There are no systematic deviations from the theoretical normal curve, the residuals are distributed normally.

Let us look at the dependence of the predicted values and residuals (Figure 11).

In the scattering diagram, we see the ratio of the residuals from the predicted values.

In the direction of the movement of points, there is a systematic pattern, expressed by the accumulation of points in the interval of residuals (-10;10) and predicted values in the interval (20;60). Based on this, we say that the residuals depend on the predicted values.

Let us evaluate the acceptability of the model as a whole by the analysis of variance. In the STATISTICA statistical package, it is designated as ANOVA. The analysis of variance is shown in Figure 12.

By the level of significance, we can say that the model is acceptable and will work better than the forecast for average values.

The determination index is quite high, it indicates a good quality of the model (Figure 13).

Its value was 0.775, which means that approximately 77.5% of factors affect the response and are taken into account in our model.

Thus, when analyzing the impact of competencies on the salary level in the model, the following turned out to be informative: Sc1, Sc2, Sc4, Sc8, Sc9, Sc11, Sc12, Sc13, Sc14, Sc15. Consequently, abilities and readiness for self-development and self-education, tolerance, high motivation for success, self-actualization of personality, strong interest in professional development (based on the morphological test of life values), focus on interaction, a high level of emotional intelligence are not interrelated and affect the level of wages of employees of the agro-industrial complex. These competencies can be called critical, because employers are willing to pay employees more money for their availability. The set of critical competencies at different stages of economic development and for different fields of activity will be different. Therefore, research should be carried out separately for different industries, at different time periods.

References

3. V. Bouchard, A. Fayolle, Corporate entrepreneurship (Routledge, 2017)


